Explaining Success AND Failure of Engineering Improvements

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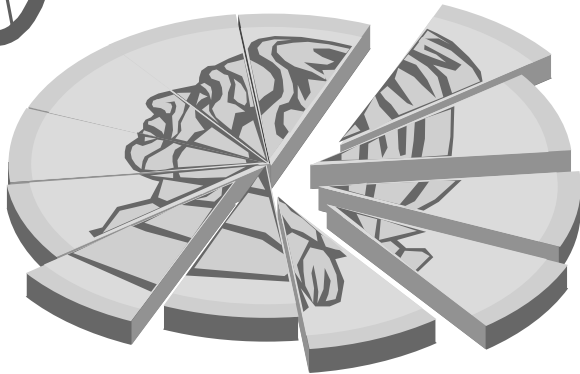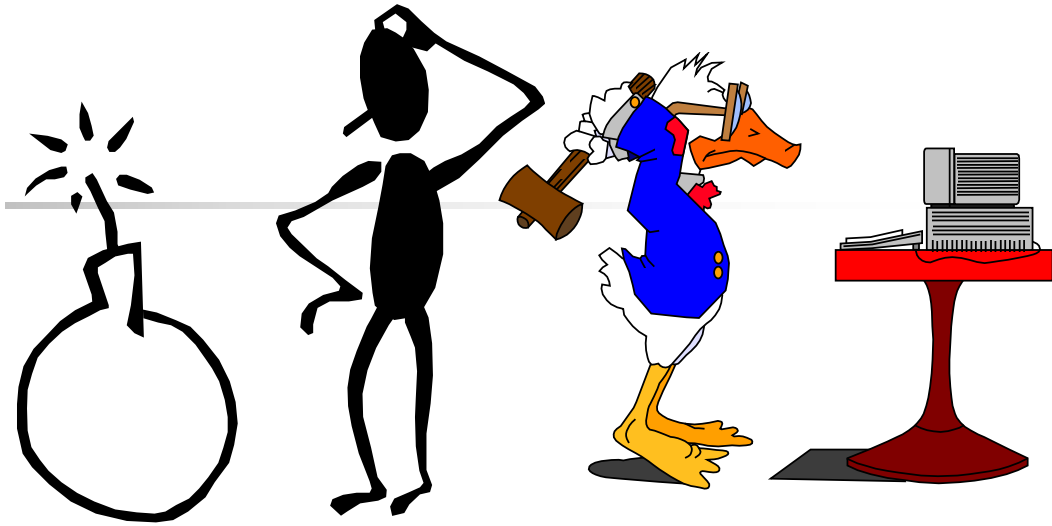Arlington, Virginia 22203 USA
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Discipline of Market Leaders

- by Treacy & Wiersema
- Survey of 80 high performing firms
- Key to success: Focus
- One & only one of three strategies:
    - Operational excellence
    - Total solution
    - Product innovativeness
- Must perform to a threshold level in other two.
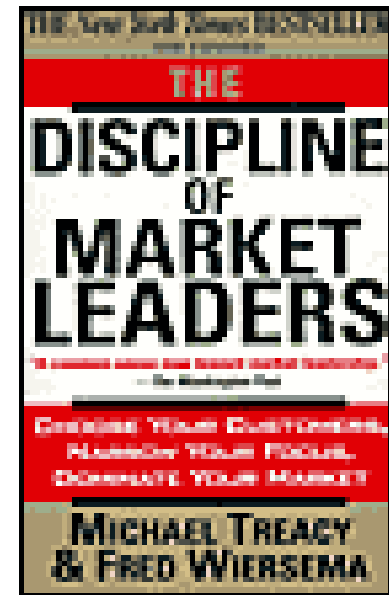
What is strategy? It's what differentiates the enterprise and makes customers select you instead of your competitors. Also called unique selling proposition, market discipline, differentiator.

Operationally excellent

- Highest quality => lowest cost
- "Formula" => short menu
- *Process* innovative

Deming chain of logic

```
Greatest          Lowest          Lowest
Market Share  ←   Prices     ←    Costs
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Environment for
