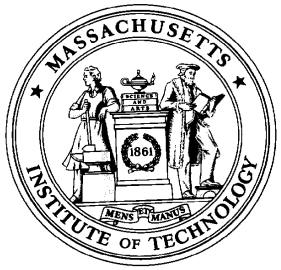
Manufacturing Strategy Concepts



Massachusetts Institute of Technology
Sloan School of Management

STRATEGY

DEVICE FOR

-DISCIPLINED PLANNING & THINKING

-COMMUNICATION

-ORGANIZATION BUILDING

Skinner on Manufacturing Strategy (1969)

- **different companies within the same industry have different strengths and weaknesses and choose to compete in different ways**

- **different production "systems" have different operating characteristics and each involves a different set of trade-offs**

- **a production system must have a customized design that reflects the priorities and trade-offs inherent in the firm's own competitive situation and strategy**

Skinner on Manufacturing Strategy

Therefore, no one operating system is universally superior under all competitive situations and for all companies.

Every operating system embodies a set of trade-offs.

Some will be particularly good at producing standardized products in high volume at low cost;

others will excel at responding quickly to shifting demand for more customized products.

New, Competing Theory: Lean

1980's: Japanese companies were succeeding not because they carefully made the right set of trade-offs among different priorities in their operations, but because they were capable of surpassing their Western counterparts across several dimensions at once.

Lean production **achieves lower cost, higher quality, faster product introductions, and greater flexibility-all at the same time-**

Lean production **can dominate any competitive situation.**

Lean production **combines the advantages of craft and mass production, while avoiding the high cost of the former and the rigidity of the latter: requires less inventory, yields fewer defects, and produces an ever-growing variety of products.**

New, Competing Theory: Lean

People should be broadly trained, rather than specialized.

Staff is "overhead" and, with a high degree of work force "empowerment," not necessary.

No amount of rejects or variance should be accepted (zero defects is the goal).

Communication should take place informally and horizontally, among line workers rather than through hierarchies.

Equipment should be general purpose and flexible. Production should be organized into "cells," rather than specialized by process stages.

Continuous processes, with as little work-in-process inventory as possible, is preferable to batch processes.

Inventory, like rejects, is waste.

New, Competing Theory: Lean

Throughput time is more important than labor or equipment utilization rates.

Product development should be organized through cross-functional teams, which pursue activities in parallel rather than sequentially.

Implication:

Manufacturing Strategy should devote less effort to customizing a production system and more effort trying to adopt the principles of the already-proven Lean Production System.

What is Strategy
Michael Porter, HBR, 1996

1. Operational Excellence is *NOT* a Strategy
   a. Establish a position you can preserve
   b. OE: doing same activities better
2. Strategy Rests on Unique Activities
   a. Offer a different value proposition
3. A Sustainable Strategy requires Trade-offs
4. You gotta have "Fit"
   a. System Elements:
      Consistent, Reinforcing, Optimized

Consequences of Lean Thinking

Western companies embarked on a wide range of programs (TQM, JIT, DFM, CE, empowerment, re-engineering)

Many of these programs worked quite well and helped companies regain parity on costs and quality.

***However,* simply adopting a set of generic improvement programs is not enough. (Only about one third of all the operations improvement programs that U.S. companies have undertaken were successful.)**

Further, programs that did achieve operational objectives (e.g., lower costs), often did not contribute to overall competitiveness.

***E.g.*, programs may reduce costs but diminish customer service, responsiveness, or flexibility.**

Consequences of Lean Thinking

So, TQM, JIT, and other dimensions of "lean production" can re-shape operating performance,

But, companies still need coherent approaches that

- **utilize these tools effectively and,**
- **develop enterprise strategies**

Further, a static fit between operating strategy and competitive strategy (Skinner's focus) is not enough.

Competitive environments are more turbulent.
Technological changes are more rapid.
Competitors (from around the globe) are more able.

Therefore, operating strategies cannot be static. They must provide the capabilities that both support and drive rapidly evolving challenges and strategies.

