eClockspeed-based Principles for Supply Chain Design*

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***Based in part on *Clockspeed: Winning Industry Control in the Age of Temporary Advantage*, by Charles H. Fine, Persues Books, 1999.**

eClockspeed-based Principles for Value Chain Design

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1. Fruit Flies & Temporary Advantage
(defs, Intel, dependence, Helix, acceleration)

2. Supply Chain Design & 3-DCE
(architectures, dependencies, core comps, make/buy, mapping, decision process)

3. eBusiness Phenomena:
Business Model Innovation
(e-tailing, B2B=mkts+e2e+NPD, CPM, free info flow)

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Value 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 evolves faster than
MICROCHIPS evolve faster than
AUTOS evolve faster than
AIRCRAFT evolve faster than
MINERAL EXTRACTION

THE KEY TOOL:

Cross-INDUSTRY Benchmarking of Dynamic Forces

INDUSTRY CLOCKSPEED IS A COMPOSITE: *

OF PRODUCT, PROCESS, AND ORGANIZATIONAL CLOCKSPEEDS

Automobile INDUSTRY CLOCKSPEED

THE *Automobile*
product technology

THE *Automobile* PRODUCTION PROCESS
process technology

THE *Automobile* MANUFACTURING COMPANY
organization

Automobile CLOCKSPEED IS A MIX OF ENGINE, BODY & ELECTRONICS

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ENGINE
slow clockspeed

BODY
medium clockspeed

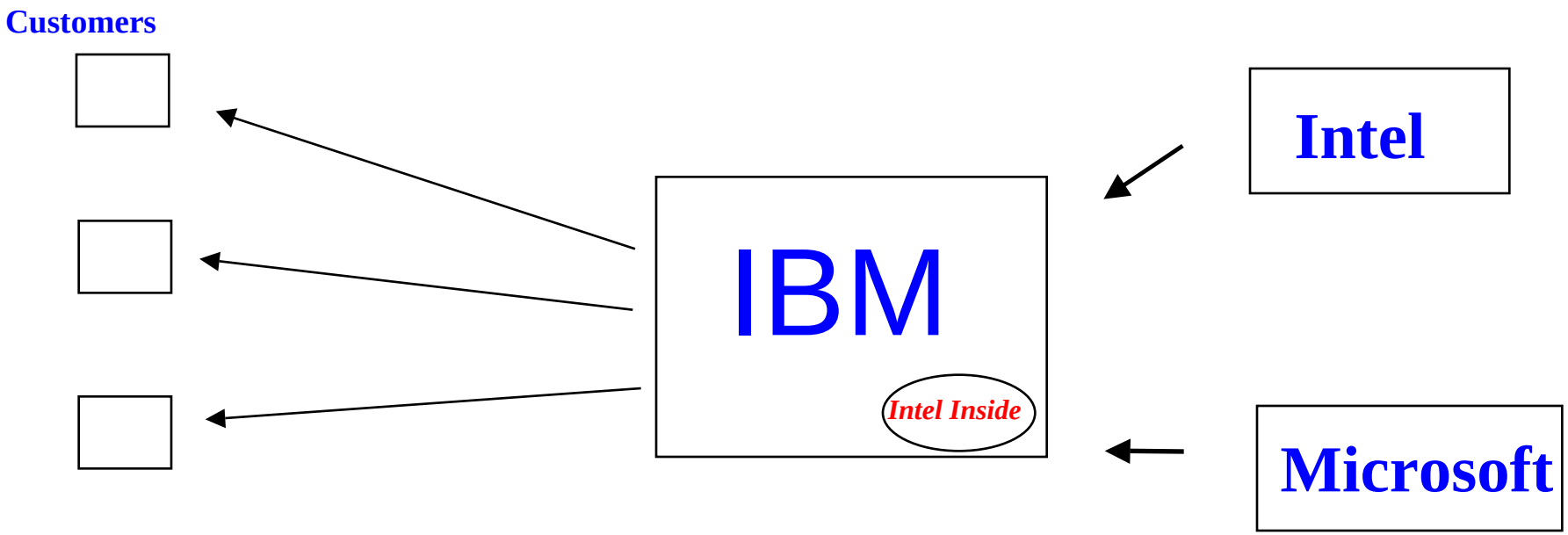
ELECTRONICS
fast clockspeed

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

The Strategic Leverage of Supply Chain Design:

Who let Intel Inside?

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



The Outcome:

A phenomenonally successful product design

A disastrous supply chain design (for IBM)

LESSONS FROM A FRUIT FLY:

THE PERSONAL COMPUTER

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

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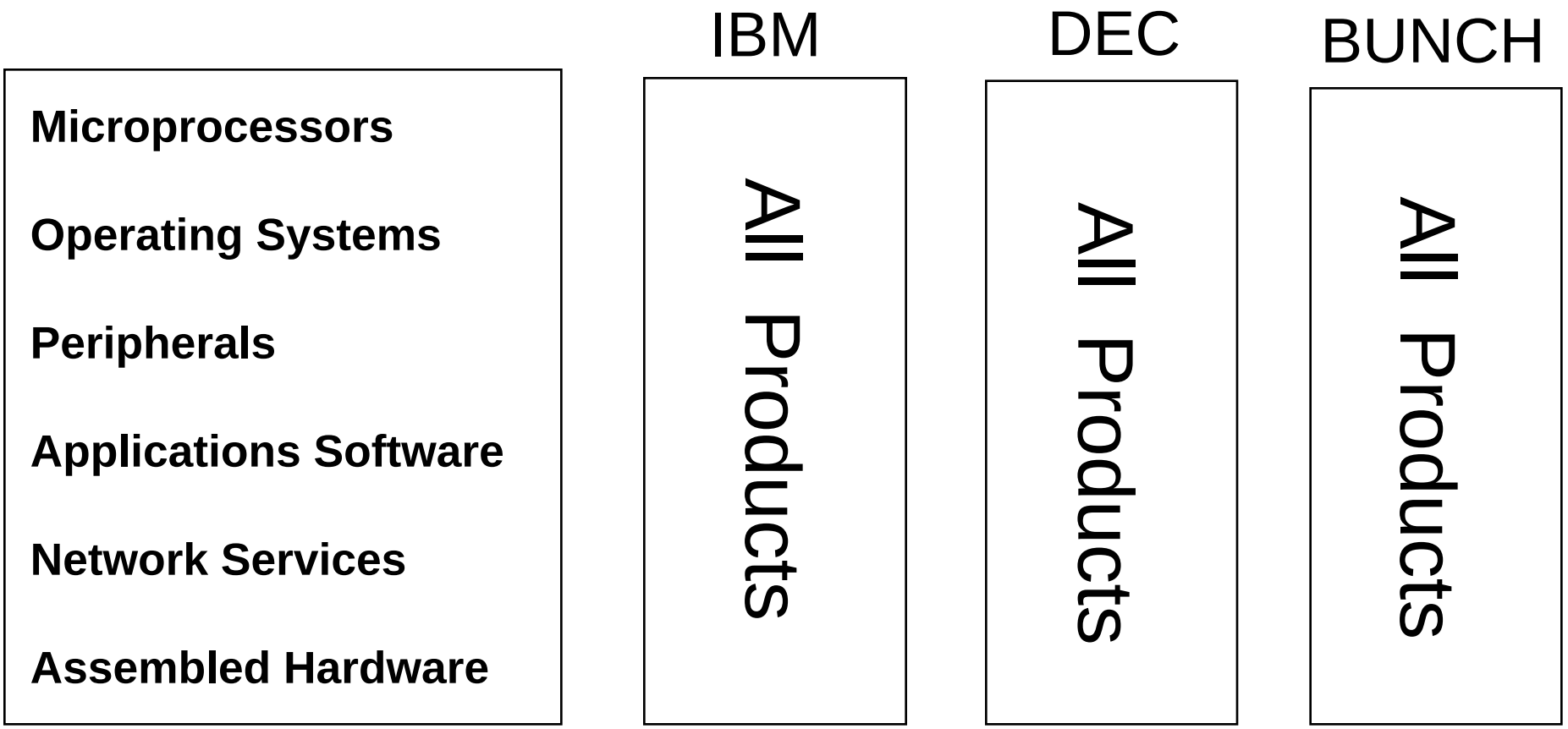
Vertical Industry Structure with *Integral* Product Architecture

Computer Industry Structure, 1975-85



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

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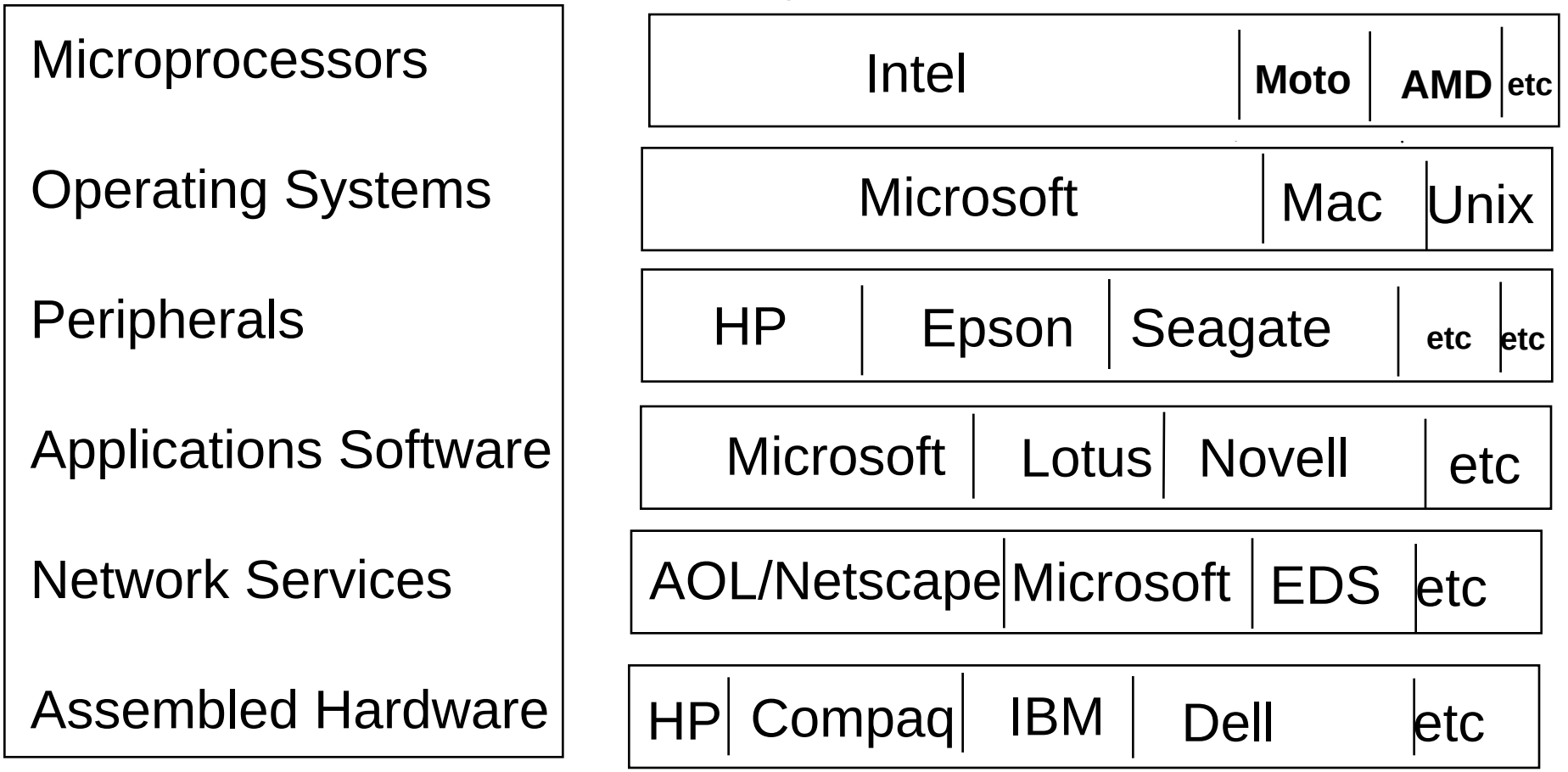
Horizontal Industry Structure with *Modular* Product Architecture