Quality
= Reward for Quality   →   Highest
(Everything else           Quality
takes care of itself)
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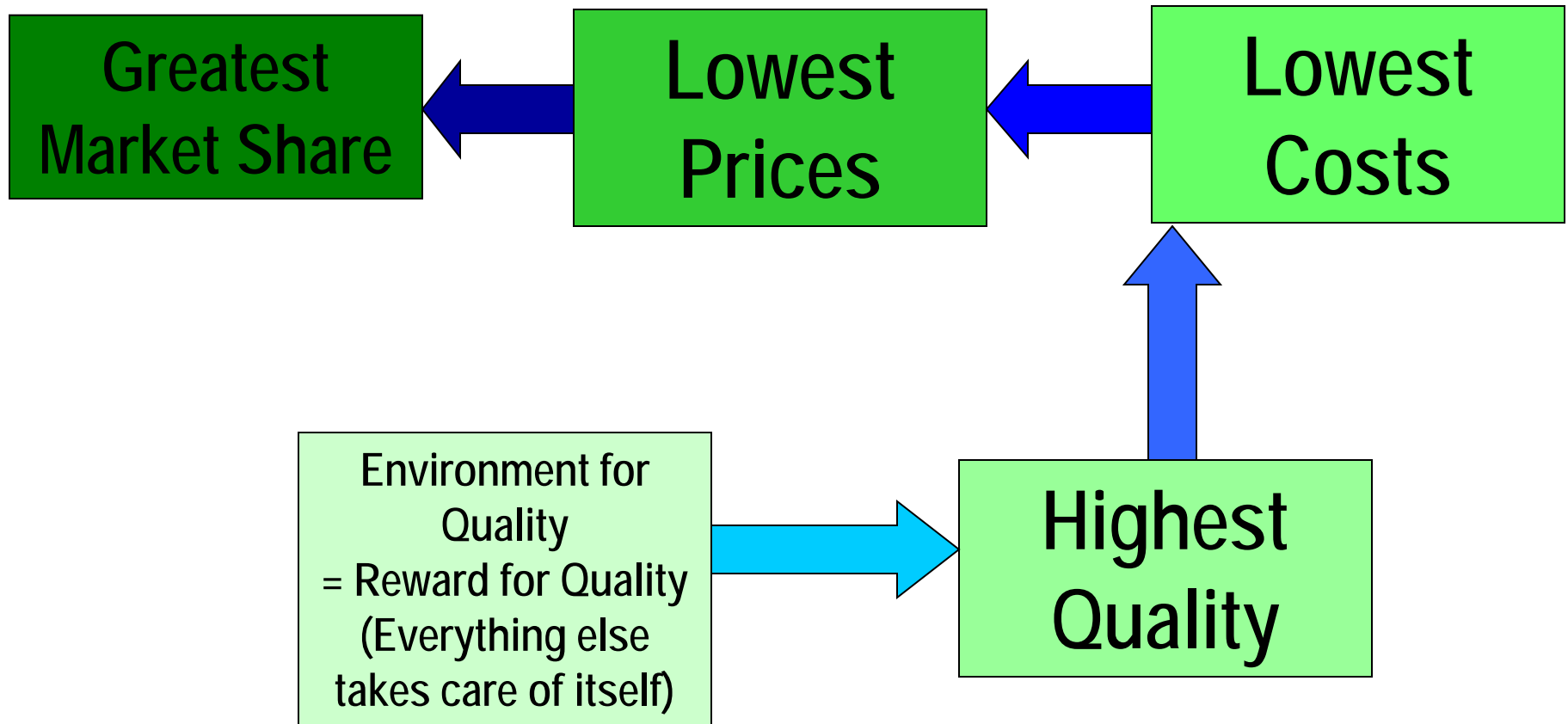
Total solution

- "Infinite" menu
- Measure: "walletshare"
- Total solution, 1-stop shopping, "one throat to choke"
- "Schmoozes"

Product innovative

- Market leader in *product* innovation
- Measure: number of patents, Nobelists, turns in the marketplace
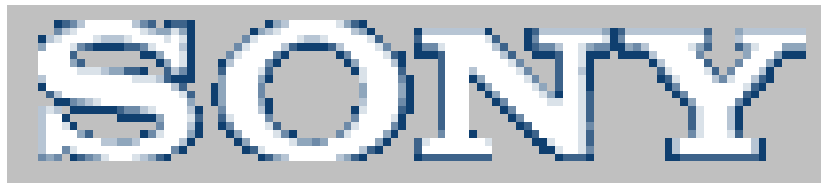
Focus on one,
have to meet the threshold in all

Implication: There is a danger when trying to focus on two or more. One cannot be all things in all markets. One has to say No to certain (prospective) customers.
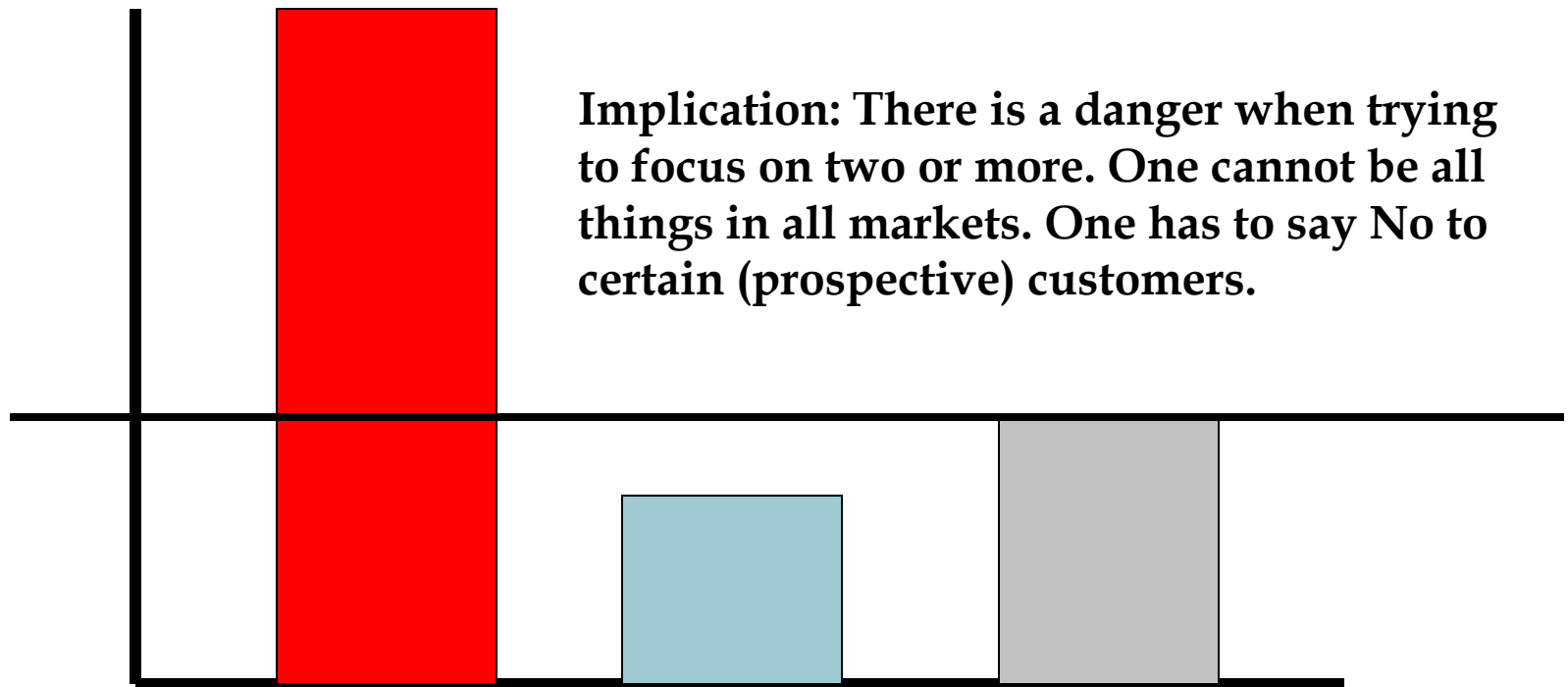
Case: Apple iPhone

The "dream"

Quality Planning	Quality Control (during operations)	

Sporadic spike

Cost of poor quality

Original zone of quality control

Chronic waste

New zone of quality control

Quality Improvement

Time

Lessons learned

J.M. Juran Wilton, CT Used with the express permission of the Juran Institute, Aug, 1990.