Skinner: Reasons for Inconsistent Manufacturing Structures

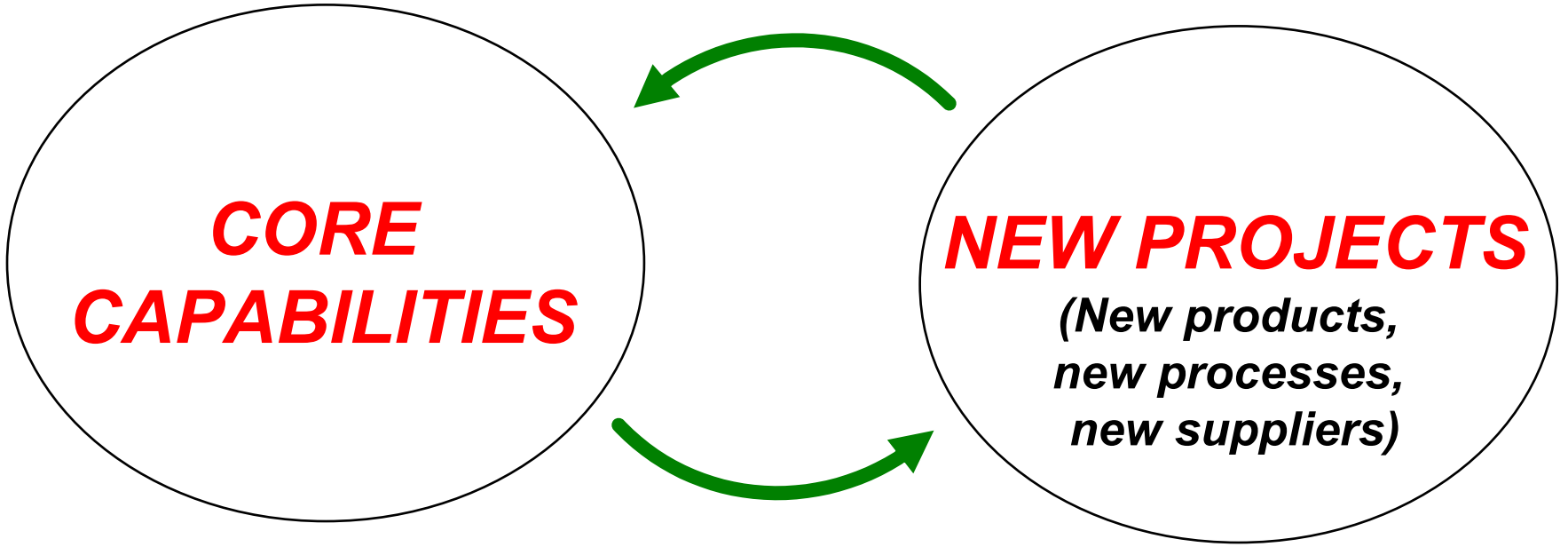
1. Manufacturing has a new manufacturing task but continues the old manufacturing policies and structure.
2. Managers in manufacturing have no clear, consistent definition or understanding of the manufacturing task facing the organization.
3. The manufacturing policies and the infrastructure being employed are inconsistent. Taken together, there is a distortion in coordination.
4. The organization lacks a focus. It is attempting to cover too many technologies or too many products and markets, too wide a range volume, and more than one manufacturing task.

Skinner: Reasons for Inconsistent Manufacturing Structures (cont.)

5. The organization has the wrong equipment & process technology for the present manufacturing task.
6. Selection of products and processes for each plant in a multi-plant setup results in mixing together, somewhat at random, a product organization, a process organization, and a volume-focused organization (or any two of the three) instead of focusing around one type of organization.

WHAT APPEAR TO BE *ROUTINE MANUFACTURING DECISIONS FREQUENTLY COME TO LIMIT THE CORPORATION'S STRATEGIC OPTIONS*, BINDING IT WITH FACILITIES, EQUIPMENT, PERSONNEL, AND BASIC CONTROLS AND POLICIES TO A NONCOMPETITIVE POSTURE WHICH MAY TAKE YEARS TO TURN AROUND.

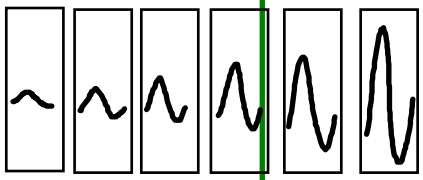
WICKHAM SKINNER, *HBR*, MAY-JUNE 1969

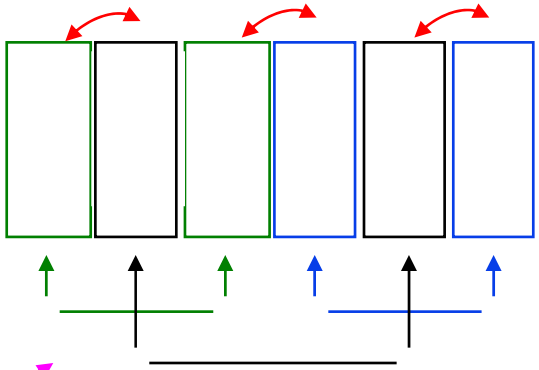


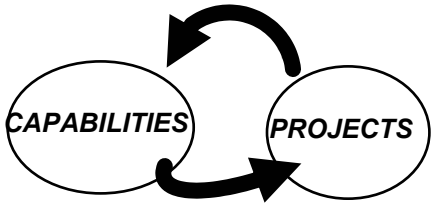
Clockspeed
The Dynamics of Strategy Formulation & Execution

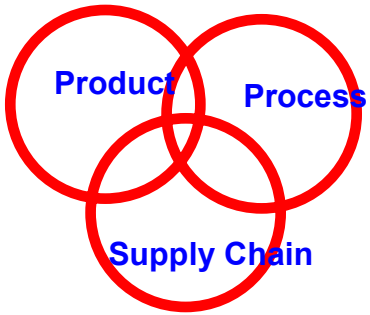
Benchmark the Fruit Flies

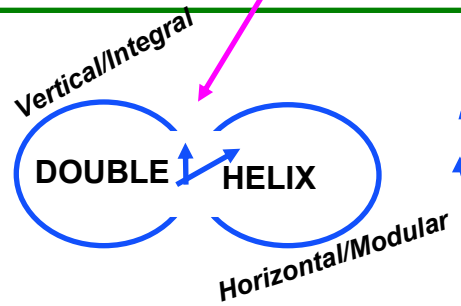
- Beware of *Intel Inside*
- SC control point unstable (comp, assem, distrib)
- SC structures oscillate
  -- int/int or mod/mod
- The Bullwhip lives
- Dependence/Independence has positive feedback
- Projects feed capabilities & vice-versa
- eBusiness accelerates Clockspeeds
- All Advantage is Temporary
- Align Architectures in Pdt, Proc, & SC
- Tech & Comp drive clockspeeds

