The "Do More Engineering" Process
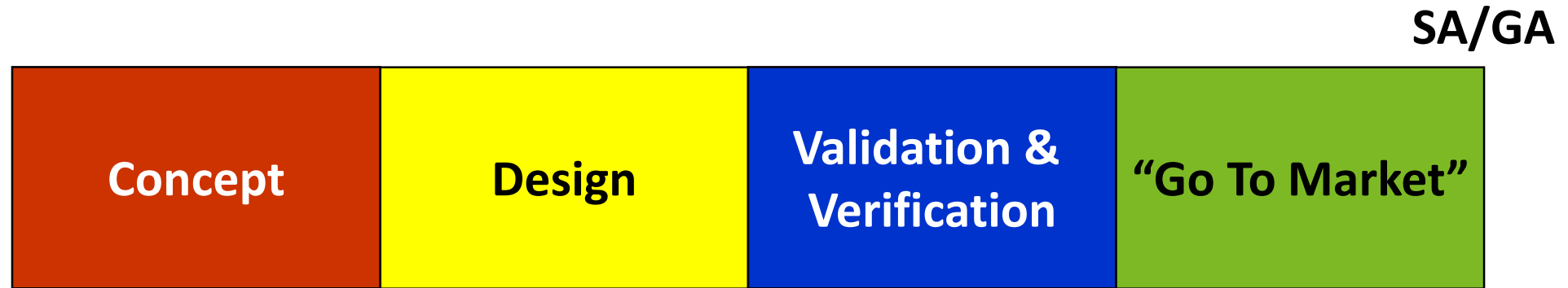
INTEGRATING DFMA INTO THE PRODUCT DEVELOPMENT PROCESS
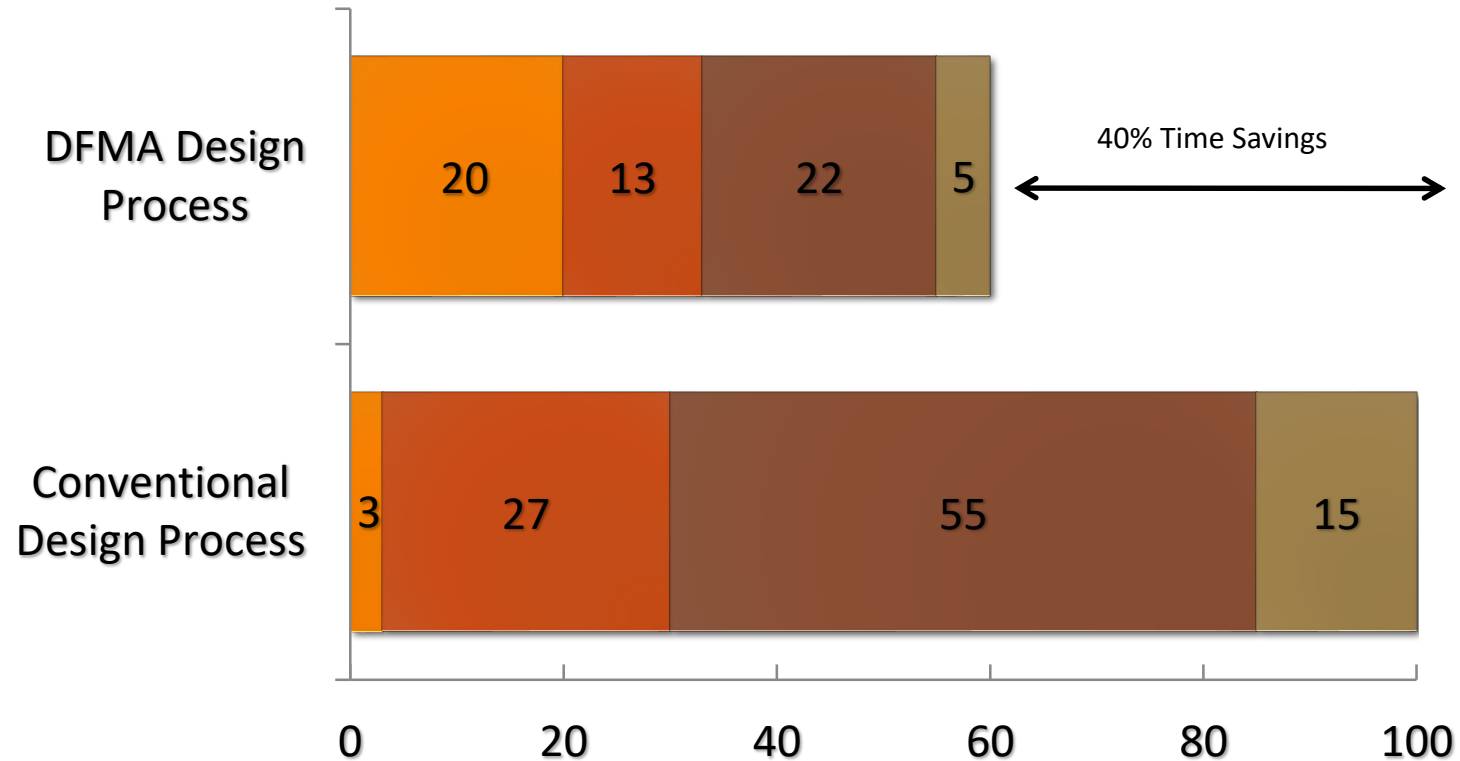
Typical Product Development Process