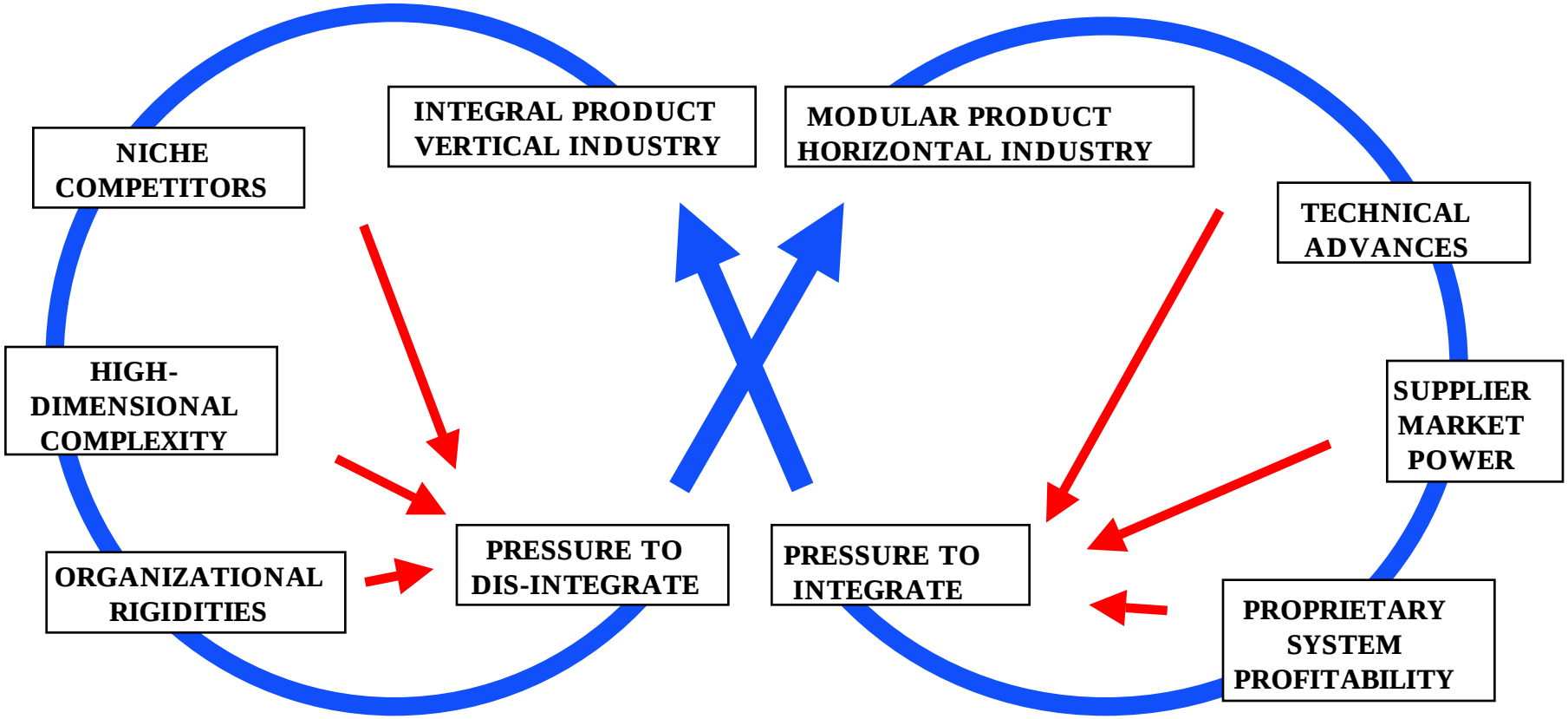
Computer Industry Structure, 1985-95



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

THE DYNAMICS OF PRODUCT ARCHITECTURE AND INDUSTRY STRUCTURE:

THE DOUBLE HELIX



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

THE *DOUBLE HELIX* IN OTHER INDUSTRIES

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- ***TELECOMMUNICATIONS--***
  - **"MA BELL" was Vertical /Integral**
  - **BABY BELLS & LONG LINES & CELLULAR are Horizontal/Modular**
  - **Today's AT&T 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***

Controlling the Chain Through Distribution:

The End of *P&G Inside* ?

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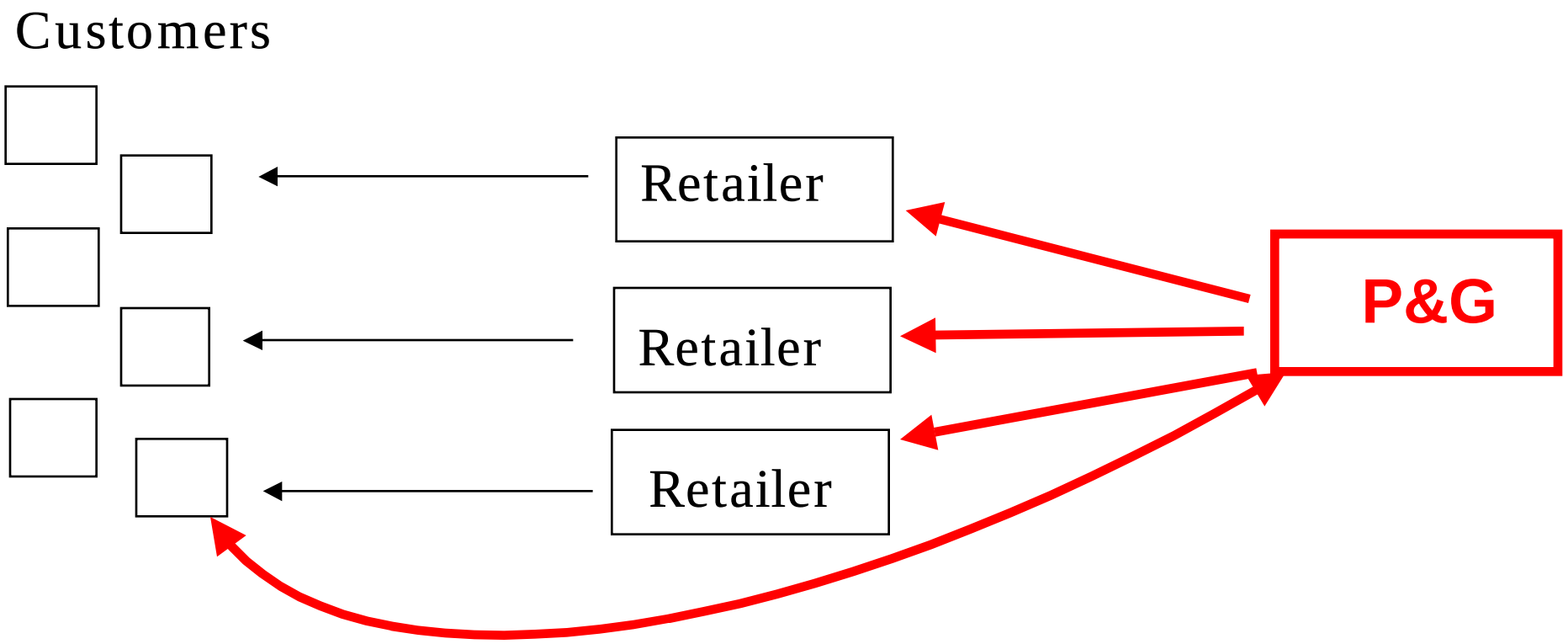
Controlling the Channel Through Closeness to Customers:

consumer research, pricing, promotion, product development



Controlling the Chain Through Distribution:

Beware of *Walmart Outside*

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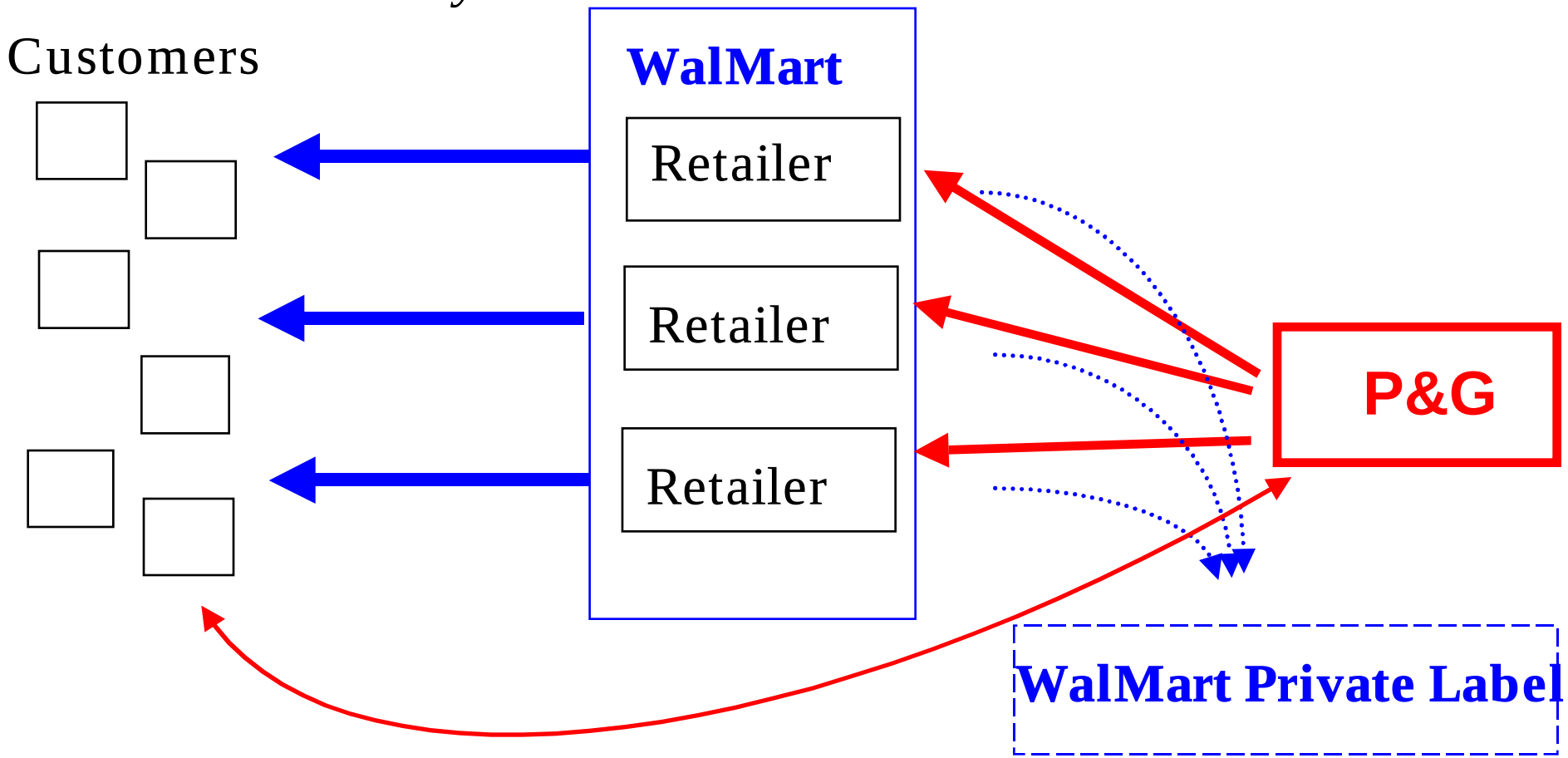
Controlling the Channel Through Closeness to Customers:

Chain Proximity



Battle for Channel Control - Proprietary Systems v. Closeness to Customers

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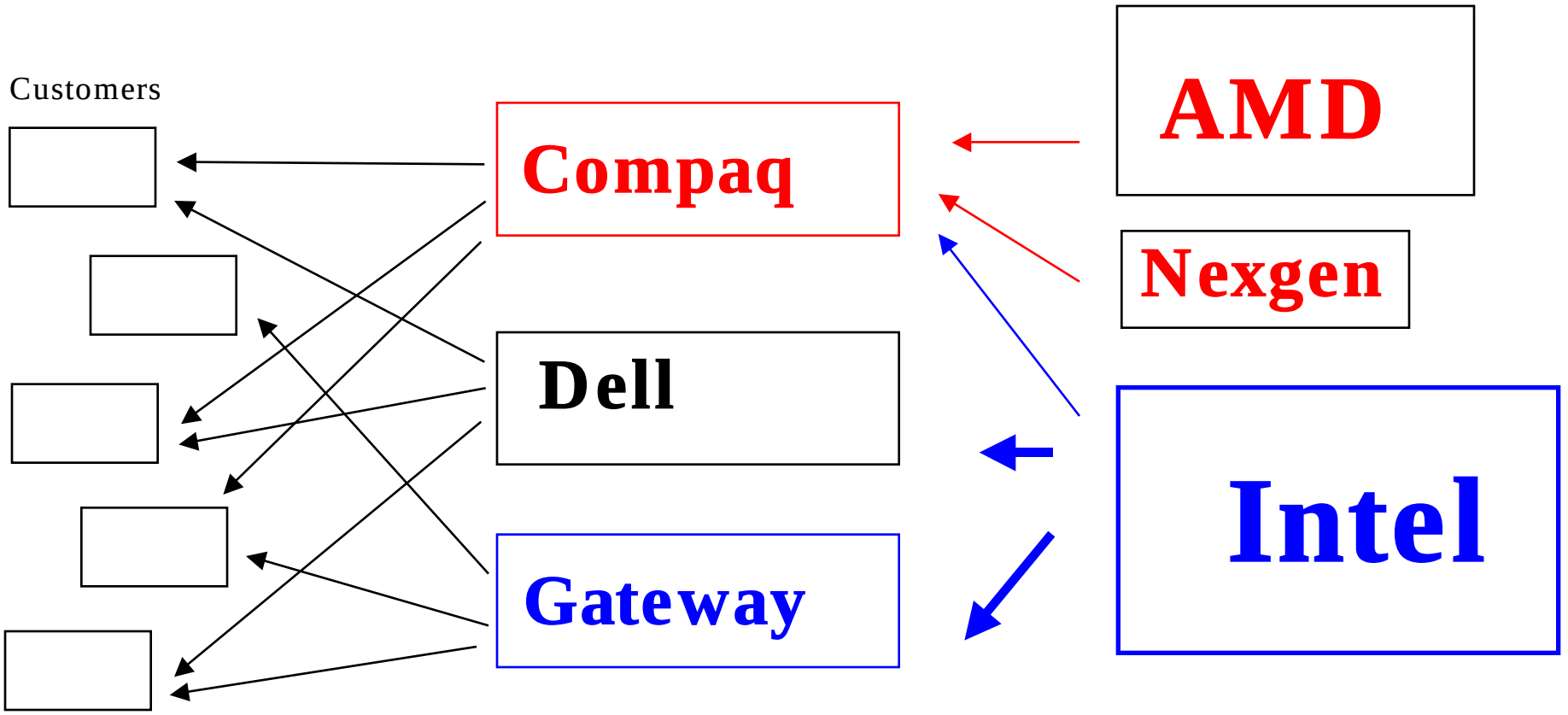
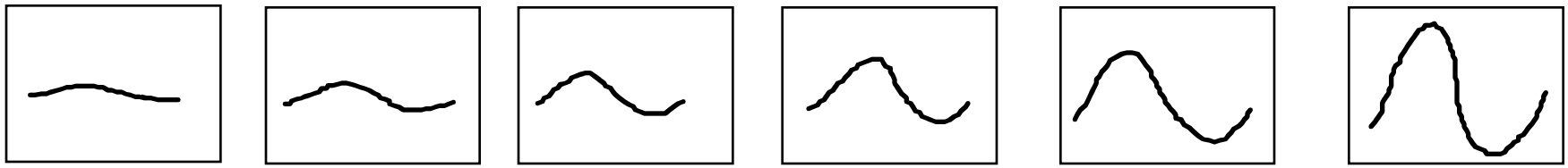
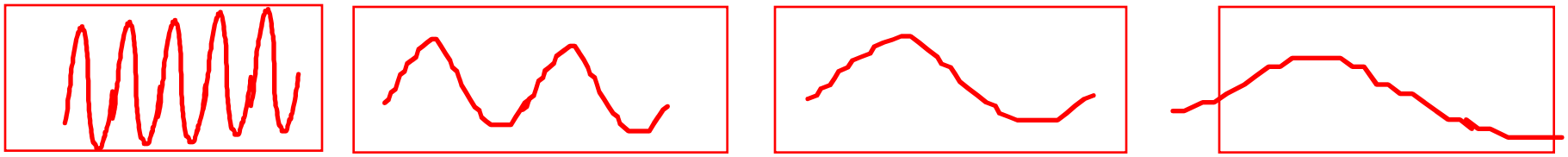