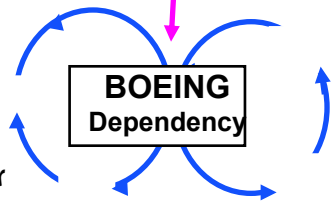












LOSING AMERICA'S LEAD (see *Made in America*, MIT Press, 1991)

EVIDENCE:

- -Slow Productivity Growth Rates
- -Slow to Market with New Techs.
- -Lagging Quality vs. World Comp.
- -Trade Deficit
- -Weakening Currrency
- -Loss of Financial Independence
- -Inability to Manufacture Key Technologies (DRAM chips)

CAUSES:

- -Outdated Strategies:
- -Mass Production of Std Goods
- -Parochialism-Not Invented Here
- -Short Time Horizons
- -Failure to invest in development and production capabilities
- -Neglect of Human Resources (Firm Level, National Level)
- -Failures of Cooperation
  Industry/Government, Buyer/Supplier,Management/Workforce

THE TIMELESS SECRETS OF INDUSTRIAL SUCCESS

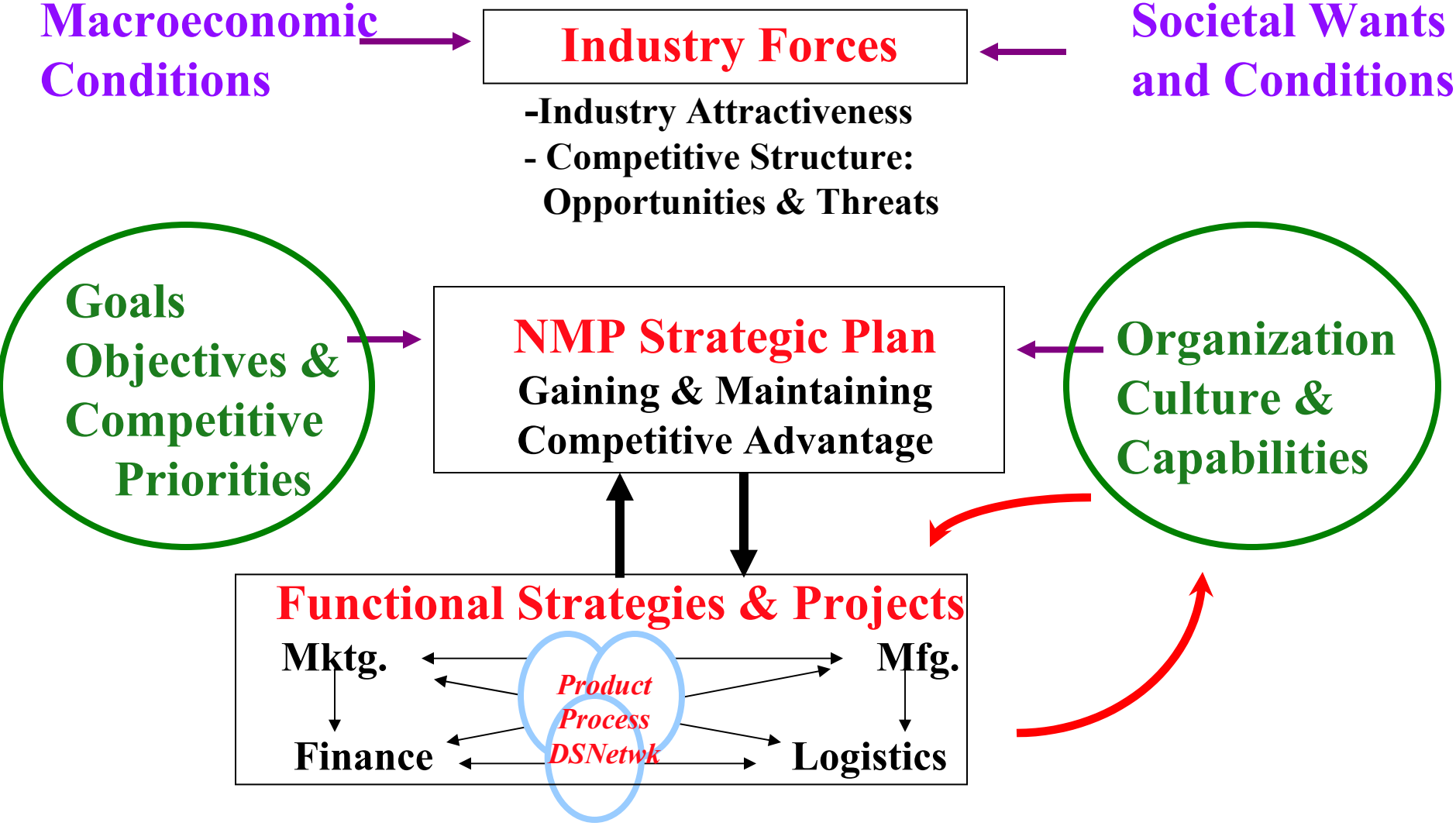
(R. H. HAYES, HARVARD UNIVERSITY)