Concept	Design	Validation & Verification	"Go To Market"

Activity

Distribute 100% product development cycle time across the four phases

The More Things Change …

Percentage of Design Time

Legend:
- Concept design
- Initial design
- Design changes
- Data dissemination

DFMA Design Process: 20, 13, 22, 5
Conventional Design Process: 3, 27, 55, 15

40% Time Savings

Source: Plastics Design Forum

The More Things Change …

EXHIBIT II

Japanese automaker with QFD made fewer changes than U.S. company without QFD
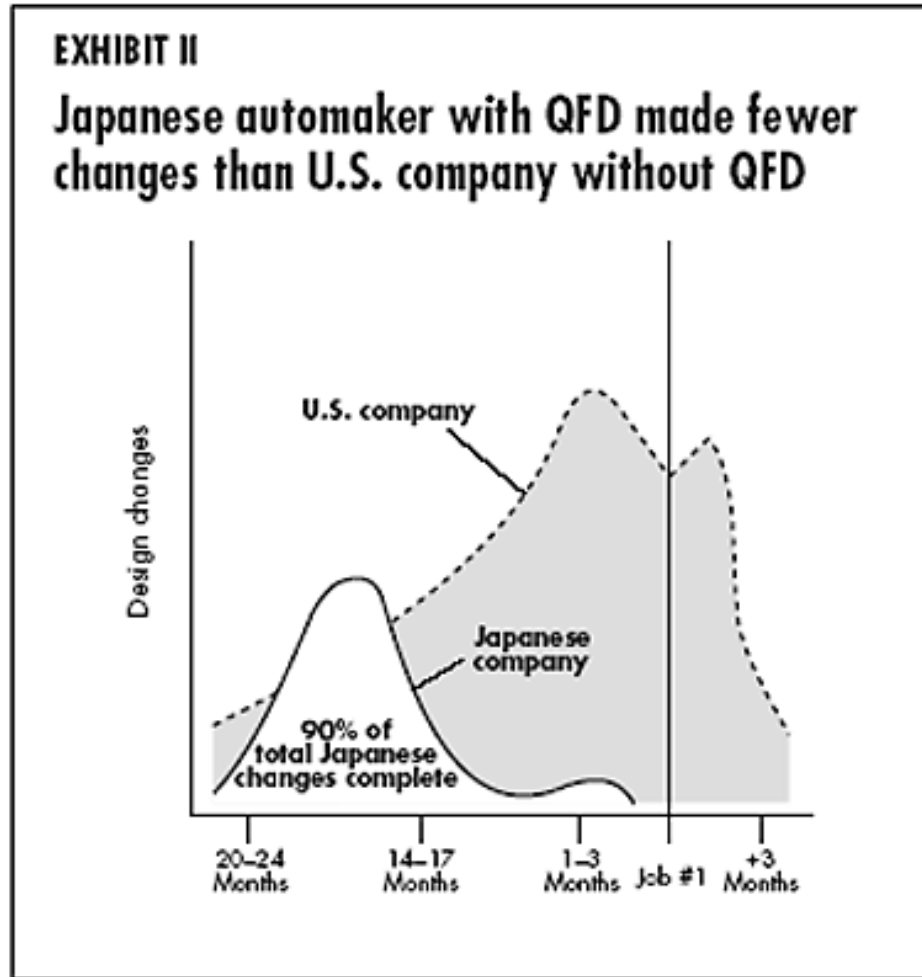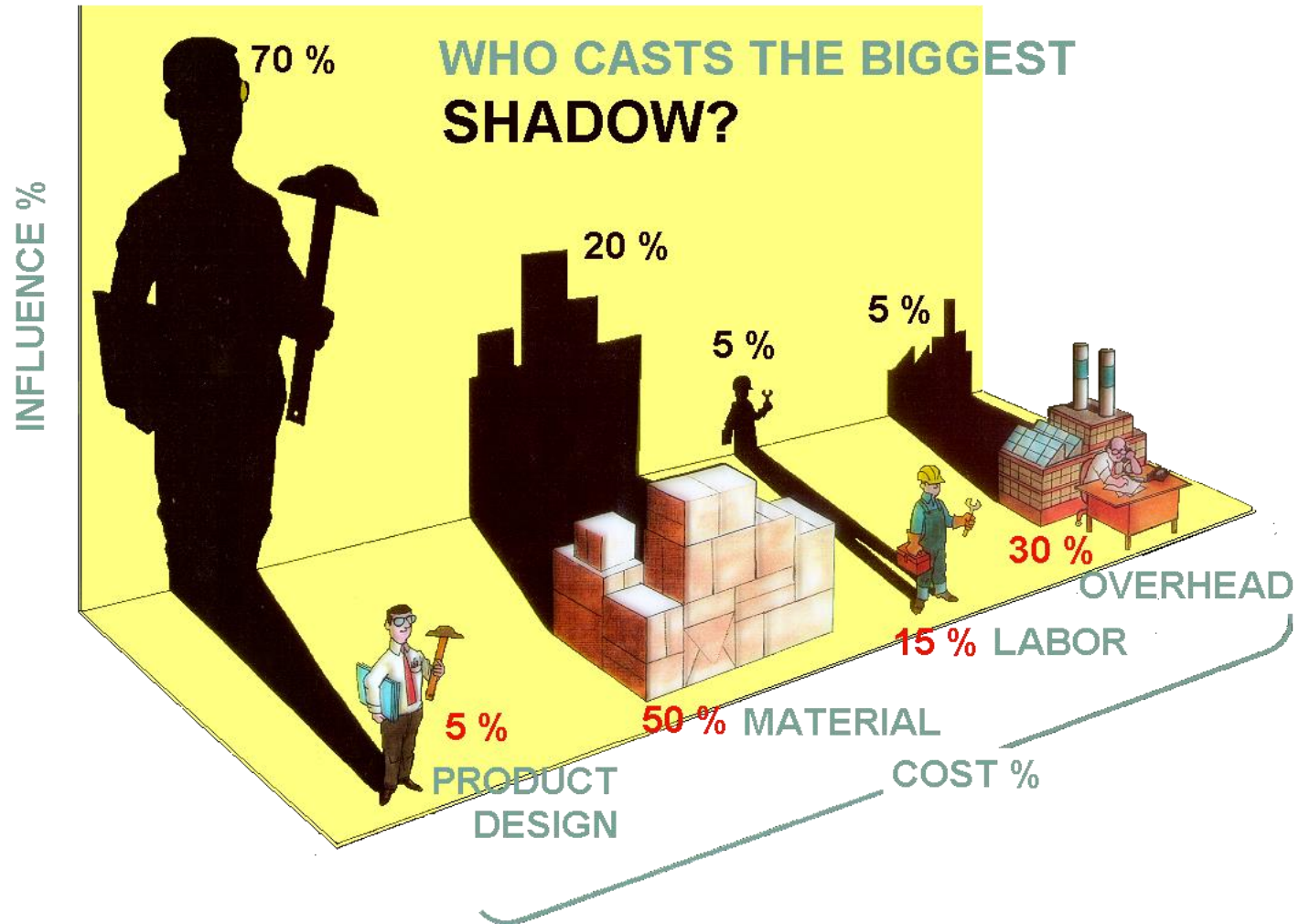
Exhibit II Japanese automaker with QFD made fewer changes than U.S. company without QFD Source: Lawrence P. Sullivan, "Quality Function Deployment," Quality Progress, June 1986, p. 39. © 1986 American Society for Quality Control. Reprinted by permission.