Volatility Amplification in *"The Bullwhip Effect"* and Clockspeed Amplification in *"The Speedup Effect"*



Customer | Retailer | Distributor | Factory | Tier 1 | Equipment

Inventories & Orders fluctuate more as you look upstream, tough on suppliers, but



Web Site Developer | PC Maker | Chip maker | Equipment Maker

Clockspeeds accelerate as you head downstream, closer to the final customer

Media Supply Chains: An Industry at *Lightspeed*

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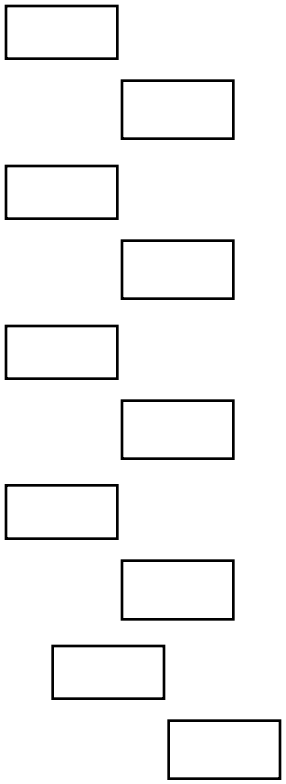

Customers

The box

- Telephone
- Personal Computer
- Television
- VCR
- Pager

The Pipe

- Phone network:
  - -copper
  - -fiber optics
- **Local Area Networks**
- Cable Networks
- Airwaves:
  - -broadcast TV
  - -cellular tel
  - -satellite / microwave
- Retail Outlets for CD's, tapes, print:
  - -Blockbuster
  - -Seven-Eleven

The Content

- Video / Audio: Movies & Art & News & Sports
- Print: newspapers & magazines & books
- Communication: voice & video & email
- Education
- Shopping
- Internet, *et al*

ALL COMPETITIVE ADVANTAGE IS TEMPORARY

Ford **in the late 1910's and early 1920's**
GM **in the 1950's and 1960's**
IBM **in the 1970's**
Microsoft **in the 1990's**

The *Greeks*, The *Romans*,
The *Ottomans*, The *Huns*

The *Yankees*, The *Cowboys*,
The *Celtics*, The *Canadiens*

The faster the clockspeed, the shorter the reign

eClockspeed-based Principles for Value Chain Design

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1. Fruit Flies & Temporary Advantage
(defs, Intel, dependence, Helix, acceleration)

2. Supply Chain Design & 3-DCE
(architectures, dependencies, core comps, make/buy, mapping, decision process)

3. eBusiness Phenomena: Business Model Innov.
(e-tailing, B2B=mkts+e2e+NPD, CPM, free info flow,

SUPPLY CHAIN DESIGN:
Three Components

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1. Insourcing/OutSourcing

(The Make/Buy or Vertical Integration Decision)

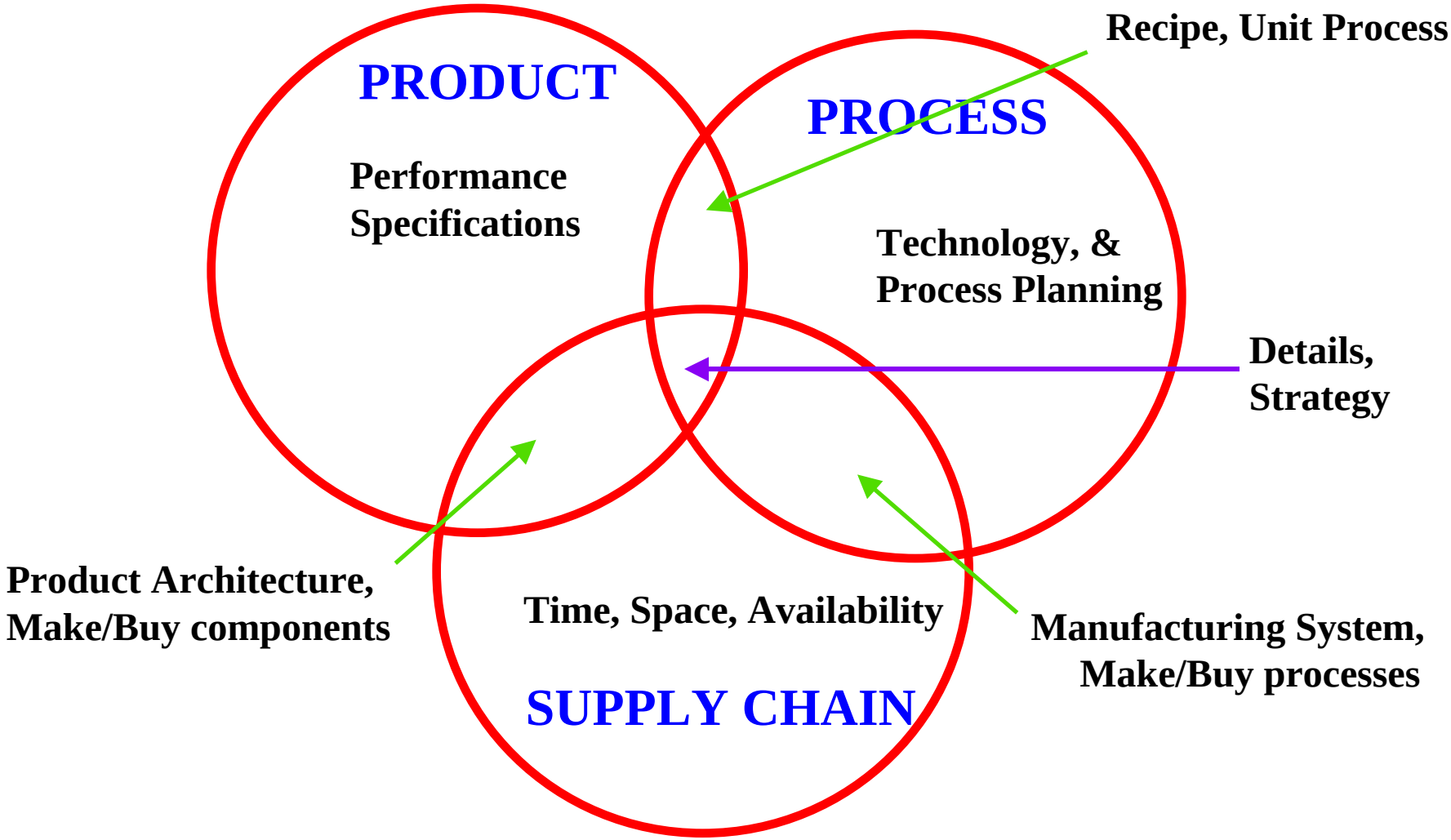
2. Supplier Selection

(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.)

IMPLEMENTATION OF SUPPY CHAIN DESIGN: EMBED IT IN 3-D CONCURRENT ENGINEERING*



ARCHITECTURES IN 3-D
INTEGRALITY VS. *MODULARITY*

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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**

SUPPLY CHAIN ARCHITECTURE

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Integral supply-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 supply-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

DESIGNING ARCHITECTURES FOR PRODUCTS & SUPPLY CHAINS: THE NEED FOR ALIGNMENT

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SUPPLY CHAIN ARCHITECTURE (Geog., Organ., Cultural, Elec.)

PRODUCT ARCHITECTURE

	INTEGRAL	MODULAR
INTEGRAL	Jet engines Microprocessors Mercedes vehicles	Polaroid Nortel
MODULAR	Automotive Supplier Parks	Personal Computers Bicycles Chrysler Vehicles Cisco

DESIGNING ARCHITECTURES FOR PRODUCTS & SUPPLY CHAINS: MODULARITY VS. OPENNESS

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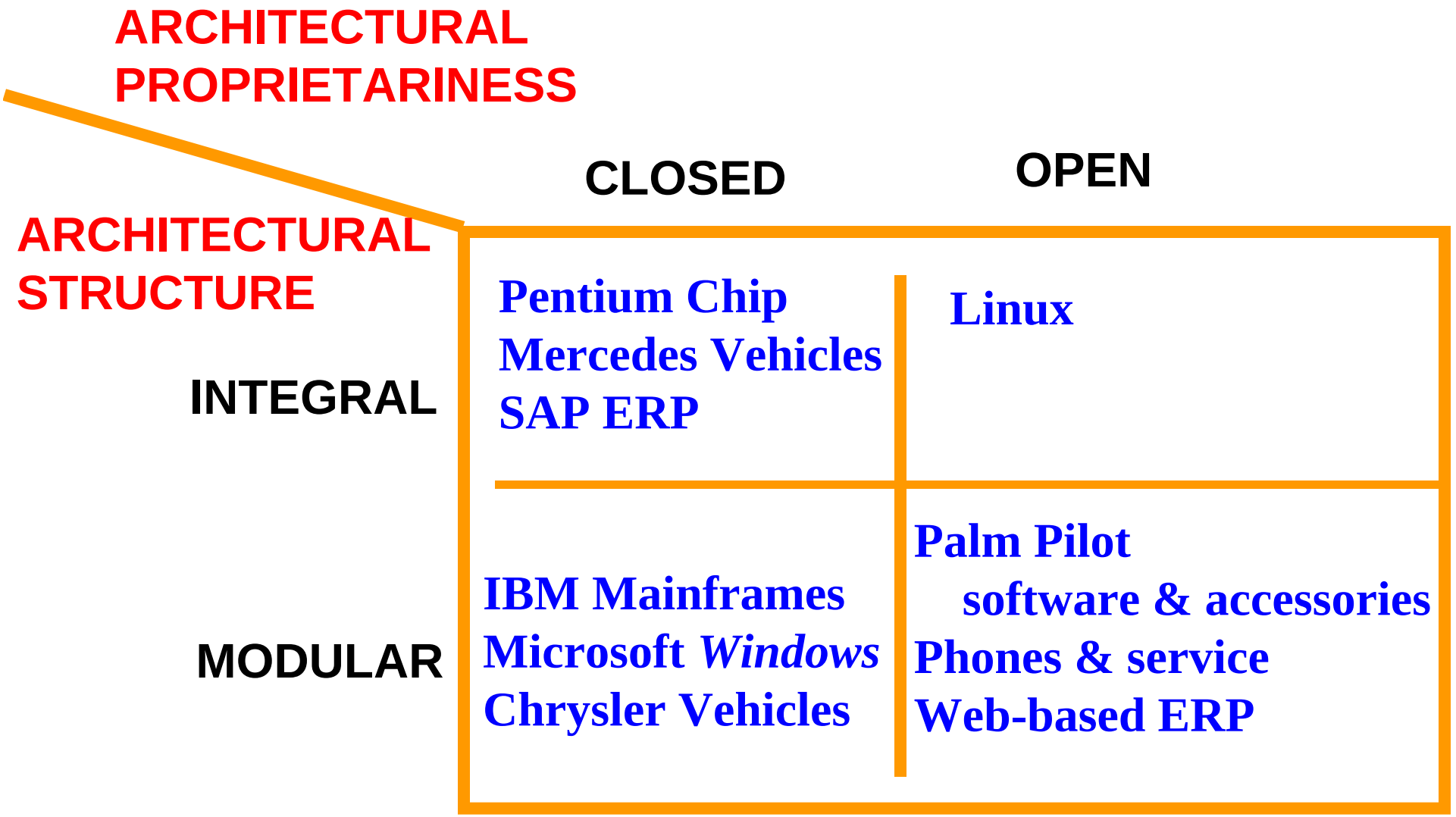

In/Outsourcing: Sowing the Seeds of Competence Development to develop dependence for knowledge or dependence for capacity