1. **BEWARE OF COMPLACENCY**
2. **CONTINUALLY ENLIST THE HELP OF EMPLOYEES TO IMPROVE PRODUCT AND PROCESS**
3. **DENY EVERY INCH TO ACTUAL AND POTENTIAL COMPETITORS**
4. **STUDY COMPETITORS' SOURCES OF SUCCESS**
5. **DON'T BE TOO RATIONAL**

The Corporate Strategic Planning Process

See Fine and Hax, "Manufacturing Strategy: A Methodology & an Illustration," *Interfaces*, 1984.

Can we map the strategic forces at Nokia?



Key Success Factors:

- Internal Coherence
- Inter-functional Coordination
- Strategic Fit

Adapted from D. Rosenfield, MIT

FOUR STAGES OF THE STRATEGIC ROLE OF MANUFACTURING IN A COMPANY

(see WHEELWRIGHT/HAYES, *HBR*, JAN '85)

1. INTERNALLY NEUTRAL

Minimize the "negative effect" of manufacturing

2. EXTERNALLY NEUTRAL

Achieve Parity with Competitors

3. INTERNALLY SUPPORTIVE

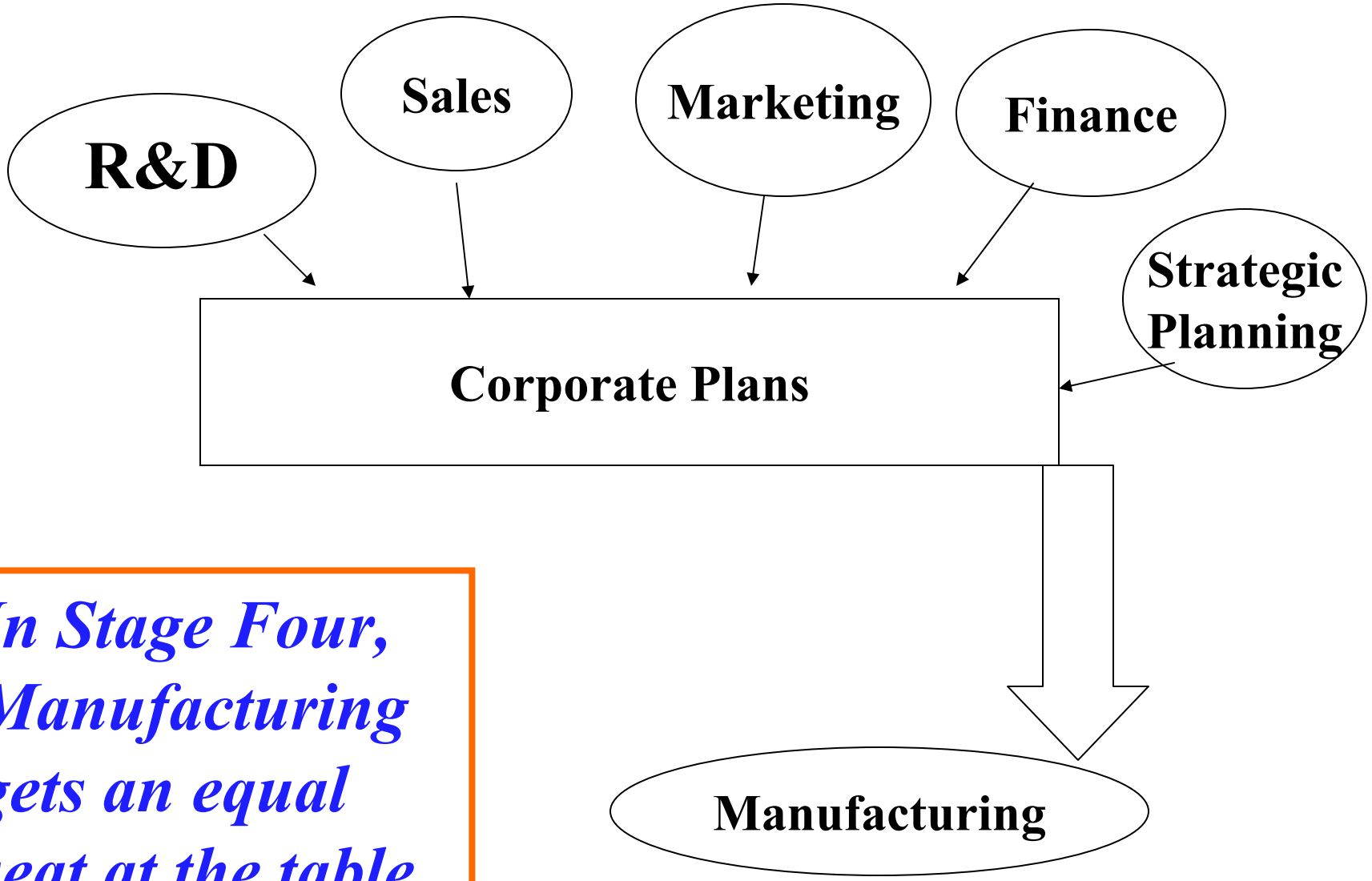
Provide Support to the Business Strategy