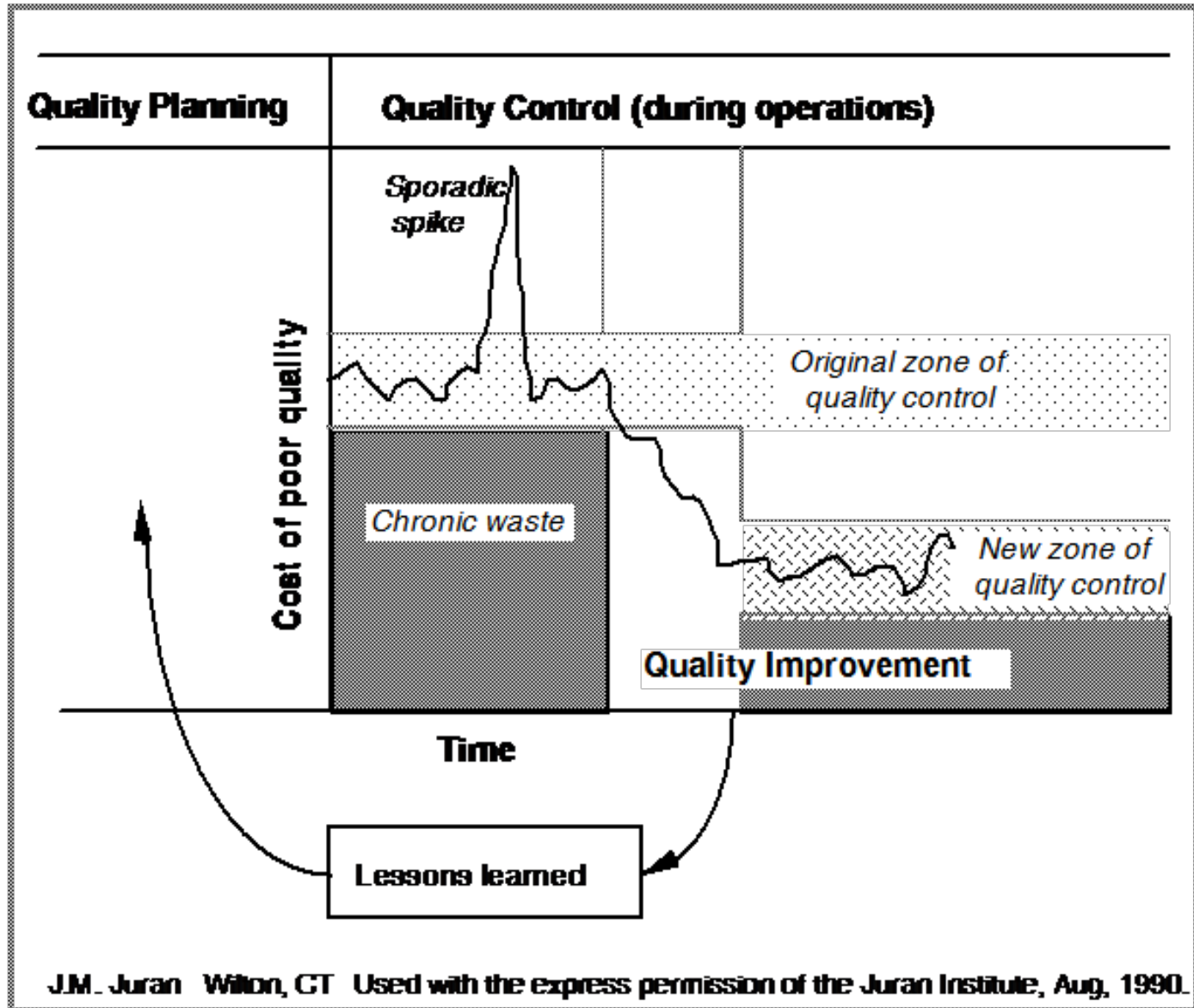
Process focus
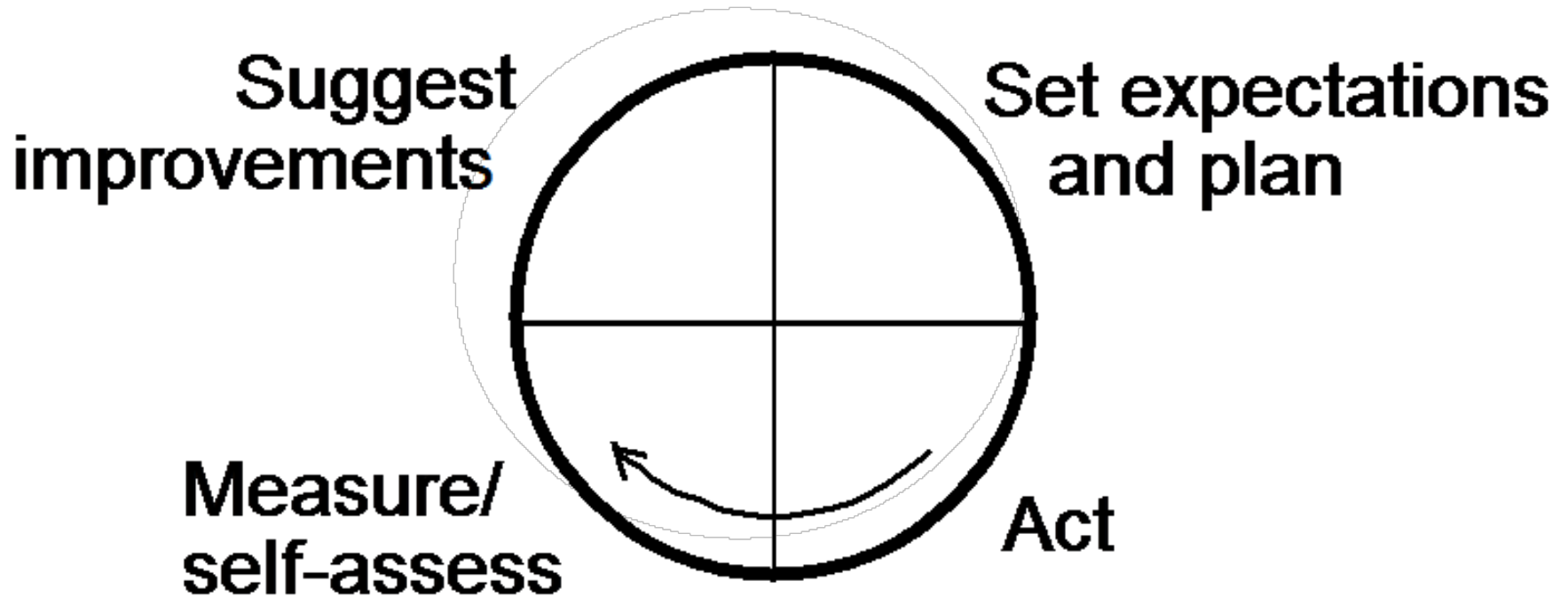
Continuous Improvement Cycle

QUALITY MANAGEMENT MATURITY GRID

Rater _____   Unit _____

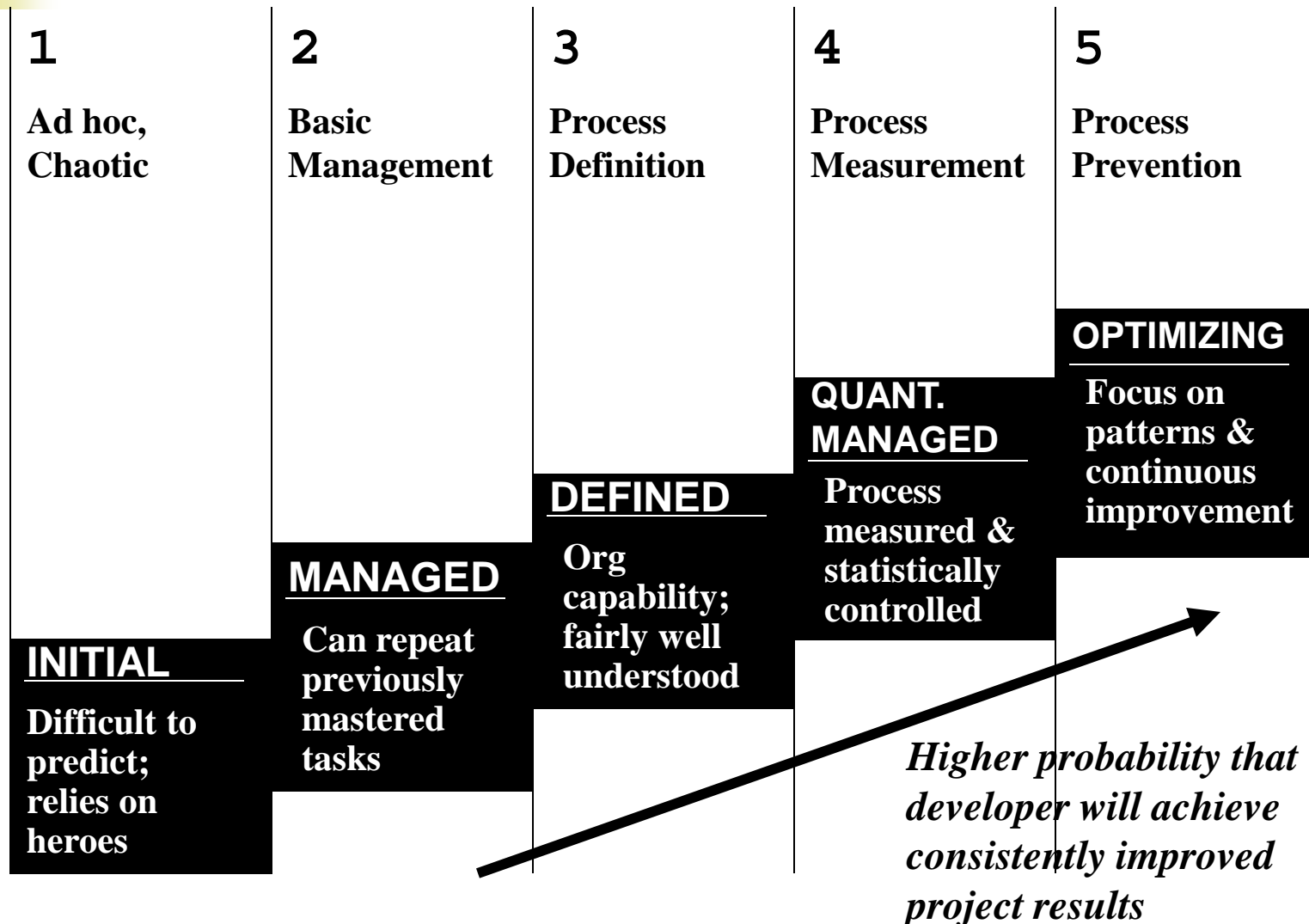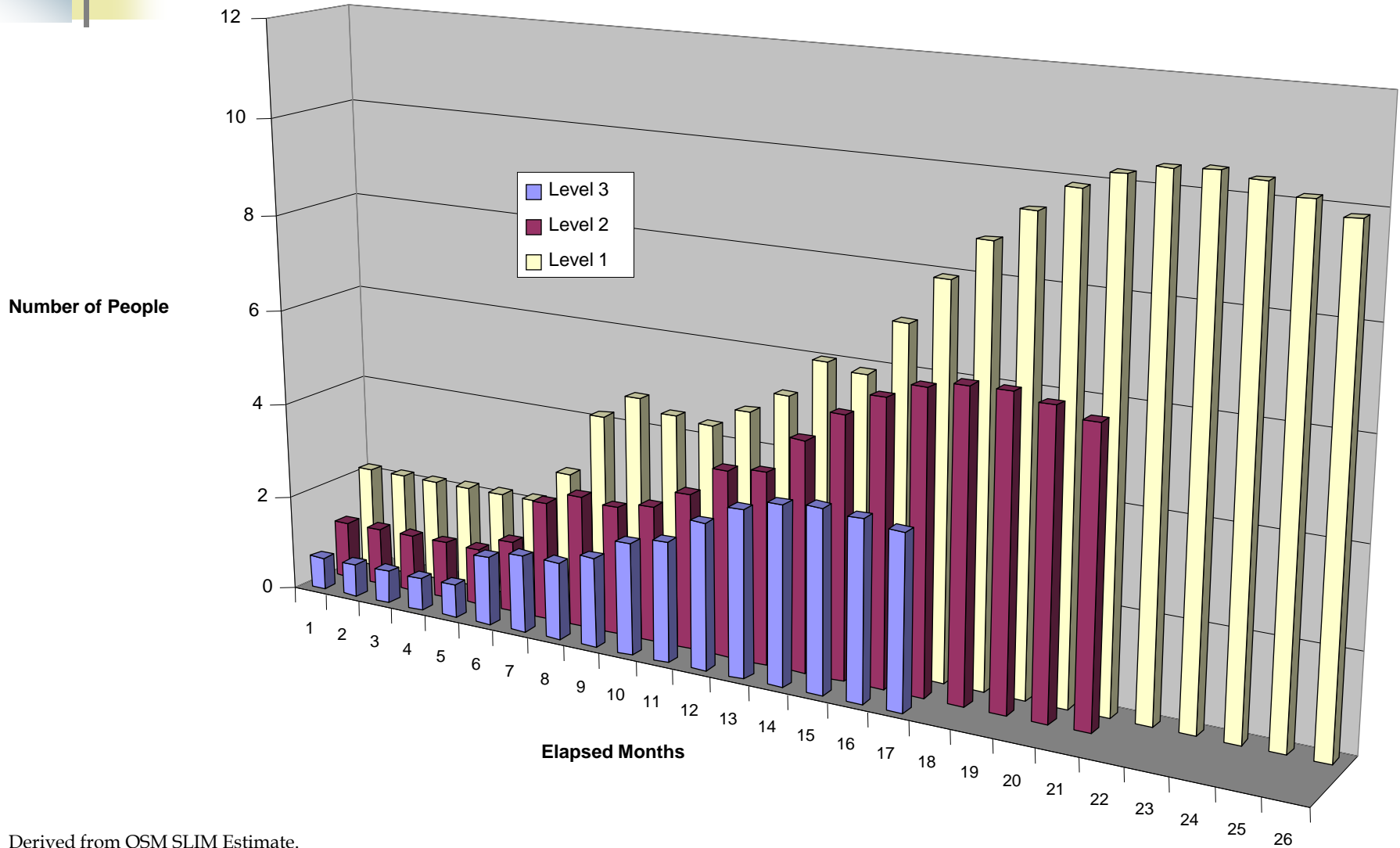| Measurement Categories	Stage I: Uncertainty	Stage II: Awakening	Stage III: Enlightenment	Stage IV: Wisdom	Stage V: Certainty
Management understanding and attitude	No comprehension of quality as a management tool. Tend to blame quality department for "quality problems."	Recognizing that quality management may be of value but not willing to provide money or time to make it all happen.	While going through quality improvement program learn more about quality management; becoming supportive and helpful.	Participating. Understand absolutes of quality management. Recognize their personal role in continuing emphasis.	Consider quality management an essential part of company system.