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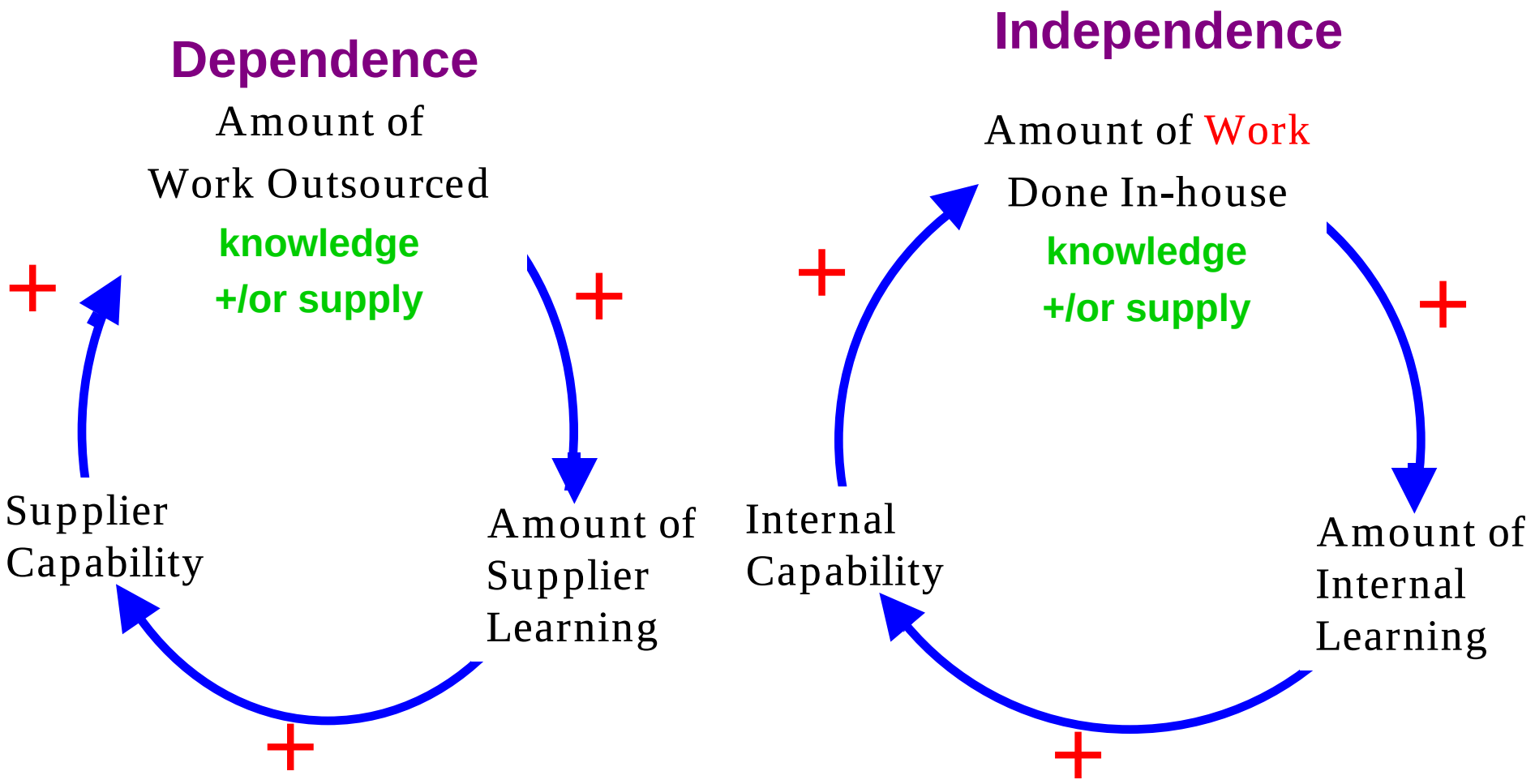

Dynamics between New Projects and Core Capability Development

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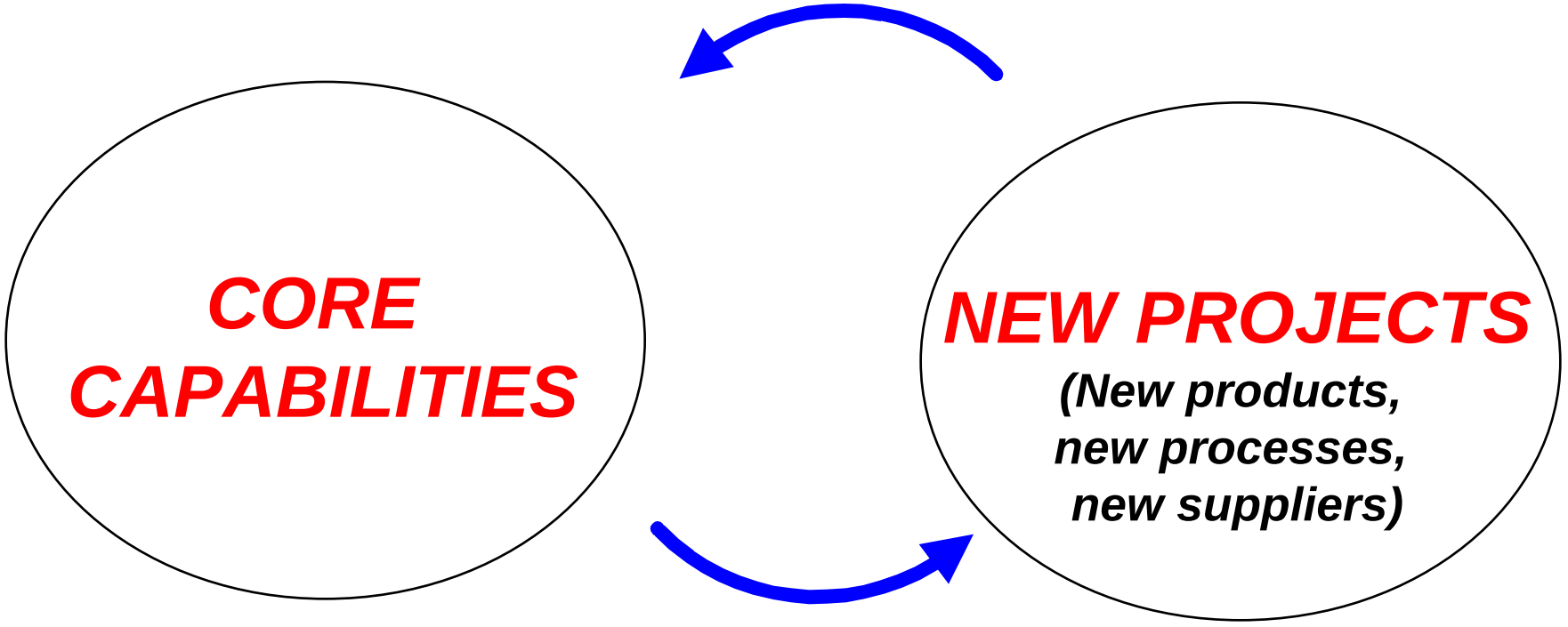

Leonard-Barton, *Wellsprings of Knowledge*

Technology Dynamics in the Aircraft Industry:
LEARNING FROM THE DINOSAURS

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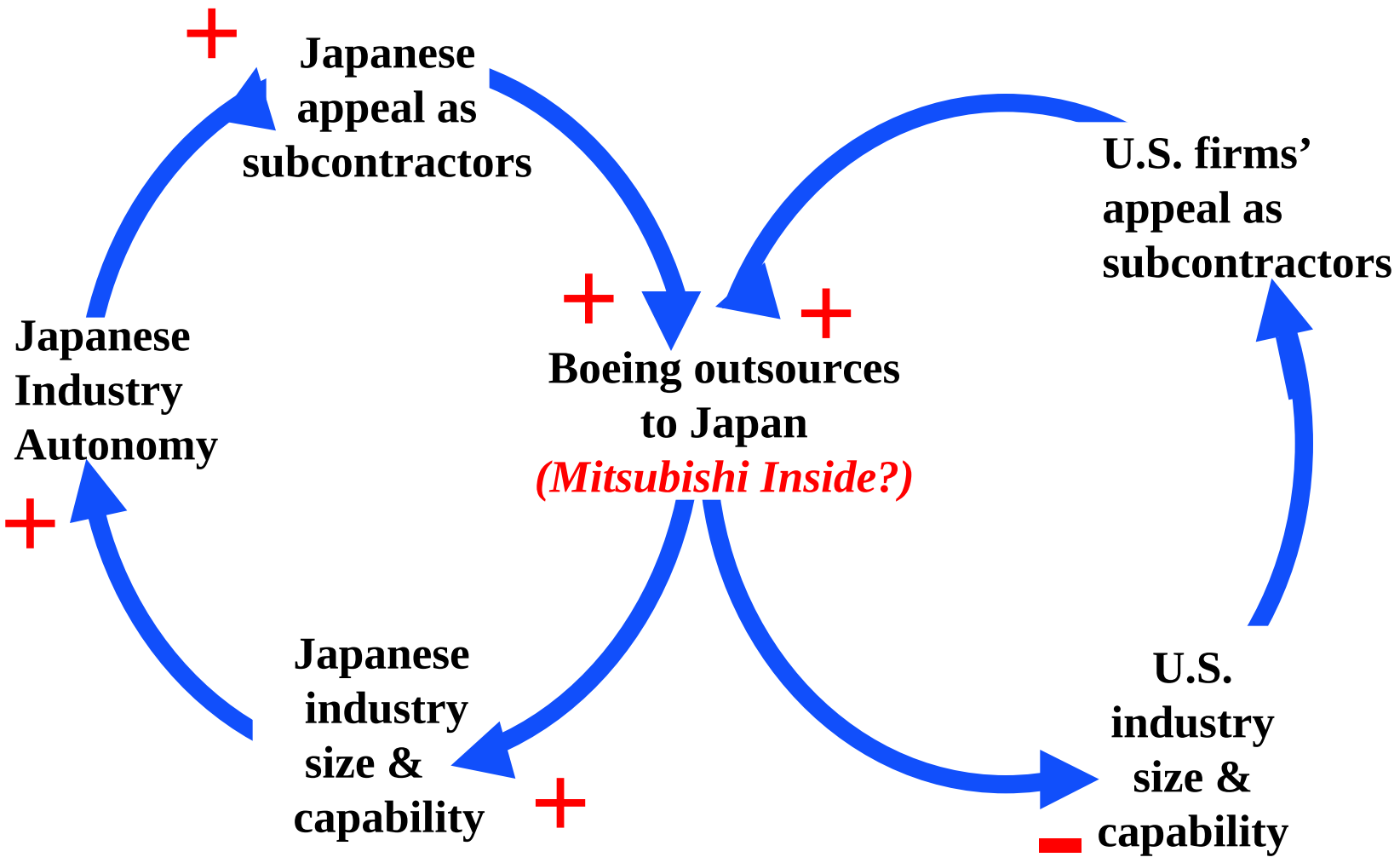

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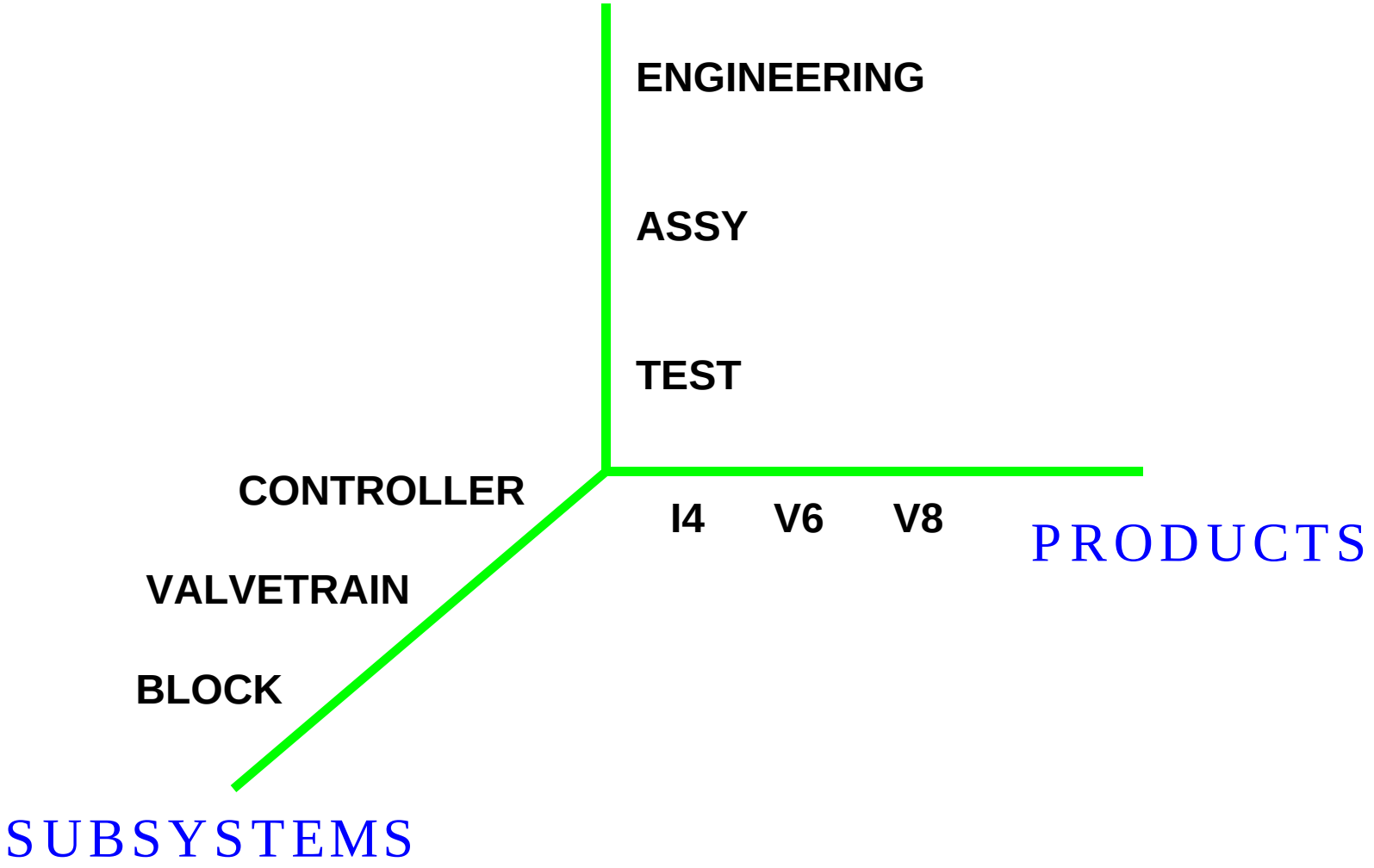
SOURCEABLE ELEMENTS

