

Design For Six Sigma (DFSS)

Introduction

24 January 2015

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1. Design For Six Sigma
2. Application of Design For Six Sigma
3. Benefits of Design For Six Sigma
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What is DFSS?

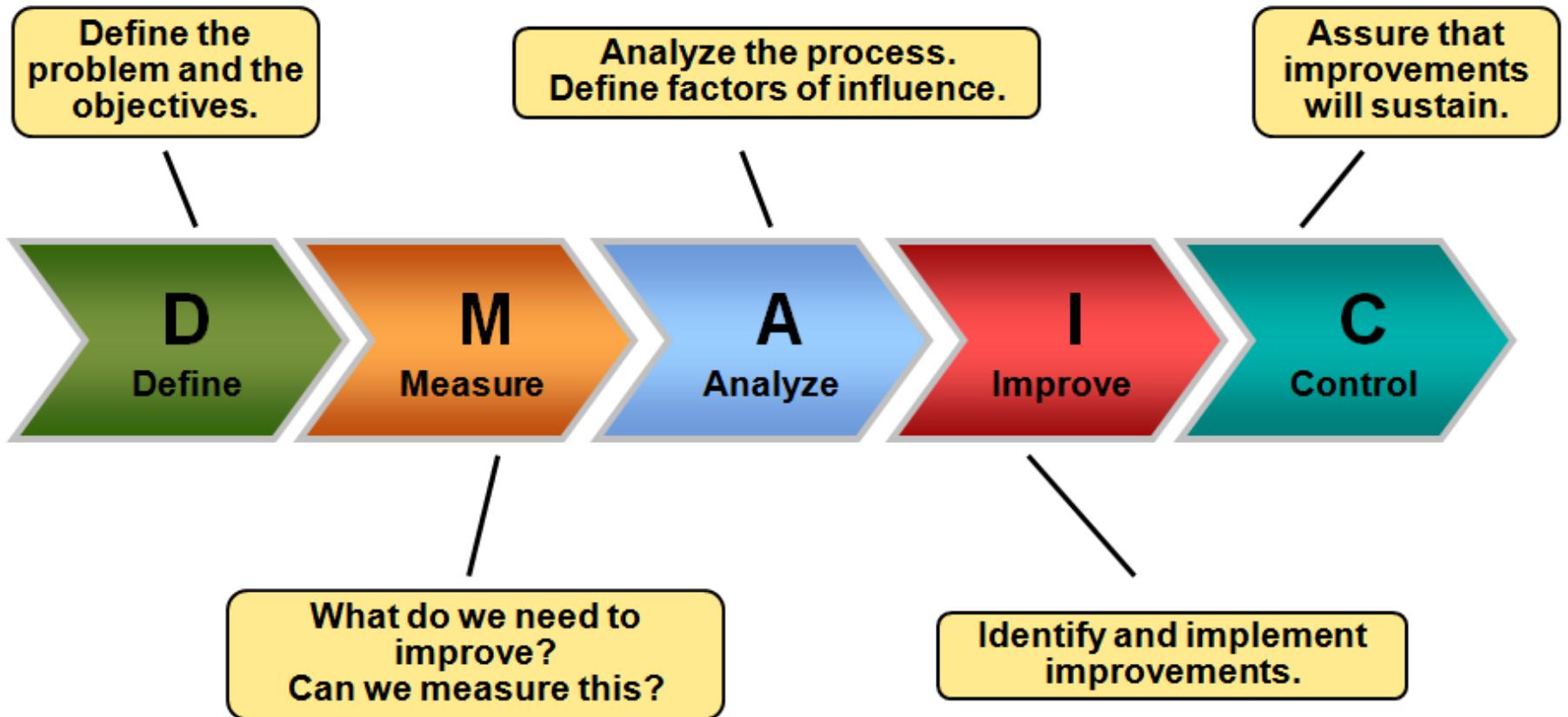
- DFSS is a new development from **Six Sigma**
- It is methodology to enhance new product and service development process
- It provides a more systematic way to manage the deliverable, resources and trade-offs
- It helps you to deliver better products and services that your customers want and willing to pay for (at **Six Sigma Level**)

What is Six Sigma?