Quality organization status	Quality is hidden in manufacturing or engineering departments. Inspection probably not part of organization. Emphasis on appraisal and sorting.	A stronger quality leader is appointed but main emphasis is still on appraisal and moving the product. Still part of manufacturing or other.	Quality department reports to top management, all appraisal is incorporated and manager has role in management of company.	Quality manager is an officer of company; effective status reporting and preventive action. Involved with consumer affairs and special assignments.	Quality manager on board of directors. Prevention is main concern. Quality is a thought leader.
Problem handling	Problems are fought as they occur; no resolution; inadequate definition; lots of yelling and accusations.	Teams are set up to attack major problems. Long-range solutions are not solicited.	Corrective action communication established. Problems are faced openly and resolved in an orderly way.	Problems are identified early in their development. All functions are open to suggestion and improvement.	Except in the most unusual cases, problems are prevented.
Cost of quality as % of sales	Reported: unknown Actual: 20%	Reported: 3% Actual: 18%	Reported: 8% Actual: 12%	Reported: 6.5% Actual: 8%	Reported: 2.5% Actual: 2.5%
Quality improvement actions	No organized activities. No understanding of such activities.	Trying obvious "motivational" short-range efforts.	Implementation of the 14-step program with thorough understanding and establishment of each step.	Continuing the 14-step program and starting Make Certain.	Quality improvement is a normal and continued activity.
Summation of company quality posture	"We don't know why we have problems with quality."	"Is it absolutely necessary to always have problems with quality?"	"Through management commitment and quality improvement we are identifying and resolving our problems."	"Defect prevention is a routine part of our operation."	"We know why we do not have problems with quality."