SUPPLY CHAIN ELEMENTS



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

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ITEM IS	DEPENDENT FOR KNOWLEDGE & CAPACITY	DEPENDENT FOR CAPACITY ONLY	INDEPENDENT FOR KNOWLEDGE & CAPACITY
MODULAR	A POTENTIAL OUTSOURCING TRAP	BEST OUTSOURCING OPPORTUNITY	OVERKILL IN VERTICAL INTEGRATION
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

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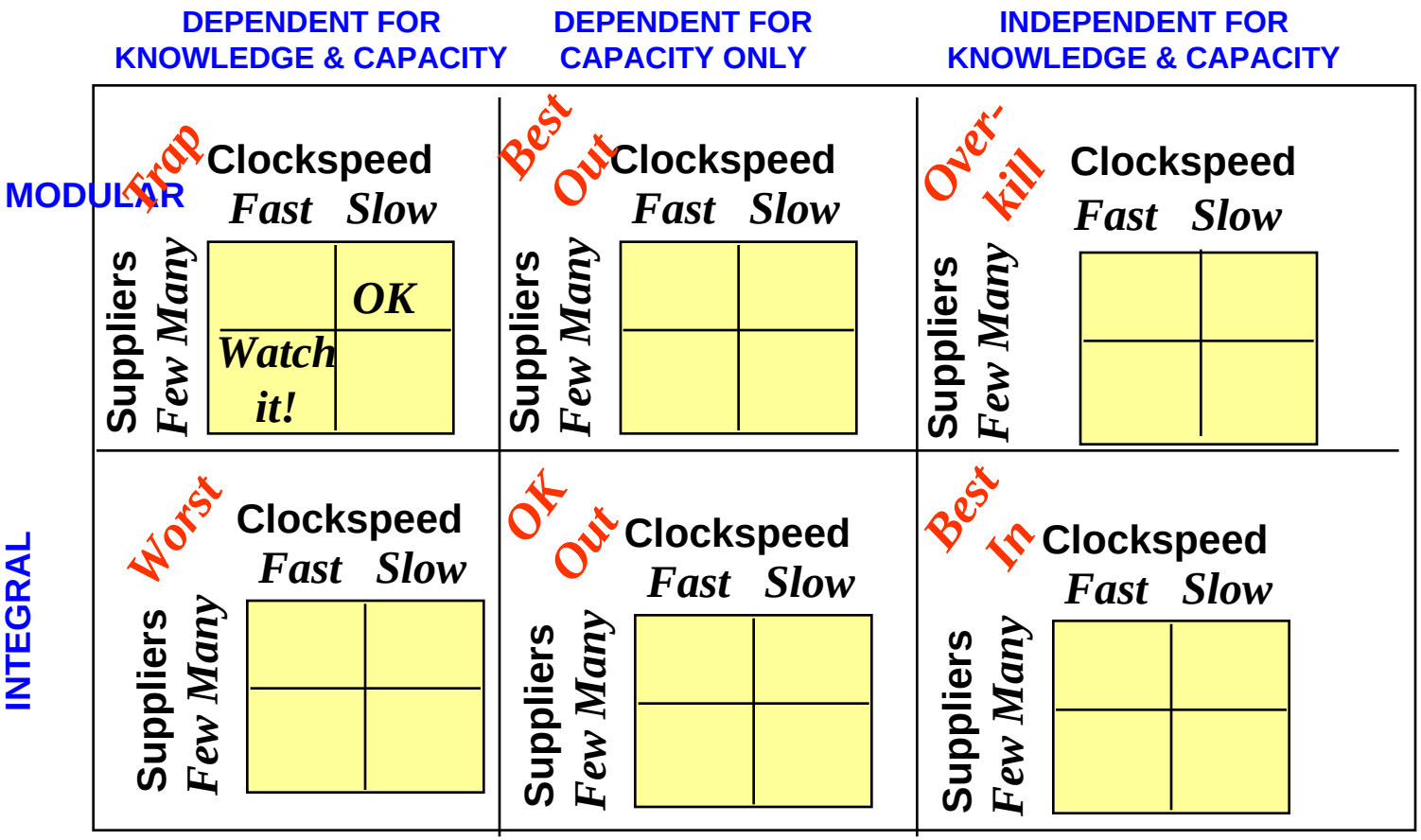

Adapted from C. Fine, *Clockspeed*, Chapter 9

Strategic Sourcing Assessment requires evaluation of five key criteria

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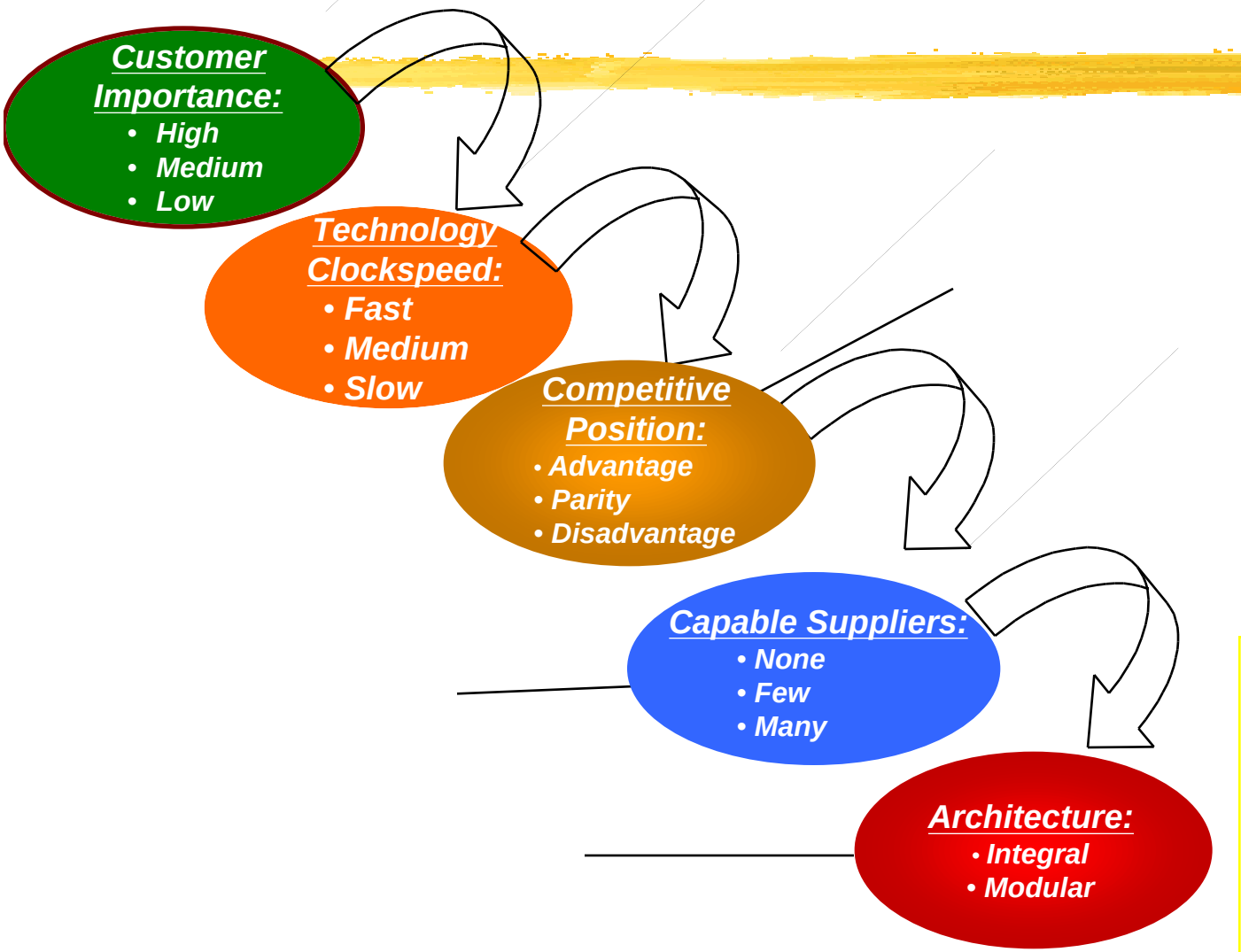
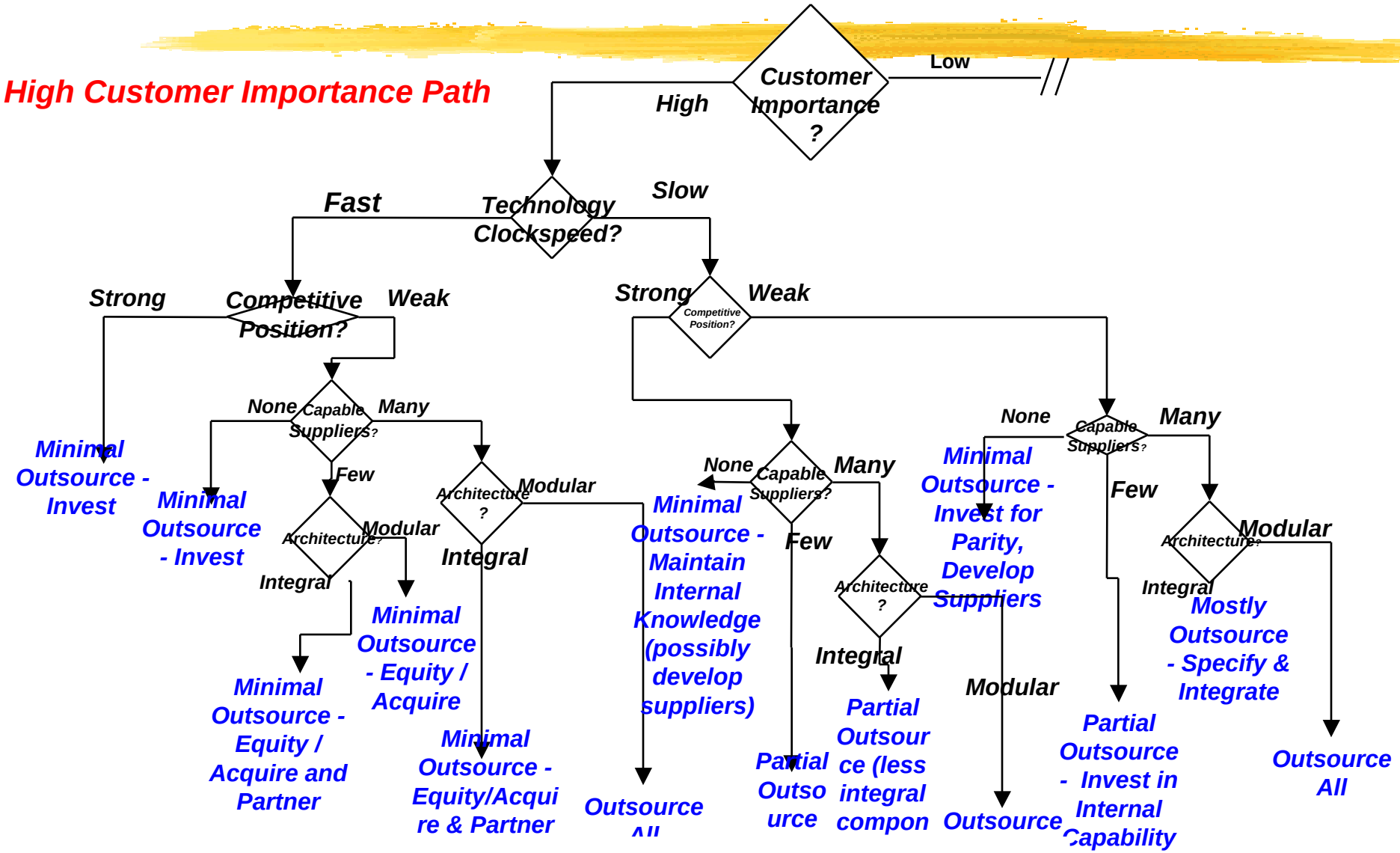


Possible Decisions (Knowledge & Supply):

- Insource
- Outsource
- Partner/Acquire
- Partial Insource
- Partial Outsource
- Invest
- Spin Off
- Develop Suppliers