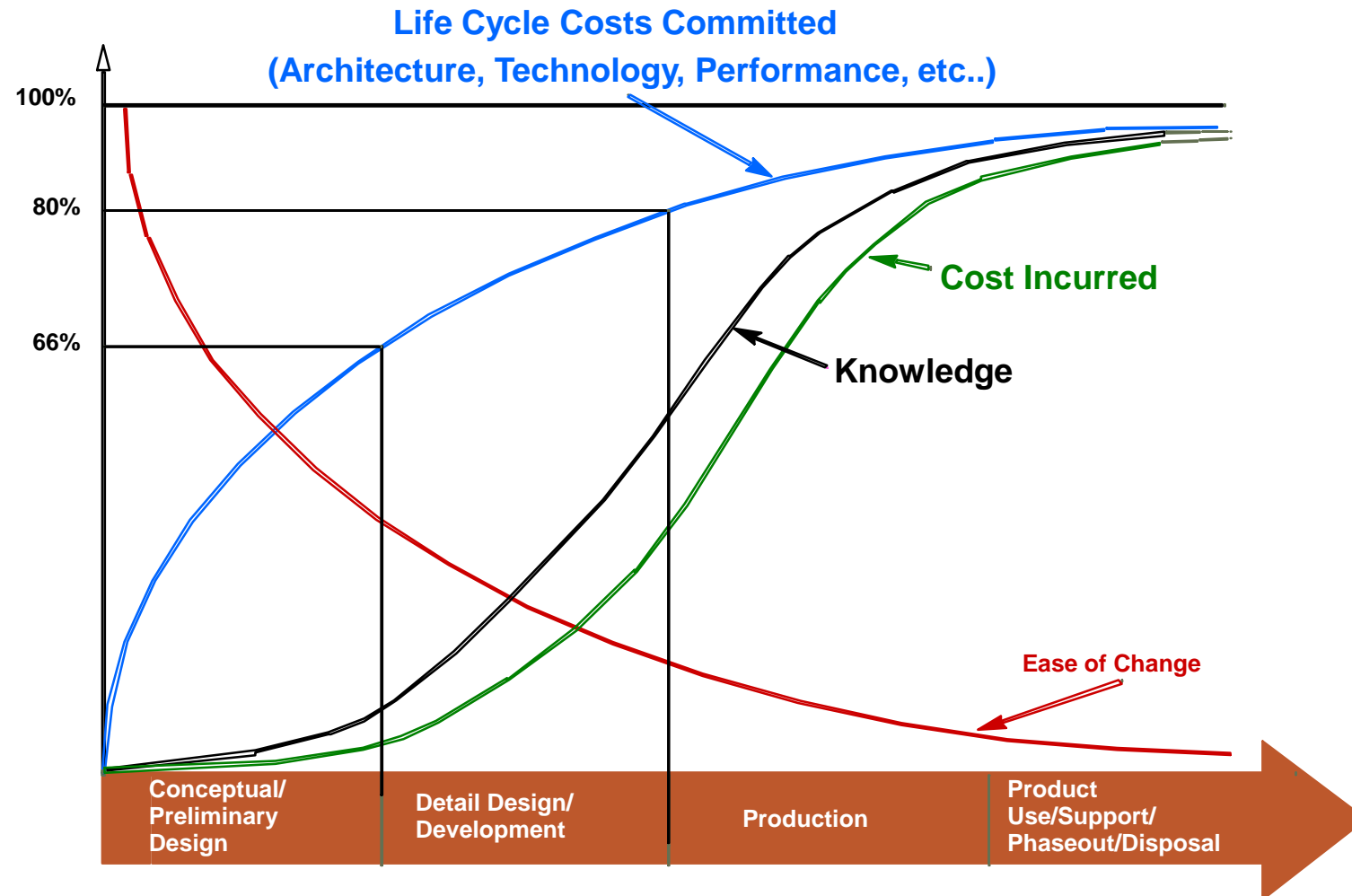HBR Article by John Hauser and Don Clausing … May 1988

The More Things Change …

WHO CASTS THE BIGGEST SHADOW?