From P. Crosby *Quality is Free.*

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Overview of staged levels

1	2	3	4	5
Ad hoc, Chaotic	**Basic Management**	**Process Definition**	**Process Measurement**	**Process Prevention**

5 — OPTIMIZING
Focus on patterns & continuous improvement

4 — QUANT. MANAGED
Process measured & statistically controlled

3 — DEFINED
Org capability; fairly well understood

2 — MANAGED
Can repeat previously mastered tasks

1 — INITIAL
Difficult to predict; relies on heroes

Higher probability that developer will achieve consistently improved project results

Value of climbing process maturity ladder

Number of People
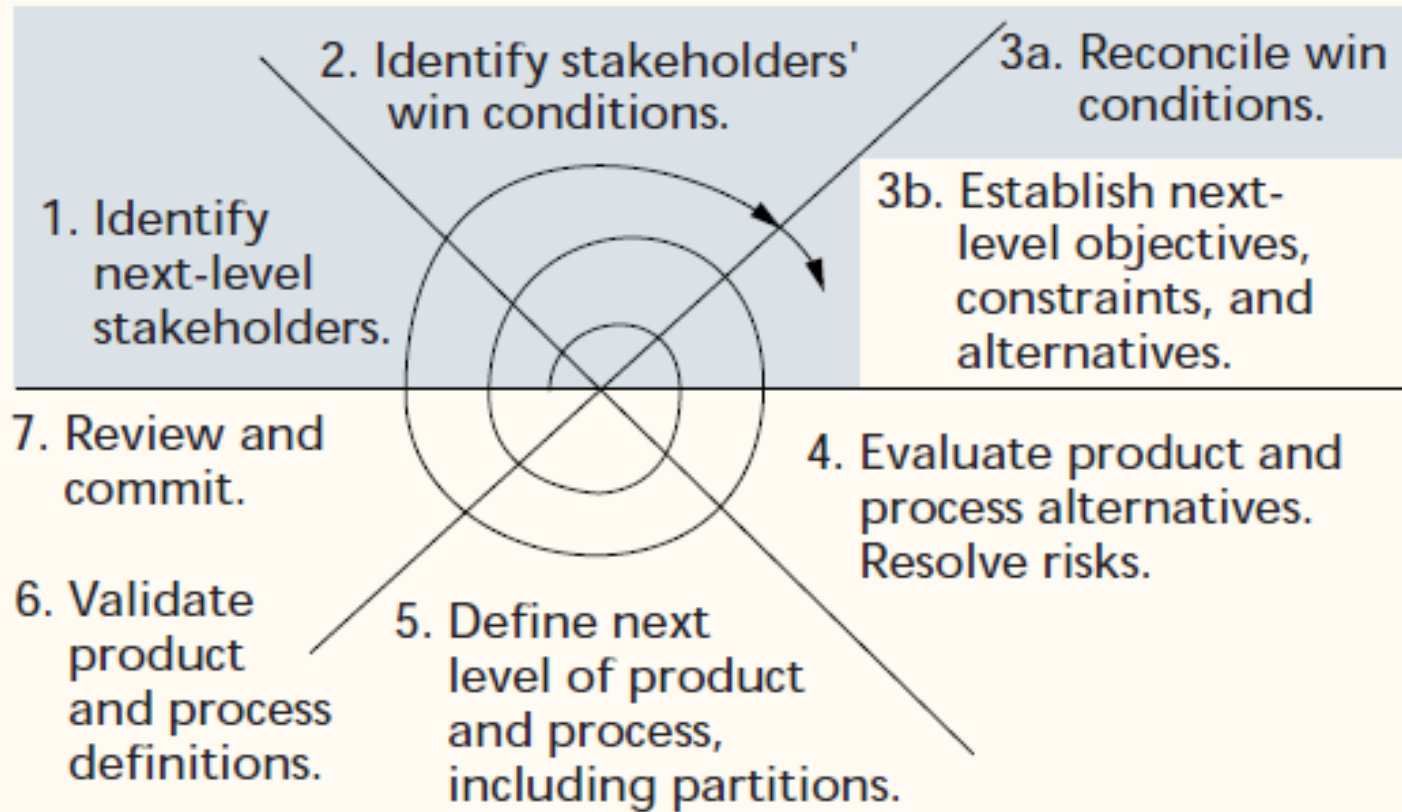
Elapsed Months

Legend: Level 3, Level 2, Level 1

Derived from QSM SLIM Estimate.

How might quality be defined in a product innovative enterprise?

- Best management of risk = making risk visible and early in the life cycle.

- Shortest time between glimmer in the eye and revenue-generating product.

Choice of life cycle

2. Identify stakeholders' win conditions.

3a. Reconcile win conditions.

1. Identify next-level stakeholders.

3b. Establish next-level objectives, constraints, and alternatives.

7. Review and commit.

4. Evaluate product and process alternatives. Resolve risks.

6. Validate product and process definitions.
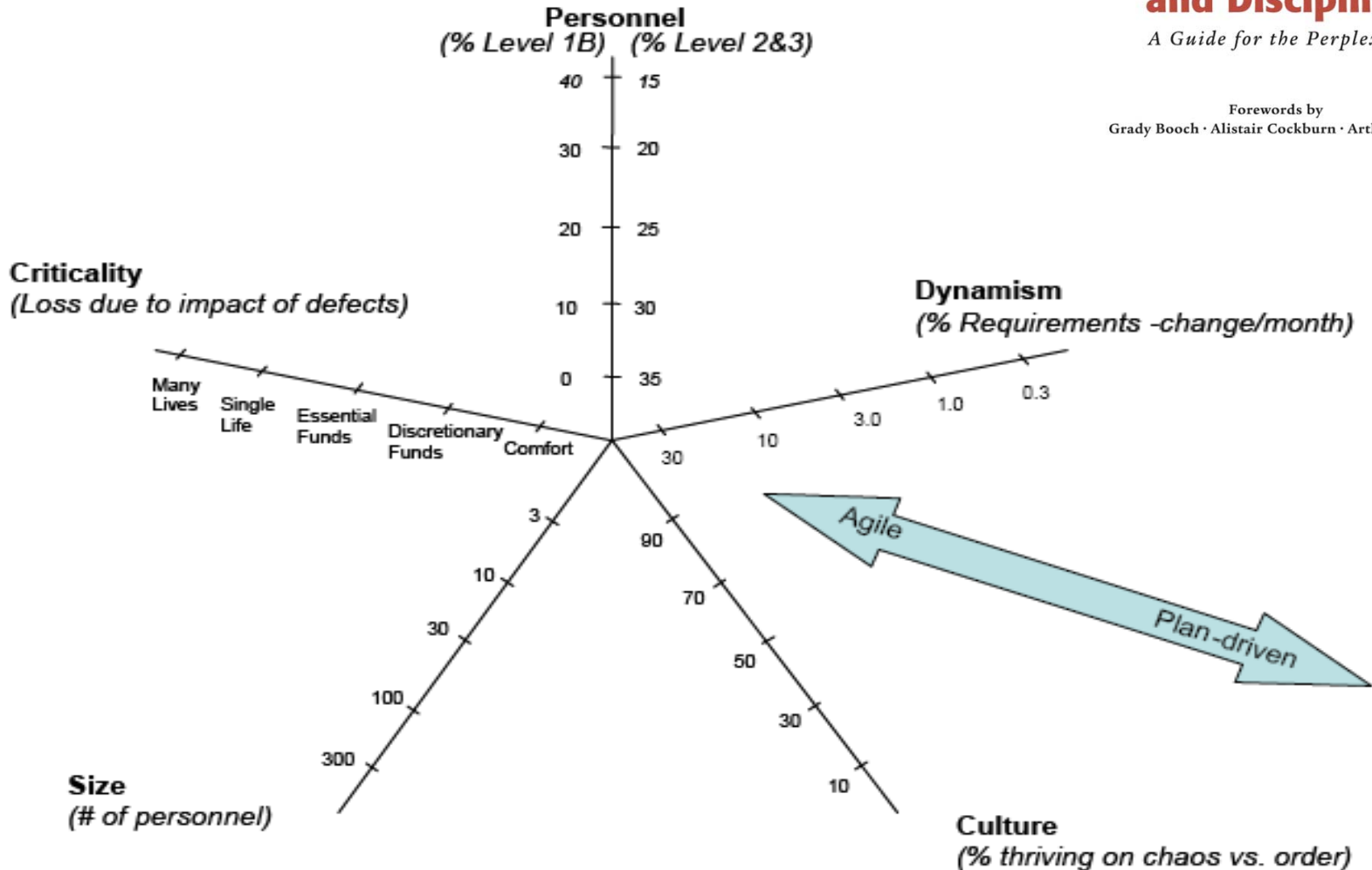
5. Define next level of product and process, including partitions.

Source: Boehm, B, et al. (July 1998)
"Using the WinWin spiral model: A case study."
IEEE *Computer, 31(7)*, 33-44.

Barry Boehm
Richard Turner

Balancing Agility and Discipline

A Guide for the Perplexed

Forewords by
Grady Booch · Alistair Cockburn · Arthur Pyster