- Developed by Motorola in the mid-1980s
- Jack Welch of GE made it a strategic business management philosophy, saving billions of dollars
- Spreading from manufacturing into servicing and other sectors



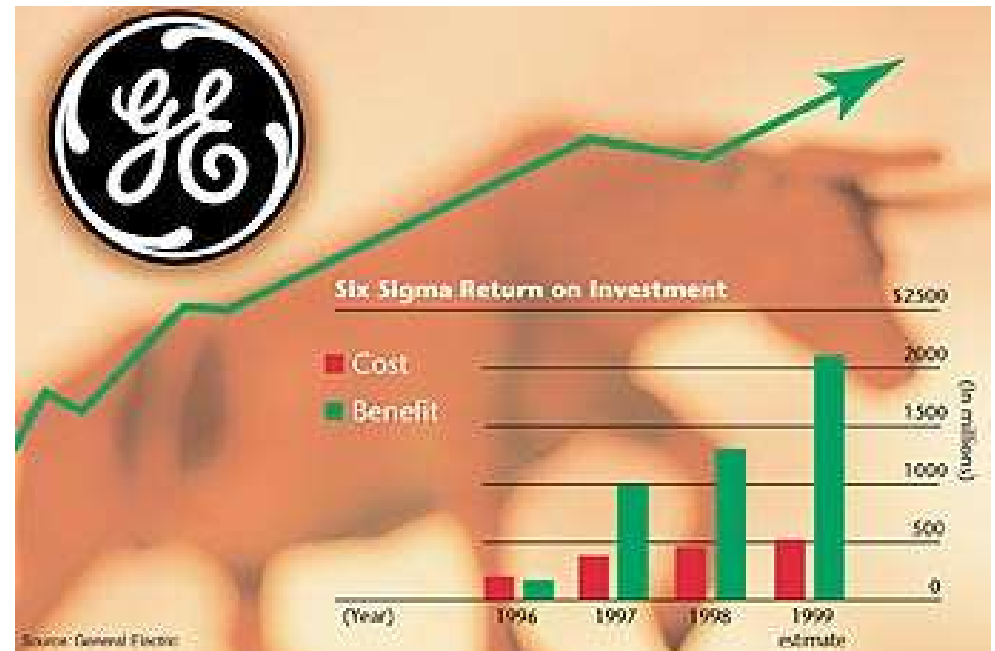
Six Sigma DMAIC Roadmap



Benefits of Six Sigma

Benefits:

- Delighting Customer
- Solving Problem
- Reducing Defect
- Increasing Profit
- And more...



Problems encountered by Six Sigma

1. It does not address the customer values deep enough
2. DMAIC-based projects could not solve flawed design
3. Non-valued added processes cannot be removed

DFSS Foundations

1. Customer-oriented design
2. Systematic and creative design
3. Robust performance and prevention philosophy

Example: Six Sigma in Pizza Express (1)