INFLUENCE %

70 %

20 %

5 %

5 %

5 %
PRODUCT
DESIGN

50 % MATERIAL

15 % LABOR

30 % OVERHEAD

COST %

Source: Ford Motor Company

The More Things Change …

Life Cycle Costs Committed
(Architecture, Technology, Performance, etc..)

100%

80%

66%

Cost Incurred

Knowledge

Ease of Change

Conceptual/
Preliminary
Design

Detail Design/
Development

Production

Product
Use/Support/
Phaseout/Disposal

Fabrycky & Blanchard, 1993

"Do More Engineering" Product Development Process
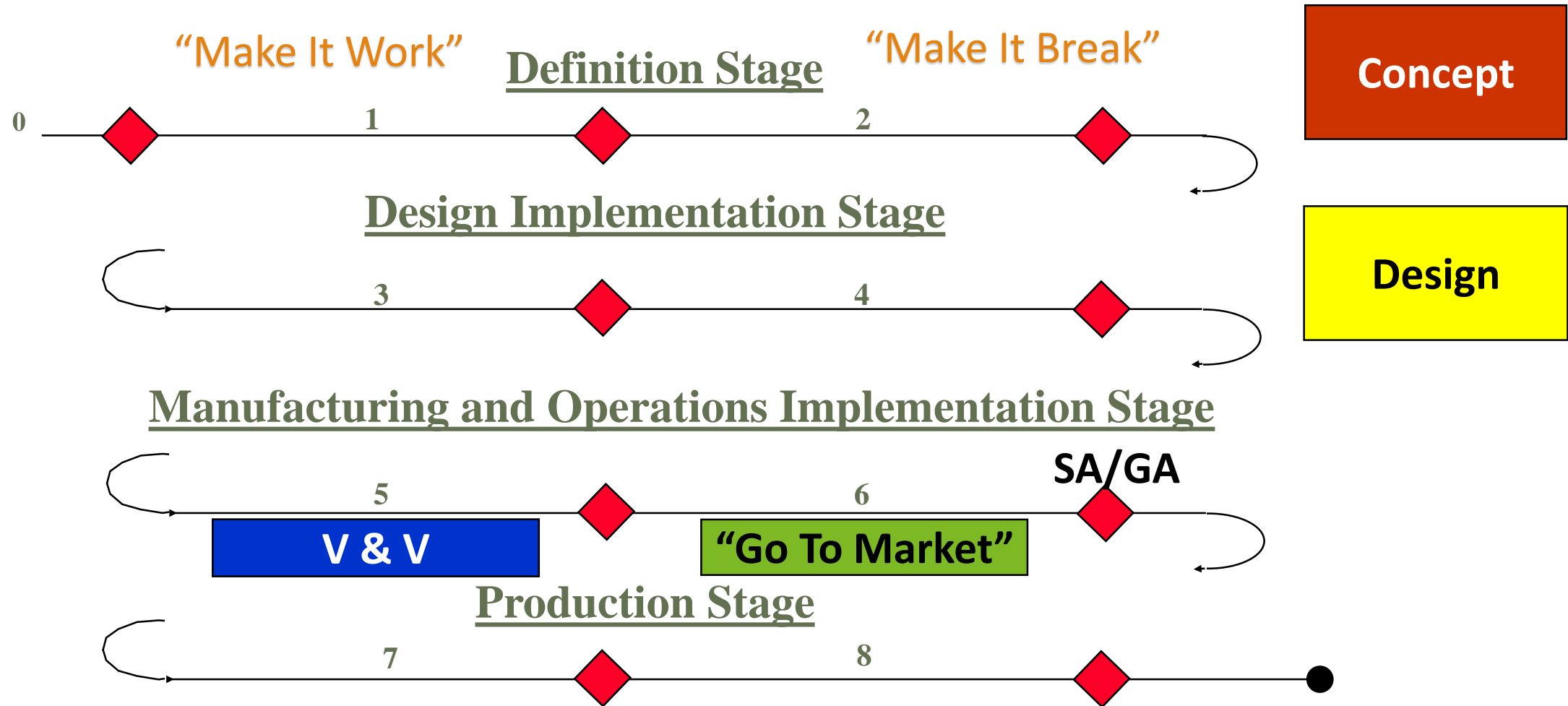
"Do More Engineering" Best Practices