Sourcing Strategy Decision Tree - High Customer Importance Path



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

Sourcing Strategy Decision Tree - Low Customer Importance Path

MIT
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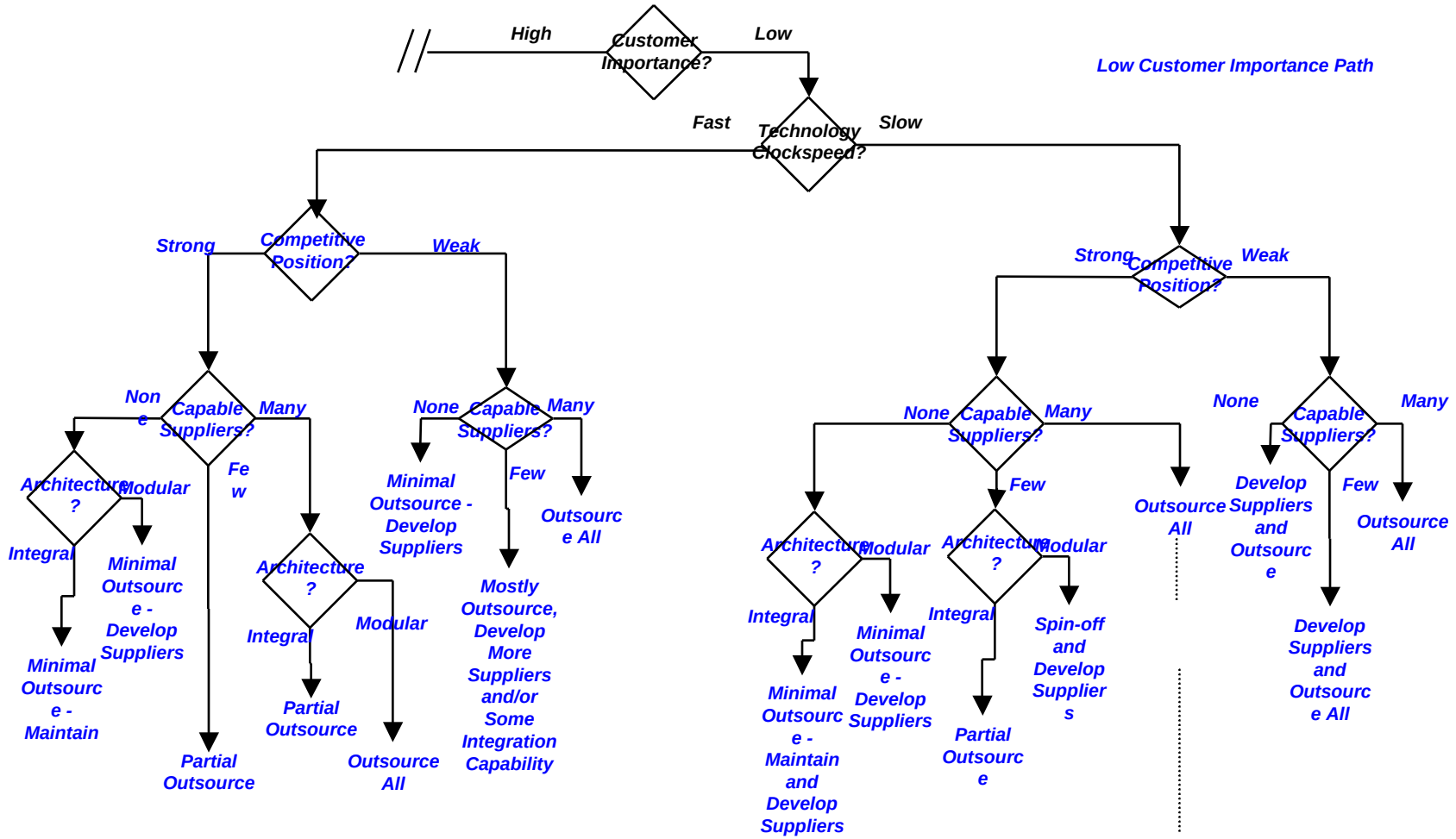
ockspeed.com



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

Actual knowledge work compared to outcome of Decision Framework

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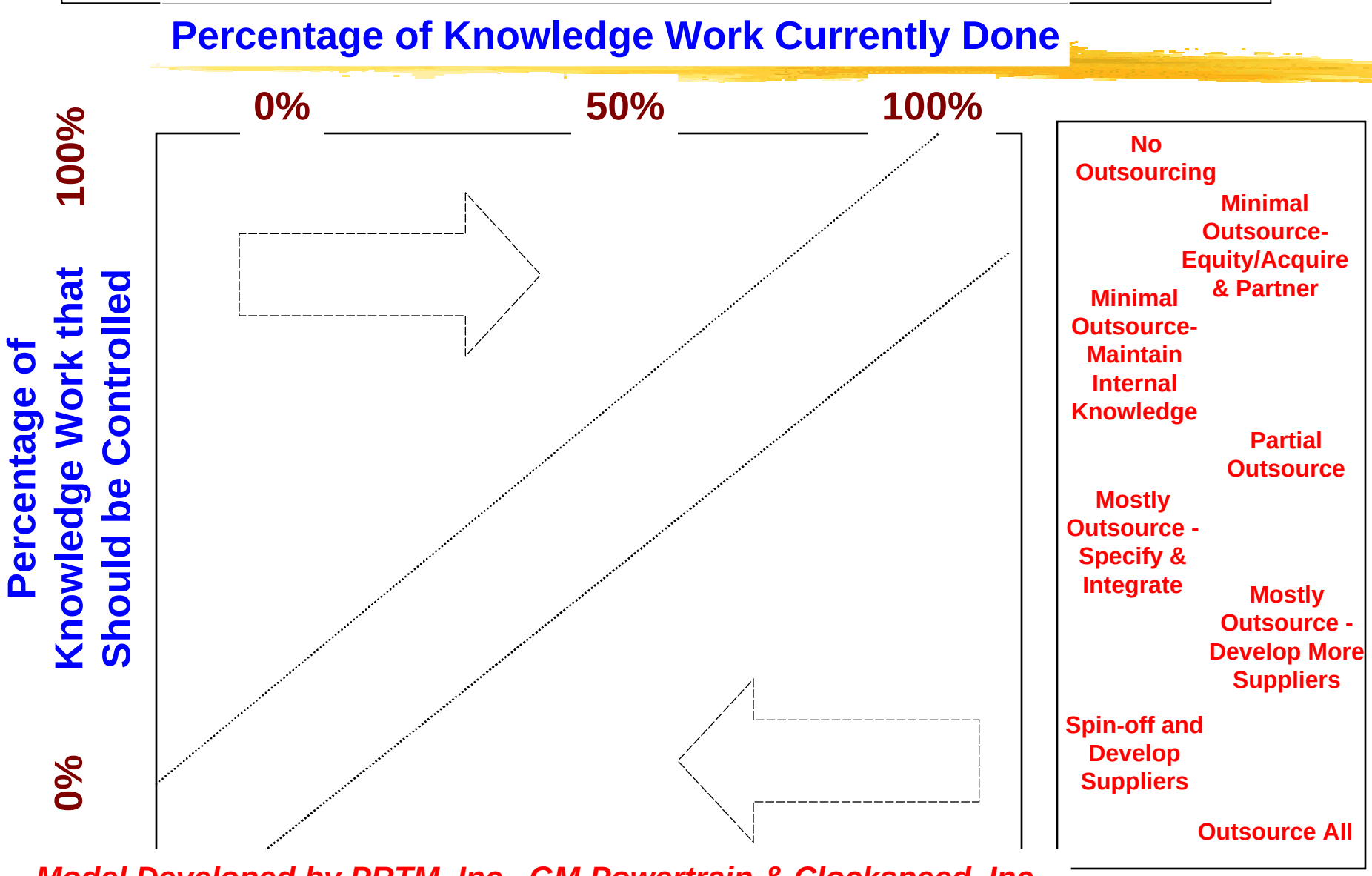
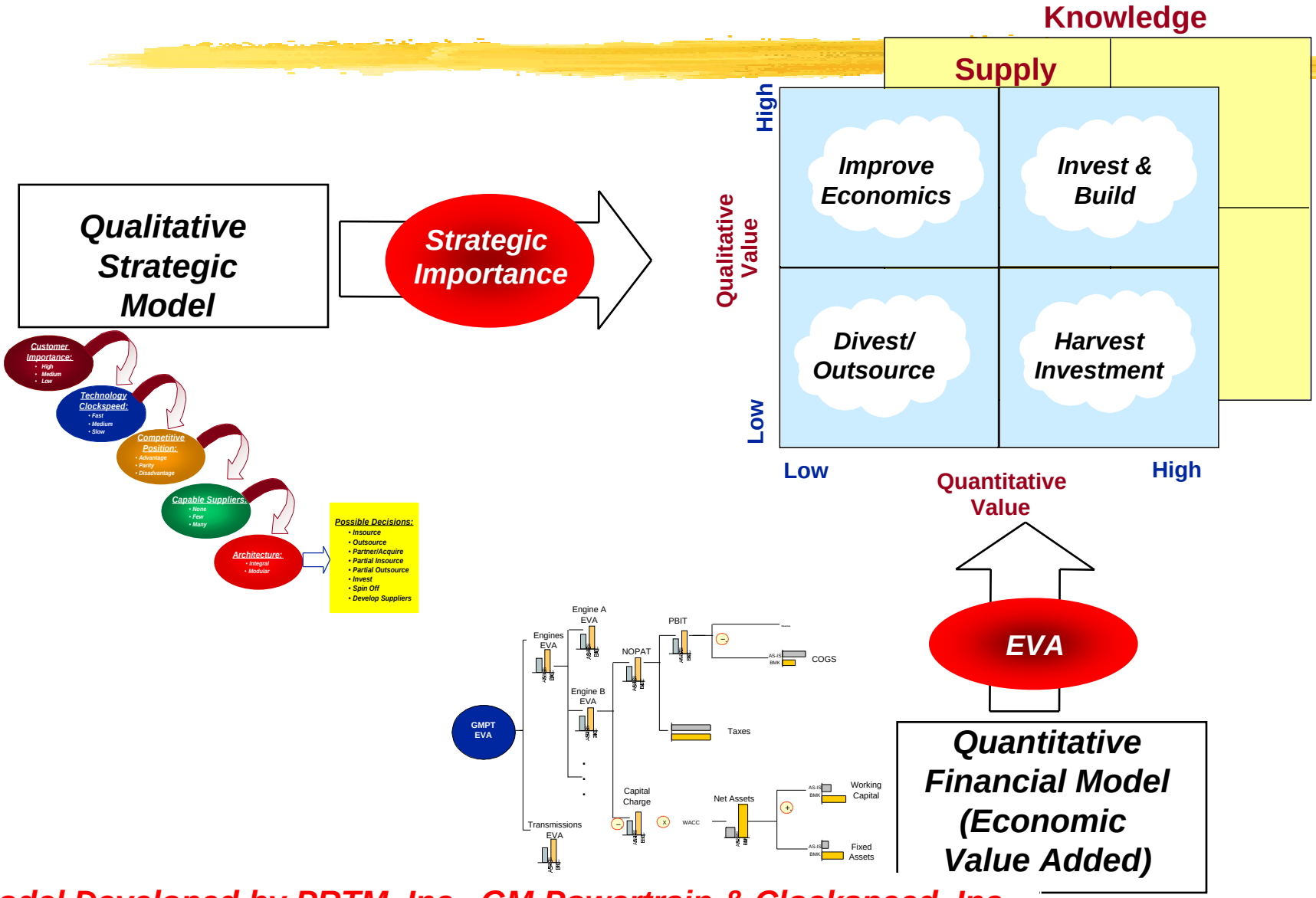
lockspeed.com



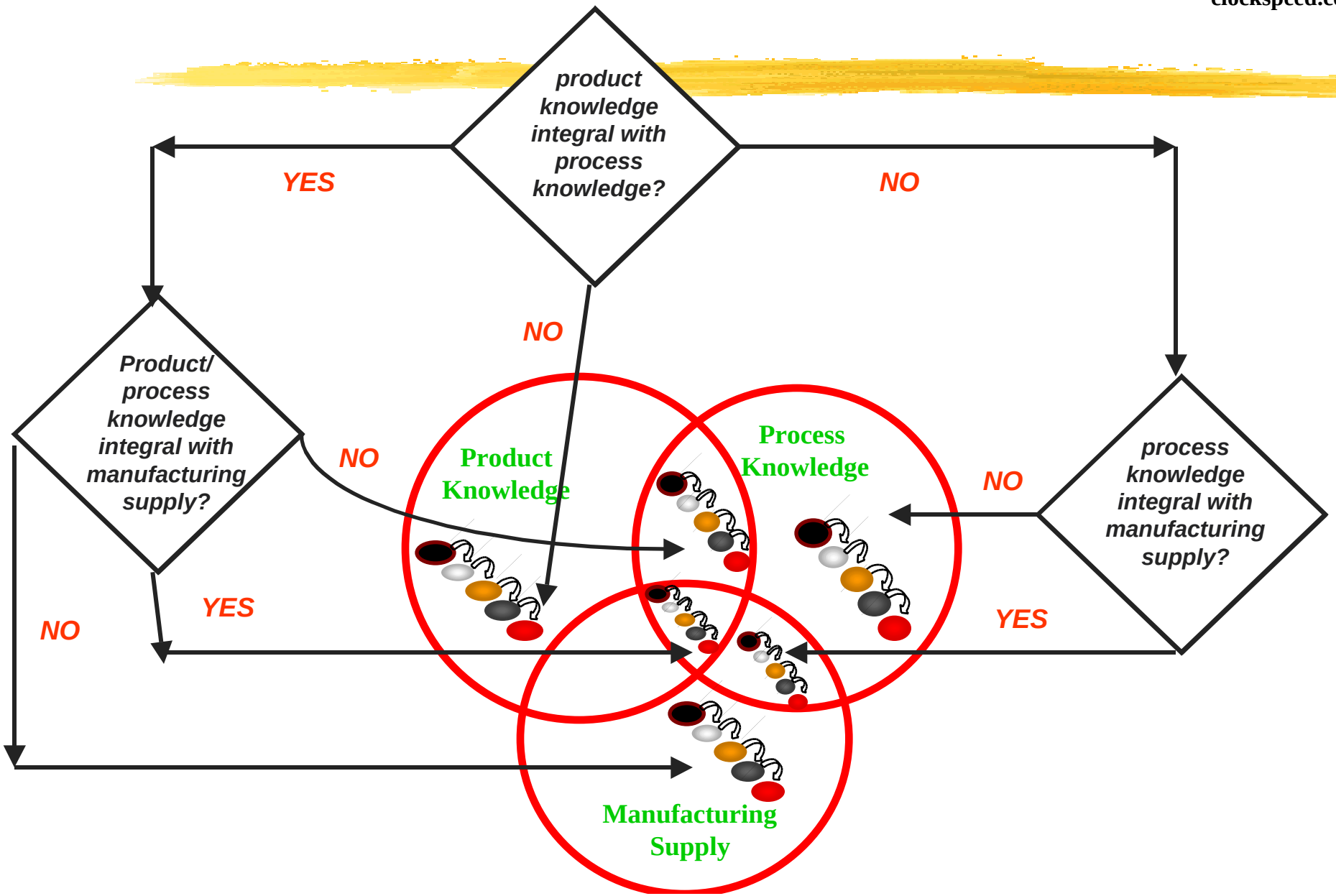
Model Developed by PRTM, Inc., GM Powertrain & Clockspeed, Inc.