4. EXTERNALLY SUPPORTIVE

Manufacturing contributes significantly to competitive advantage

Note: Inside-out vs. Outside-in of Clockspeed approach

Stage 1 or 2 Corporation



In Stage Four, Manufacturing gets an equal seat at the table

STAGE 4 CHARACTERISTICS

MFG STRATEGY IS INTEGRATED W/ENGINEERING, FINANCE, PROCUREMENT, MARKETING/SALES

100% OF PEOPLE ARE KNOWLEDGE WORKERS

- -CONTRIBUTE MORE WITH MINDS THAN HANDS
- -UNDERSTAND THE BUSINESS & JOB
- -MASTERY OF ALL QUALITY TOOLS
- -SOUGHT AFTER BY COMPETITORS
- -LEADERSHIP, TEAMWORK
- -LIFELONG LEARNING AND TEACHING
- -CULTURE OF EXPERIMENTATION
- -DESIREABLE PLACE TO WORK
- -CHALLENGING, FULFILLING CAREERS

Stage 4 Characteristics

PROCESS

- -TECHNOLOGY LEADER
- -PROCESS DEVEL & IMPROV
- -INNOVATION IN METHODS & EQUIP

IN-CONTROL & CAPABLE (Cpk > 2)

INTELLIGENT USE OF INFORMATION TECHNOLOGY

VALUE CHAIN

BENCHMARK-DRIVEN

- -WORLD-CLASS PRACTICES
- -WORLD-CLASS MEASURES
- -REVERSE ENGINEERING
- -INFO EXCHANGE WITH THE BEST

SUPPLIERS SEND THEIR BEST PEOPLE AND PARTS

TESTBED FOR TECHNOLOGY INNOVATORS

NETWORKED WITH CUSTOMERS

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 & PROCEDURES

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.

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 (BYTHE 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)

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

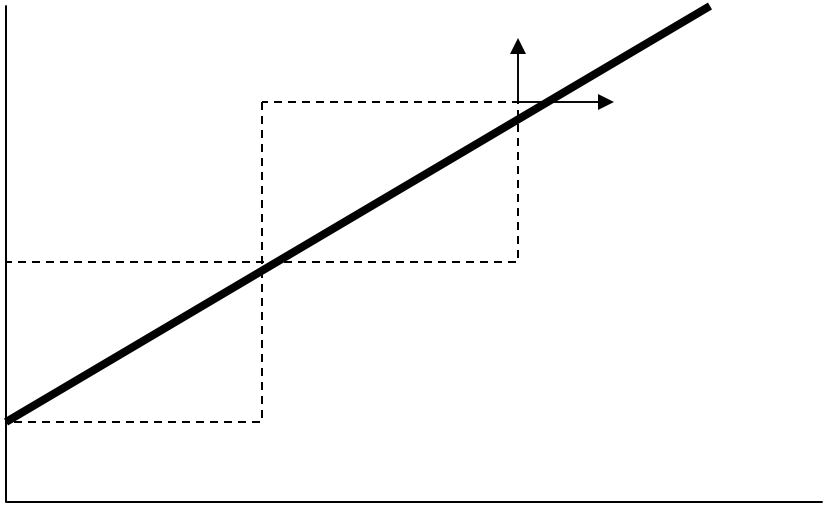
Major Manufacturing Decision Categories

1. FACILITIES
   - size
   - location
   - focus
2. CAPACITY
   - amount
   - timing
   - type
3. VERTICAL INTEGRATION AND PARTNER 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. LOGISTICS AND SUPPLY CHAIN
   - logistics facilities and methods
   - inventory policies
   - vendor coordination
   - production planning
7. ORGANIZATIONAL AND INCENTIVES
   - structure
   - reporting levels
   - degree of centralization
   - role of staff
   - control/reward systems
   - costing systems
8. BUSINESS PROCESSES: PRODUCT DEVELOPMENT, QUALITY INFRASTRUCTURE ETC.
   - interfaces and responsibilities
   - responsibilities
   - vendor development
   - monitoring and intervention

Facilities and Capacity

Capacity Issues:

- Does Capacity lead or follow Demand; Use of suppliers
- Capacity Decisions have long lead times and involve large increments



Facility Issues:

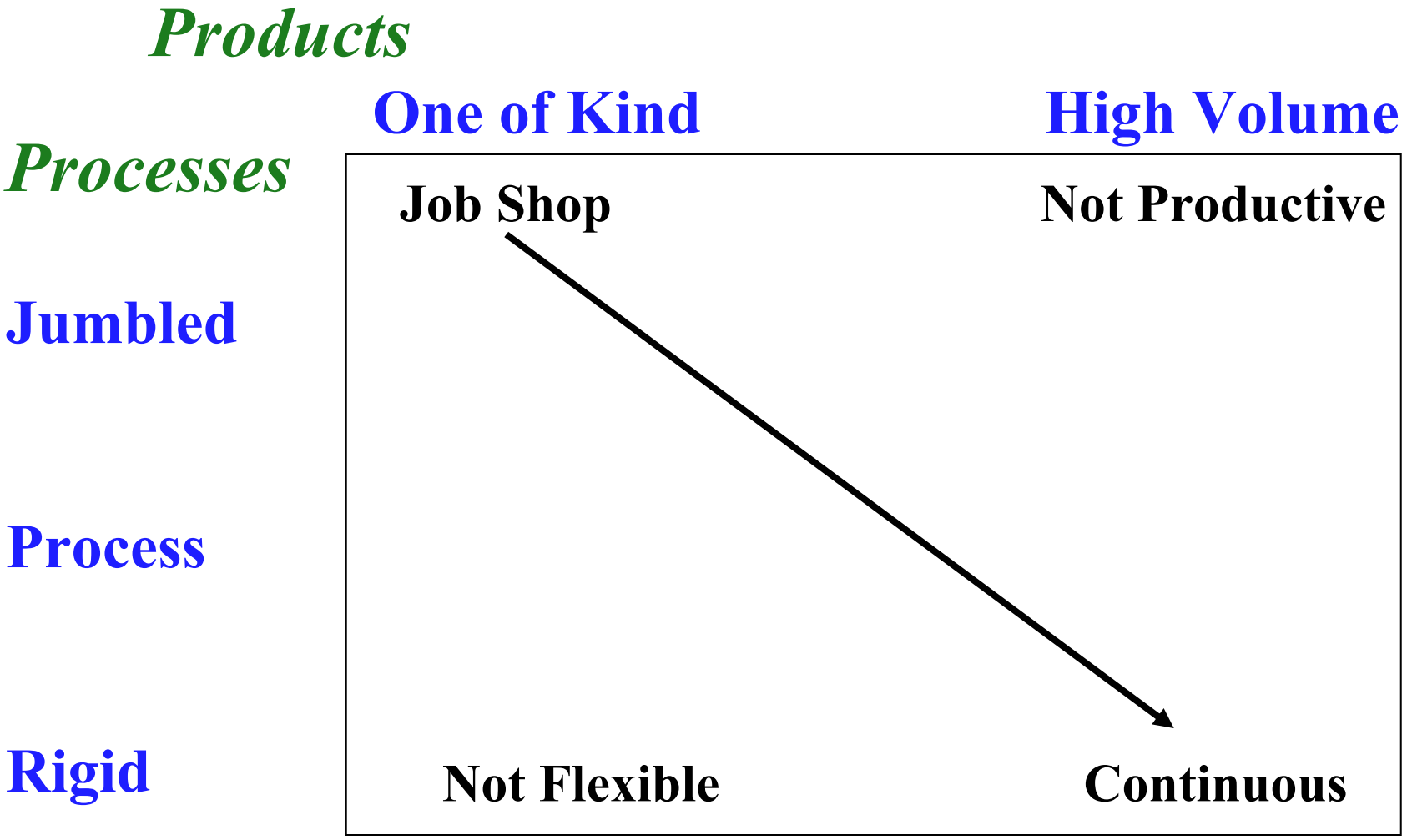
- Pure Space Needs
- Geographic & Distribution Issues
- Focus Issues
- Corporate principles
- Scale Issues
- Means of Evaluation

Manufacturing Technology

Manufacturing Process Technology is a fundamental determinant of how a company competes

- **Processes have specific attributes that are appropriate for different products and life cycles**
- **Any new process or technology will have a major effect on a business**
- **Do you want off-the-shelf or custom equipment?**
- **Do you want to lead or lag in manuf technology?**
- **Do you want to develop manuf. tech internally?**

Process Productivity can be viewed Through the Process-Product Matrix



Strategic mission

Organization strengths

Performance measures

- **OPERATIONS COSTS**
  - –unit costs
  - –total (volume) costs
  - –lifetime costs
- **DEPENDABILITY AND TIME**
  - –percentage of on-time shipments
  - –response to results for info or changes
  - –product and volume flexibility
  - –delivery time

- **QUALITY**
  - – return rate
  - – product reliability and durability
  - – cost and rate of field repairs
- **INNOVATIVENESS**
  - – product innovativeness
  - – time to market and development cycle

The Classic Plant Missions

Mission	Facilities	Infrastructure	Labor
Low Unit Cost	Specialized machines linked by the time cycle	Materials planning and control	Repetitive work
High service level	Reserve machine capacity	Inventory management	Overtime and idle time
Wide line	General purpose machines and inventory of tools	Production scheduling	Changing assignments
Custom service	General purpose machines	Design to cost	Reliance on workers' skills
Product innovation	Flexible general purpose machines	Design and development	Team responsiveness

Linking Strategies to Missions

Mission	Investment Requirements	Marketing Strategy	Sales Strategy
Low Unit Cost	Automation	Narrow line and conservative design	Price competition
High service level	Inventory and flexible machines	Image of dependability	Rapid delivery
Custom service	Reserve capacity	Ability to respond	Analysis of customers' needs
Product innovation	Product development	Market leadership	New market segments

Assessment of Operations Policies

Operations Unit _____

Decision Category	Existing Policy	Strengths	Weaknesses	Proposed Changes
Production Technologies & Processes				
Capacity Management				
Workforce				

Assessment of Operations Policies (cont)