"Make It Work"   **Definition Stage**   **"Make It Break"**

0 — ◆ — 1 — ◆ — 2 — ◆

Objectives: Superior System Concepts Robust Technologies

- Multifunctional PD Teams
- VOC & QFD
- VAVE & Functional Flow Diagrams
- DFMA®/ DF"x"
- Competitive Benchmarking
- Reusability Assessement
- Pugh Matrix
- Taguchi's Parameter Design
- Robustness Development Fixtures
- Systems Engineering

Phase 1 Best Practices Plus:

- Early Customer Involvement
- Early Supplier Involvement
- Decision & Risk Analysis
- Fault Tree Analysis
- DFMEA/PFMEA
- Critical Parameter Layouts
- Manufacturing Process Capabilities Assessment
- Target Costing
- MRP II

Objectives: Well defined features, performance, & functional requirements Subsystems defined & proven robust Commitment to integrated proj. plan

Great Process ≠ Great Outcome

◦ Lacked diligence in Portfolio Management

◦ Too many projects/person

◦ "Sunk money" syndrome … lacked diligence in canceling projects

◦ "Ugly baby" syndrome … prima donna engineers not open to others' ideas (especially from manufacturing)

◦ Poor accountability

Ingredients for DFMA® Deployment Success

◦ Structured product development process … phased objectives, deliverables, & tools (Best Practices)

◦ Stakeholders set clear expectations/goals and support "good decisions"

◦ Consistent, data-driven decision making processes

◦ Clear roles & responsibilities (i.e. RASI)

◦ Effective competency development

◦ Designated subject matter experts (SME's) to serve as mentors & consultants

Ingredients for DFMA® Deployment Success

- ◦ Project portfolio management … project identification, prioritization, funding, and staffing
- ◦ Project staffing for success … 2-3 projects/person
- ◦ Project metrics & tracking: status, no. parts, costs, NRE, capital … predicted vs. actual vs. target
- ◦ Lessons learned collected & shared
- ◦ Integration with other business processes and practices (i.e. VAVE, FMEA, MRP/ERP, etc.)

Product Success Drivers	Current State	Goal State
Product Strategy	1.8	2.3
Process Definition	2.5	3.0
Portfolio Management	4.0	4.5
Skills & Discipline	3.5	4.0
Effectiveness Score (out of 100)	62	

Product Development Maturity Index

Facts ... Discipline ... Constancy of Purpose

SPACEX
TESLA
SolarCity
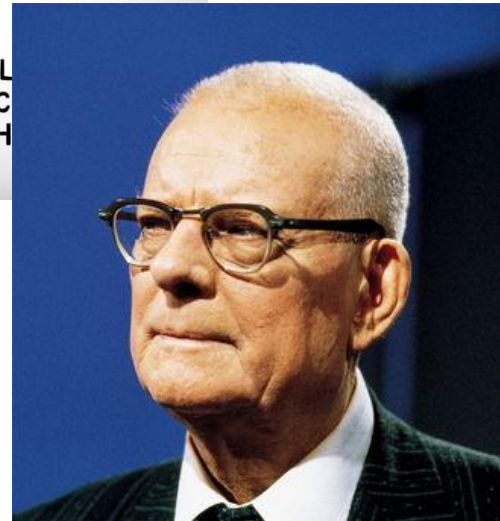
FIRST PRINCIPLES REASONING

"YOU BOIL THINGS DOWN TO
THEIR FUNDAMENTAL TRUTHS
AND REASON UP FROM THERE."

VS.

"REASONING BY ANAL
WHICH ESSENTIALLY MEANS C
OTHER PEOPLE DO WITH SLIGH

"Without discipline,
there is no Marine Corp."

"In God we trust, all others bring data."
"Create constancy of purpose toward improvement ..."

Thank You!!!