Every decision requires qualitative and quantitative analysis to reach a conclusion *



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

Application of the Sourcing Model depends on integrality/modularity among Product, Process, & Supply *



SUPPLY CHAIN DESIGN IS *THE ULTIMATE* CORE COMPETENCY

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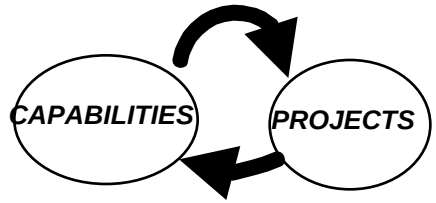
Since all advantages are temporary,
the only lasting competency is to continuously build and assemble capabilities chains.

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, Supply Chain**



Fortune Favors the Prepared Firm

PROCESS FOR SUPPLY CHAIN DESIGN

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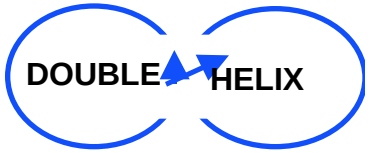
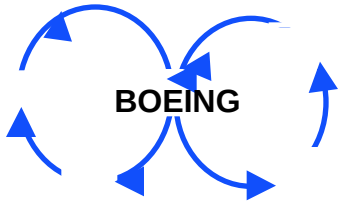
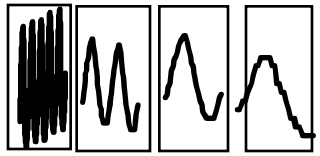
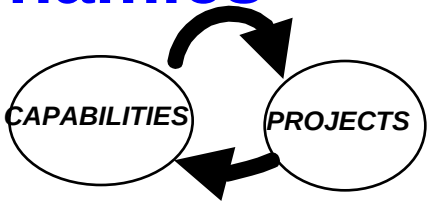
1. Benchmark the Fruit Flies
2. Map your Supply Chain
   - -Organizational Supply Chain
   - -Technology Supply Chain
   - -Competence Chain
3. Dynamic Chain Analysis
   at each node of each chain map
4. Identify Windows of Opportunity
5. Exploit Competency Development Dynamics
   with 3-D Concurrent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









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Supply Chain Mapping

Organizational Supply Chain

Chrysler	Eaton	casting supplier	clay supplier

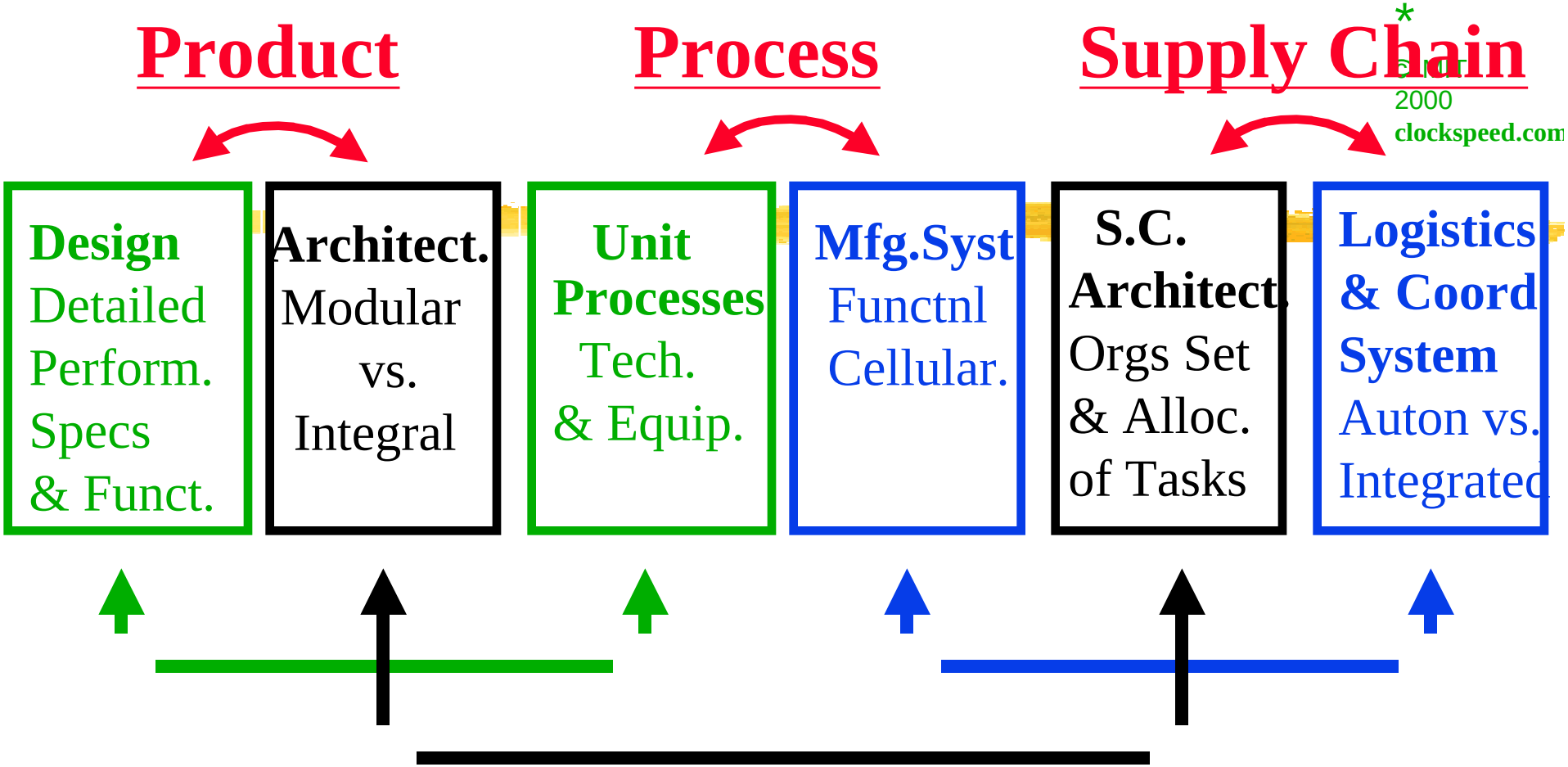
Technology Supply Chain

engines	valve lifters	casting manufacturing process	clay chemistry

Capability Chain

Supply Chain Management	Quality assurance	NVH engineering	R&D

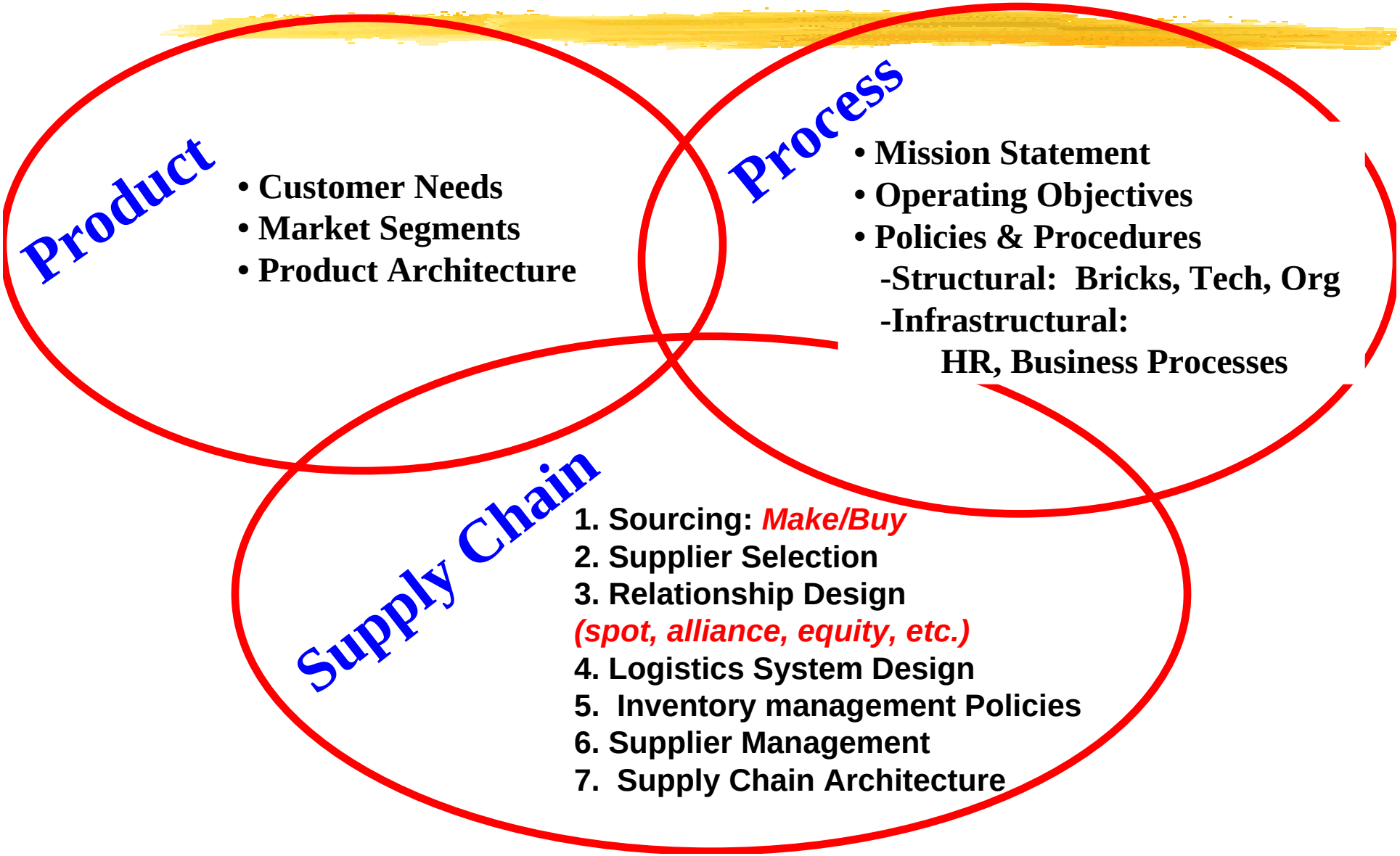
Underlying Assumption: You have to draw the maps before you can assess their dynamics.



- Focus
- Architecture
- Technology

A 3-D CE decision model illustrating the *imperative* of concurrency

Components of Product, Process, and Supply Chain Strategy



Internet Era Phenomena:
eCompetition in Business Model Design

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E-tailing:
Attack: Amazon, Webvan
Defend: Walmart.com, Ford.com, Office Depot.com

B2B:
E2E integration: Cisco, Dell
Marketplace Creation:eSteel, Ariba, Freemarkets, Covisint
Product Development: Cisco

Customer as Product Manager:
Product Innovation/Pricing/Design/Spec/Tracking/Delivery:
Dell, Herman Miller, Reflect, iMotors, Fedex, Priceline

Free & Open Digital Content:
Constructive Collaboration : Linux, Lego, Palm Pilot
"Anarchistic Constructive" Conversation: Cluetrain
Ubiquitous Sharing/Theft: Napster, FreeNet, Gnutella

Patterns in eBusiness Disruption

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	Disruption	Defense	New Value Add/Collab.
B2C	AMAZON WEBVAN iMOTORS	WALMART FORD CVS	LIVING.COM REFLECT.COM
B2B	ARRIBA FREEMARKETS	COVISINT iPAPER	CISCO PDT DEV
E2E	DELL NAPSTER	FORD OTD HERMAN MILLER	LINUX LEGO

Categorizing Business Webs: What are the dimensions?