Operations Unit _____

Decision Category	Description of Past Policy	Strengths	Weaknesses
Business Processes			
Facilities			
Vert. Int and Partner Management			

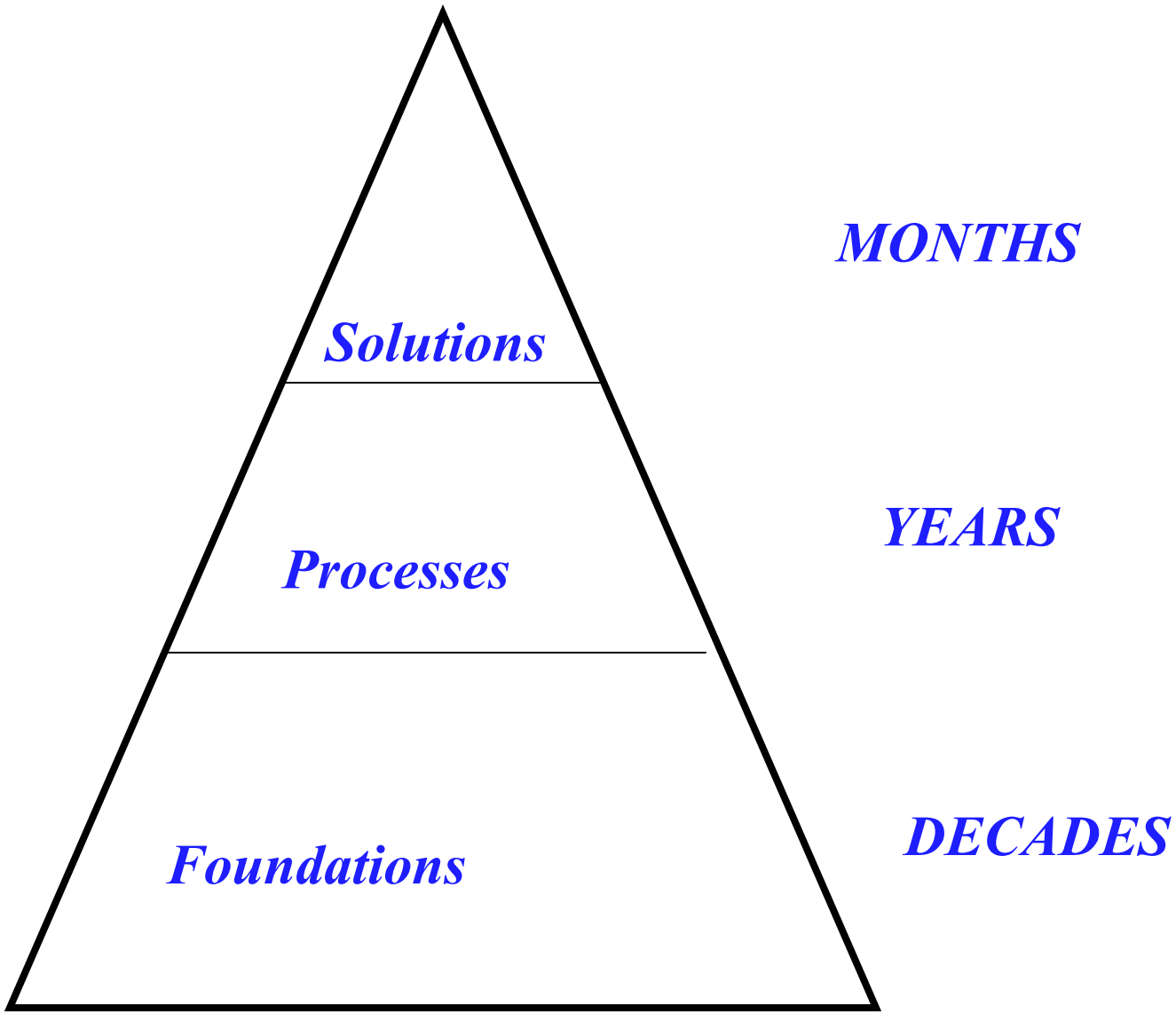
ACTION AGENDA FOR MANUFACTURING EXCELLENCE

(R. SCHONBERGER,*WORLD CLASS MFG.*)