Personnel
(% Level 1B)   (% Level 2&3)

Criticality
(Loss due to impact of defects)

Dynamism
(% Requirements -change/month)

Many Lives   Single Life   Essential Funds   Discretionary Funds   Comfort

Agile

Plan-driven

Size
(# of personnel)

Culture
(% thriving on chaos vs. order)

Product innovative: features are key

• *Improvement Goal 1: "xx is planned"*	**Planning is not as important as understanding & challenging the constraints**
• *Plan: "1.4* blinding insights per fortnight"	**Innovation cannot be planned**

Innovativeness (cont.)

|	
• *Instead – manage a basket of risks*	**Create an environment of creativity (= OK to fail *in the small*)**
• *Lightweight processes*	**Probably documented only at highest level**

Innovativeness (cont.)

• *"Good enough quality"* – quality that meets the threshold value	**Benchmark quality & other attributes to tune values**
• *High differentiation, high integration*	**Lots of experts + people whose job it is to benchmark and integrate, stay focused**

How much assurance is needed?

Combined Risk Exposure

Legend: Market Share Erosion — Value-based Testing — Value-neutral Testing
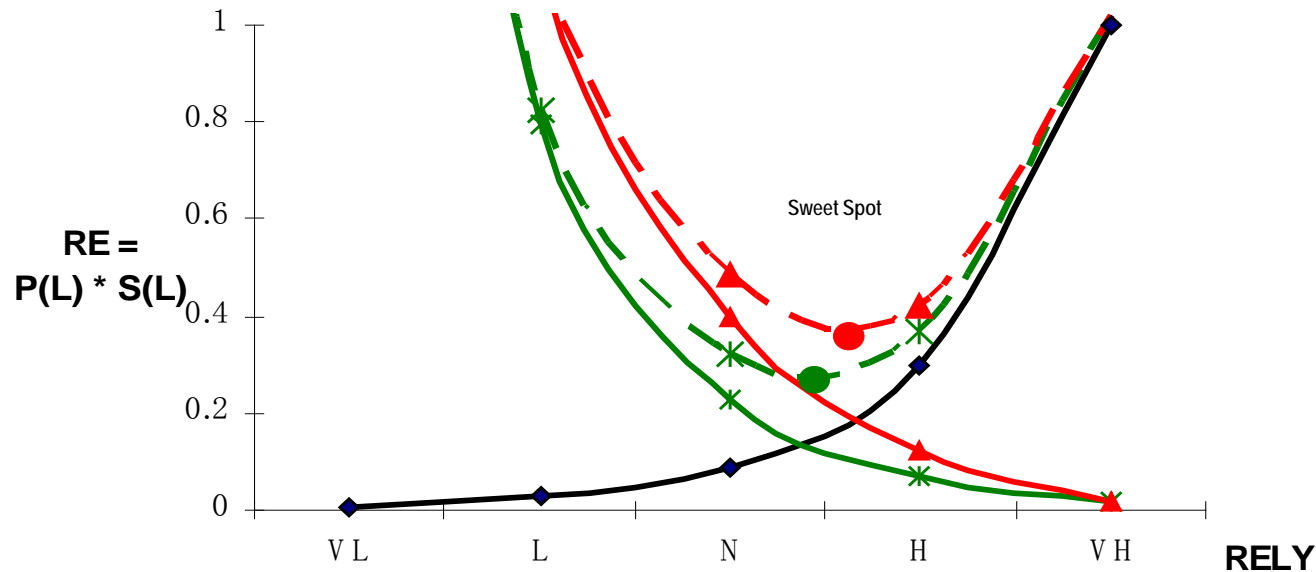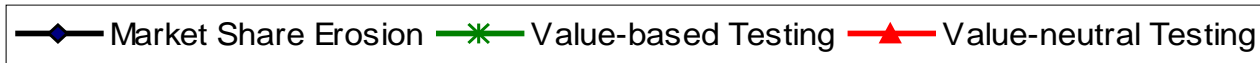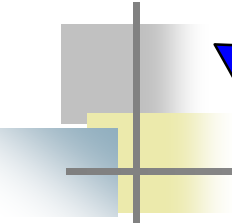
	V L	L	N	H	V H	
						RELY
COCOMO II:	**0**	12	22	34	54	**Added % test time**
COQUALMO:	**1.0**	.475	.24	.125	.06	$P_a(L)$
Value-Based:	**3.0**	1.68	.96	.54	.30	$S_a(L)$: Pareto
Value-Neutral:	**3.0**	2.33	1.65	0.975	.30	$S_a(L)$: Linear
Market Risk:	**.008**	.027	.09	.30	1.0	RE_m

Source: "How much software assurance is enough: A value-based approach," LiGuo Huang & Barry Boehm, IEEE *Software*, Sept.-Oct. 2006, pp. 88-95.