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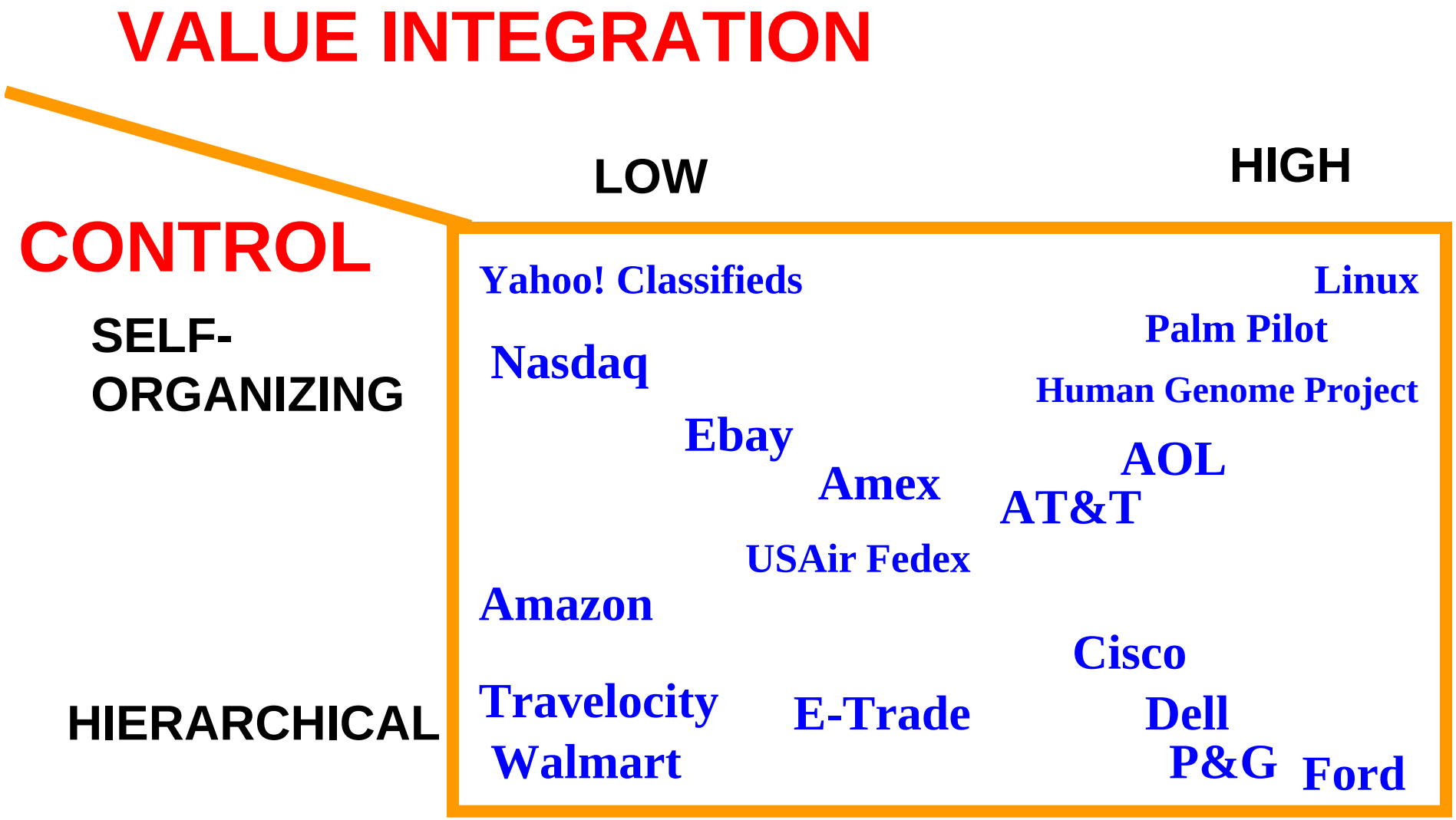
(adapted from *Digital Capital*, Tapscott, Ticoll, & Lowy, HBSP, 2000)



Cisco's E2E Integration for Fulfillment & Product Development

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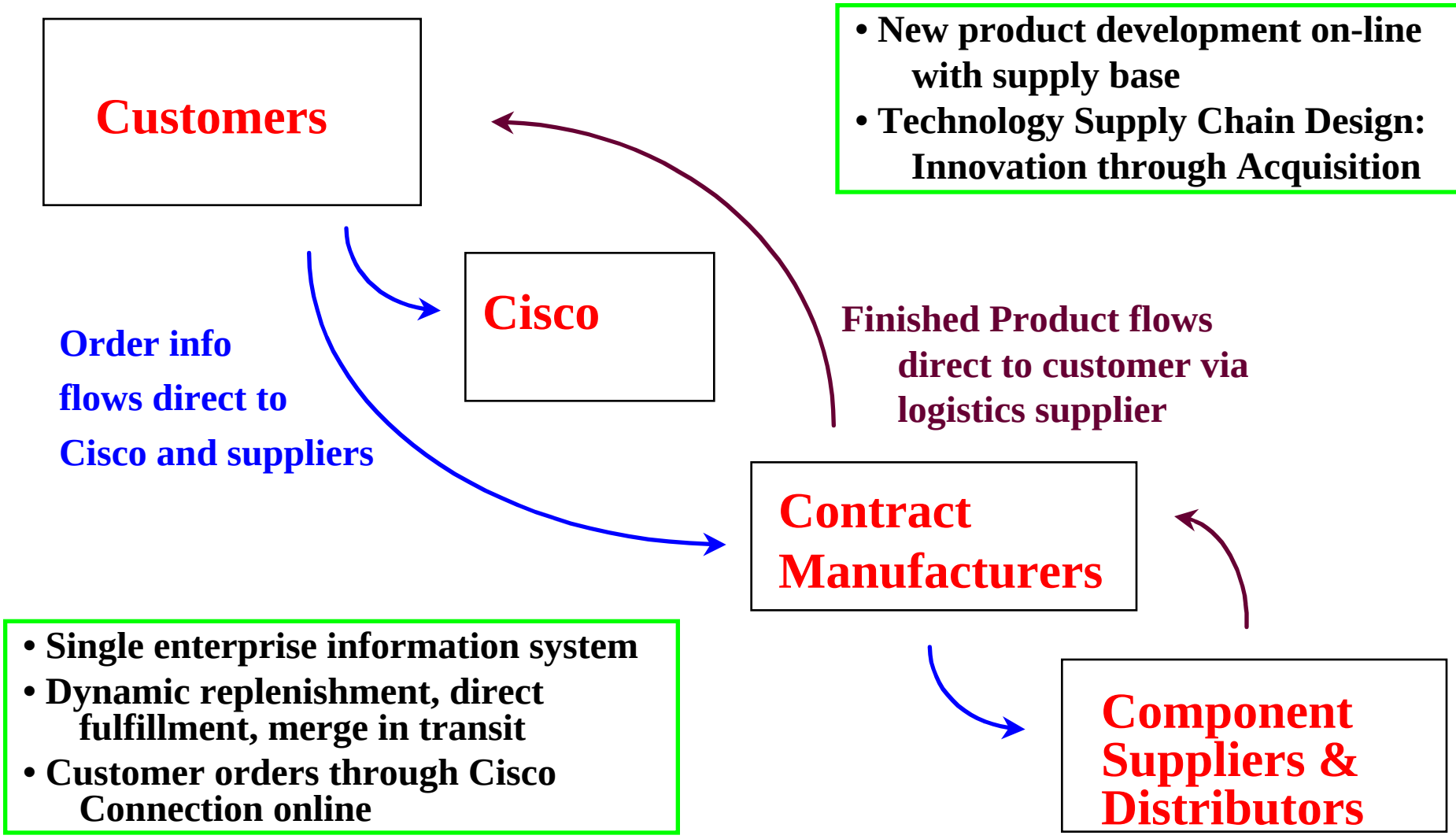

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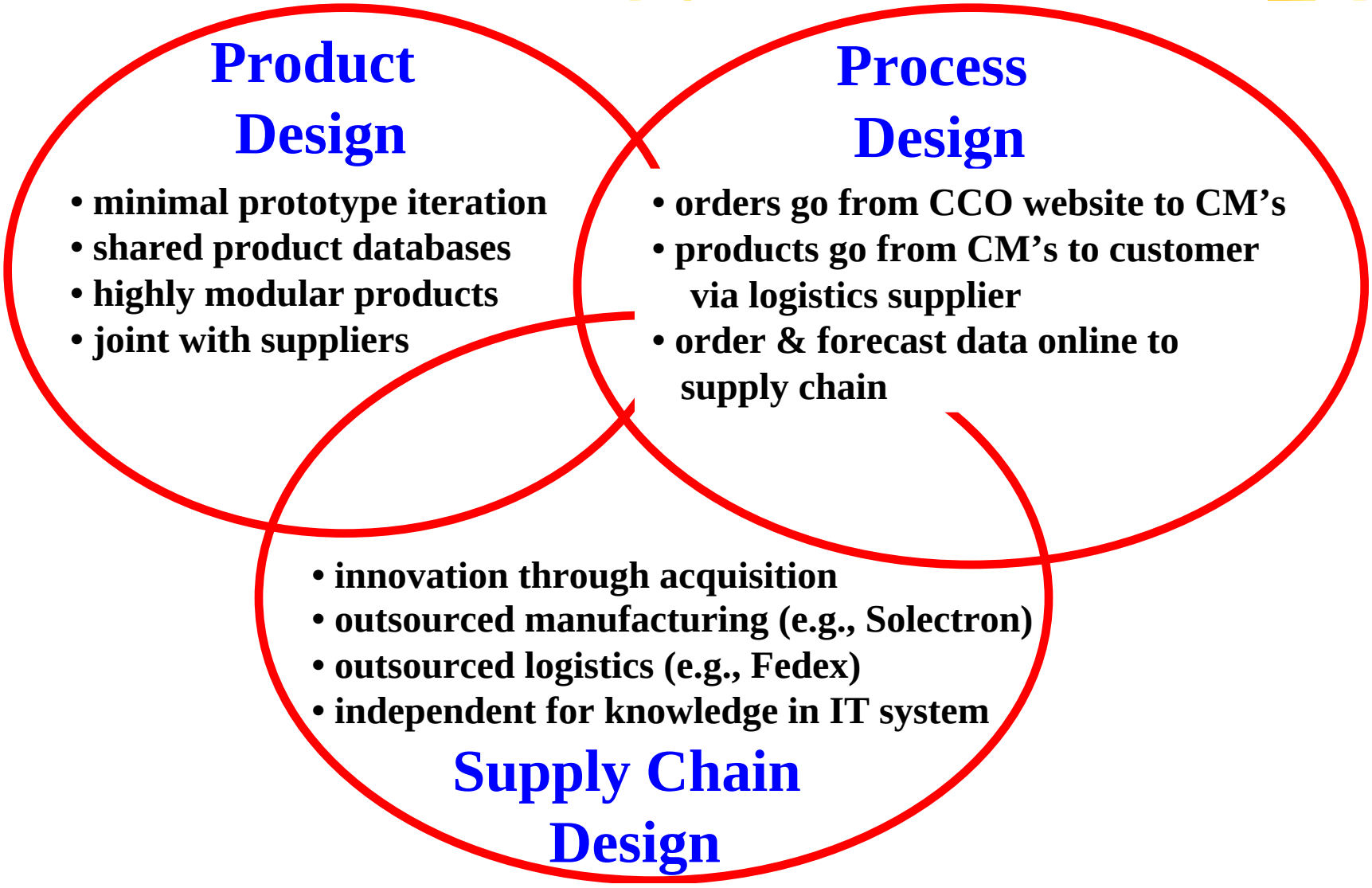
Cisco's Value Chain Design



Auto Example: Three Technological Disruptions
Each could trigger structural change

Internet-driven eBusiness

Value Chain Restructurings & Disintermediation, B2B marketplace, Build-to-Order Systems, Modularity & Outsourcing, Customer Configuration (B2C), End-to-End (E2E) integration

Telematics

Services for

Safety, Navigation, Concierge, Productivity, & Entertainment

Value Chain Implications, e.g., *"Nokia & Sprint Inside"*

Vehicle Architecture (Open vs. Closed), Revenue Model Impacts

Powertrain Innovations

Hybrid & Fuel Cell Technologies as potentially disruptive and re-inforcing of industry de-verticalization

Supply Chain Design is the Ultimate Core Competency:

Competency of passing judgement on all other competencies

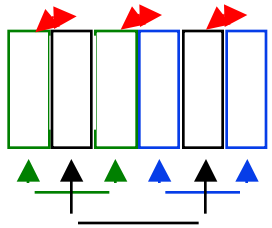
CHARLIE FINE, MIT SLOAN SCHOOL,
CLOCKSPEED, PERSEUS BOOKS, 1998.
http://web.mit.edu/ctpid/www/people/Fine.html

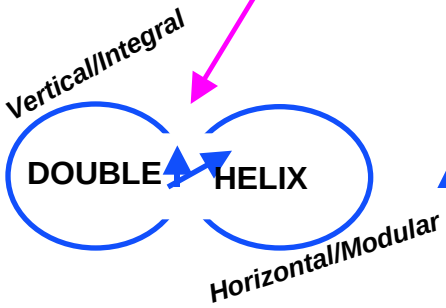
Benchmark the Fruit Flies

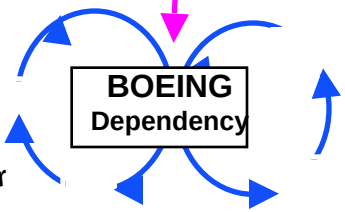
- Beware of *Intel Inside*
- SC control point unstable
  (comp, assem, distrib)
- SC structures oscillate
  -- int/int or mod/mod
- Cisco is open & modular: PDT & SC
- Dependence/Independence has
  positive feedback
- Projects feed capabilities & vice-versa
- eBusiness accelerates Clockspeeds
- All Advantage is Temporary
- Align Architectures in Pdt, Proc, & SC

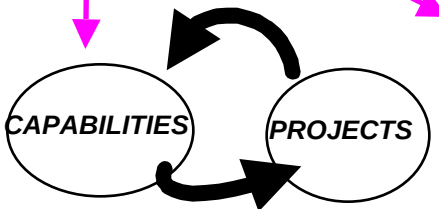
QUESTIONS

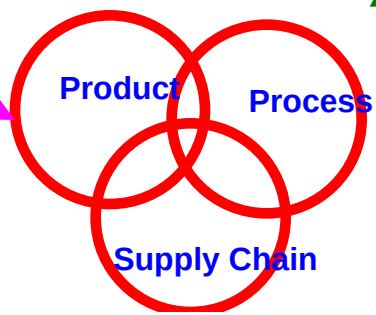
- Does Amazon need Warehouses?
- Or should they buy Fedex?
- Can Delphi be the Cisco of mobile media?
- Can Ford be the Dell of Cars?
- Is Dell done innovating?
- How can P&G get tree-to-toilet
  time down to seven days?
- What comes after open & modular?
- When will brick/click integration pay?
- When not?











All Conclusions are *Temporary*

Clockspeeds are increasing almost everywhere

eCommerce is a clockspeed driver

Supply chain design is a key competency

Study of eFlies can help with crafting strategy