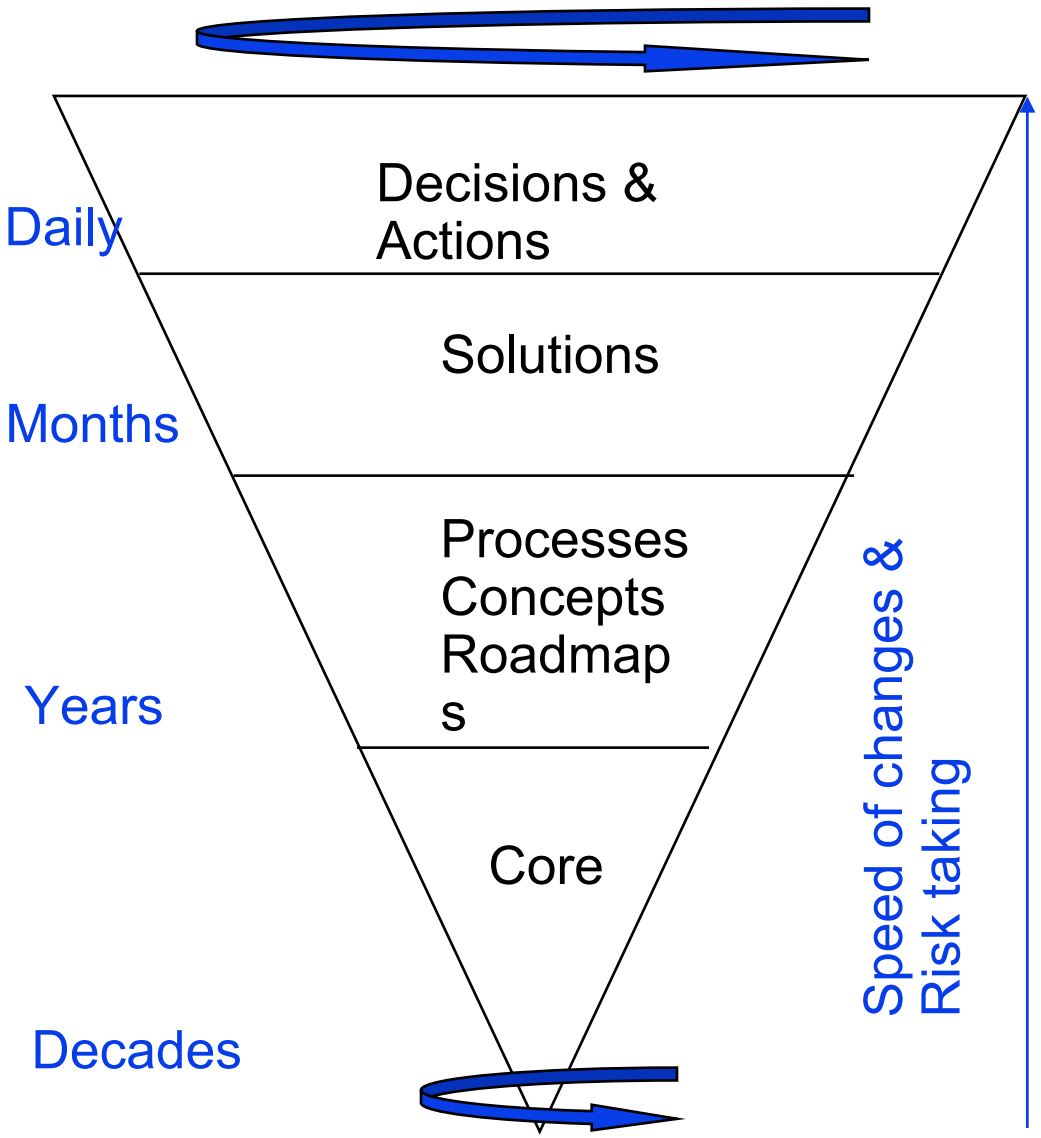
1. GET TO KNOW THE CUSTOMER
2. CUT WIP INVENTORIES
3. CUT FLOW TIMES
4. CUT SETUP & CHANGEOVER TIMES
5. CUT FLOW DISTANCE AND SPACE
6. REDUCE NUMBER OF SUPPLIERS
7. IMPROVE SUPPLIER PERFORMANCE
8. REDUCE PARTS PROLIFERATION
9. DESIGN FOR MANUFACTURABILITY
10. CROSS-TRAIN WORKERS AND MANAGERS
11. POST PRODUCTION, QUALITY, AND PROBLEM DATA
12. GIVE LINE PEOPLE FIRST CRACK AT SOLVING PROBLEMS
13. MAINTAIN & IMPROVE EXISTING EQUIPMENT & HUMAN CAPITAL
14. USE SIMPLE, CHEAP, MOVABLE EQUIPMENT
15. AUTOMATE INCREMENTALLY

SKINNER'S PROCESS STEPS FOR MANUFACTURING STRATEGY

1. COMPETITIVE ANALYSIS
2. COMPANY AUDIT/INVENTORY
3. COMPANY STRATEGY FORMULATION
4. IMPLIED MANUFACTURING OBJECTIVES
5. COST STRUCTURES AND ECONOMIC CONSTRAINTS
6. TECHNOLOGY ANALYSIS
7. MANUFACTURING EVALUATION AND OPTIONS
8. DECIDE MANUFACTURING POLICIES
9. REQUIREMENTS/TARGETS FOR MFG ORGANIZATION
10. DESIGN SYSTEMS/PROCEDURES
11. CONTROL SYSTEMS
12. SET OPERATIONS PARAMETERS
13. MONITOR PERFORMANCE
14. CONTINUOUS IMPROVEMENT ON STRATEGY
15. CONTINUOUS IMPROVEMENT ON OPERATIONS AND POLICIES


Solutions
Processes
Foundations
MONTHS
YEARS
DECADES

Strategic Dimensions - Gyroscope



Gyroscope rules:

- ✓ **Core holds the 'gyroscope' up and running**
- ✓ **Monthly/daily activities need to be balanced with each other and the core – not to shake the 'gyroscope'**
- ✓ **The clockspeed is faster in the top – the changes are faster, but smaller**
- ✓ **The risk are bigger in the bottom – the changes are bigger**