Framework for strategic planning

The Balanced Scorecard Strategy Map

Improve Shareholder Value
• share price   • return on capital employed

Financial Perspective

Revenue Growth Strategy   Productivity Strategy

| build the franchise | increase value to customers | improve cost structure | improve use of assets |

• revenue from new sources   • customer profitability   • operating cost per unit produced   • asset utilization

Customer Perspective

Customer Value Proposition

Product Leadership

Customer Intimacy

Operational Excellence

• customer acquisition, retention, and satisfaction

Internal Process Perspective

| build the franchise through innovations | increase customer value through customer management processes | achieve operational excellence through operations and logistics processes | become a good corporate citizen through regulatory and environmental processes |

Learning and Growth Perspective

| employee competencies | technology | corporate culture |

Whoosh!

- "Fit" is an important, practical reality
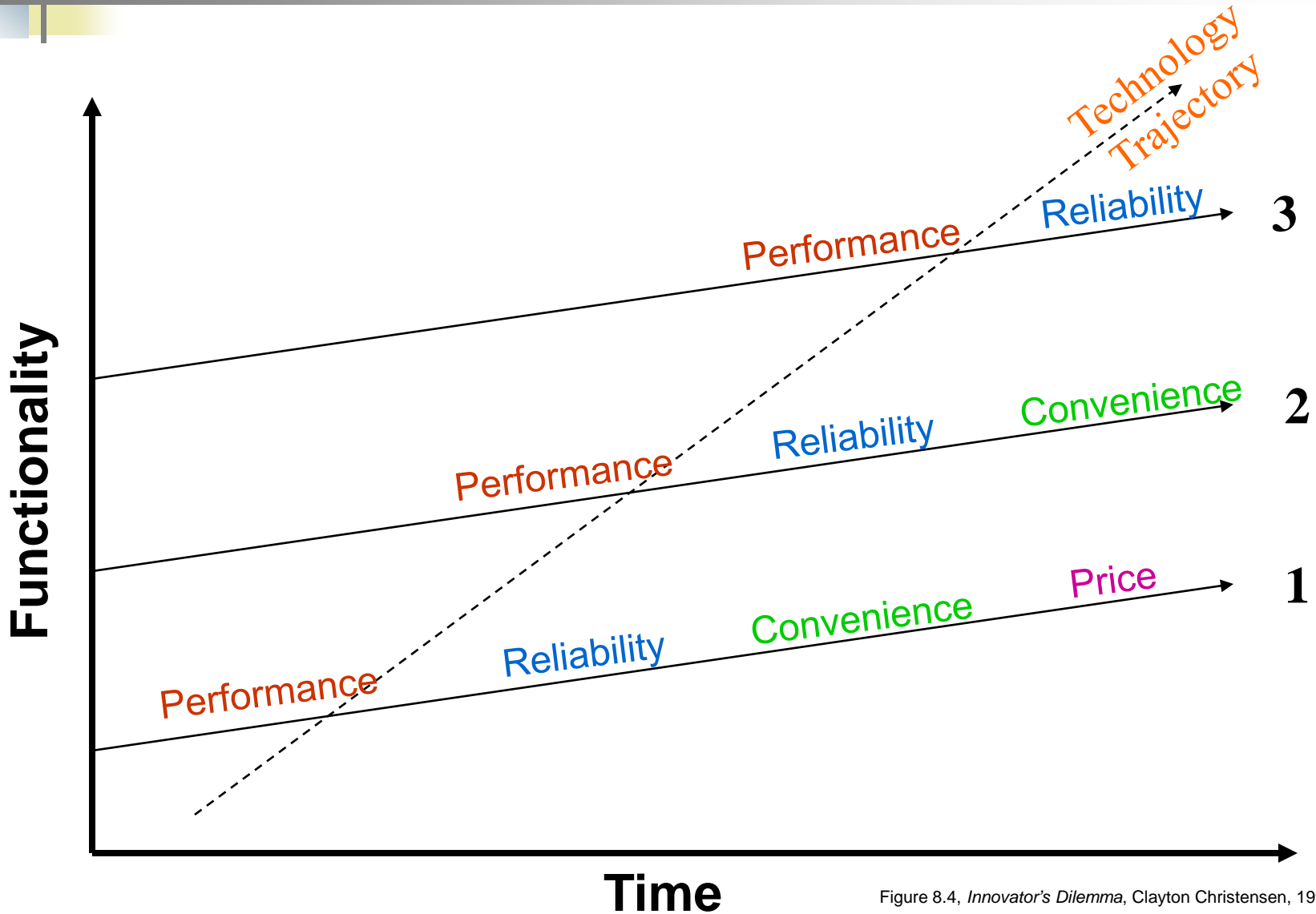- When there is "fit" then adoption goes *Whoosh*!

Innovator's Dilemma

Figure 8.4, *Innovator's Dilemma*, Clayton Christensen, 1997, p. 179.