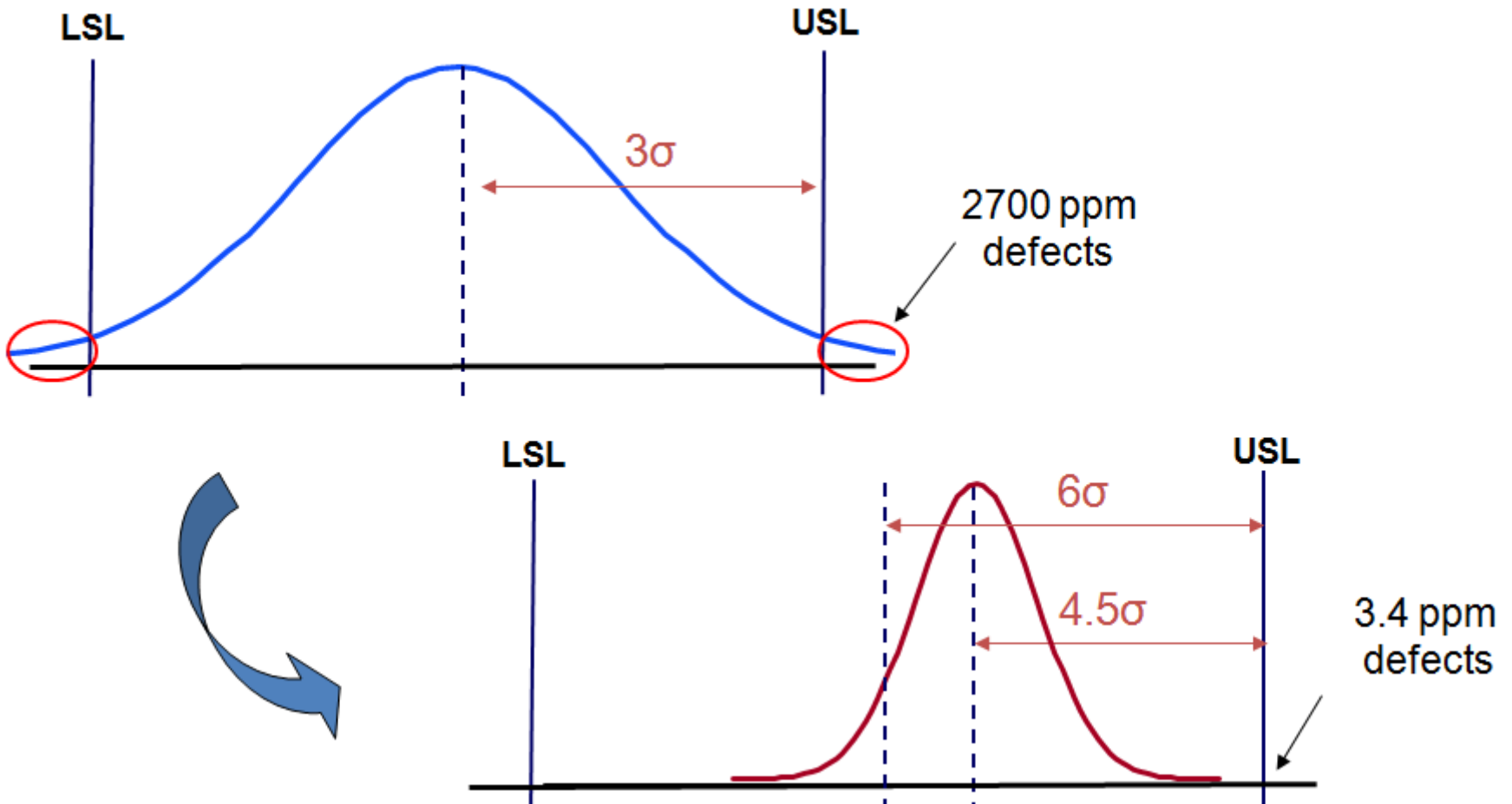
Problem: 1 out of 3 customers complained that the pizza is not hot enough

Reason: it could not be delivered in 30 min

Solution: shorted the lead time (DMAIC)

Defective Rate	Performance Capability
1 out of 3 pizzas	2 σ
7 out of 100 pizzas	3 σ
6 out of 1,000 pizzas	4 σ
2 out of 10,000 pizzas	5 σ
3.4 out of 1,000,000 pizzas	6 σ

Motorola Six Sigma Level



Example: Six Sigma in Pizza Express (2)

Business is booming and 2 new pizza ovens were installed to meet the demand \$\$\$.

Problem: customer complain that the pizza is half-baked

Reason: temperature of ovens, location of pizza inside the oven, content % ratio, time of baking, etc.

Solution: go back to everything before problem happen (by DMAIC)

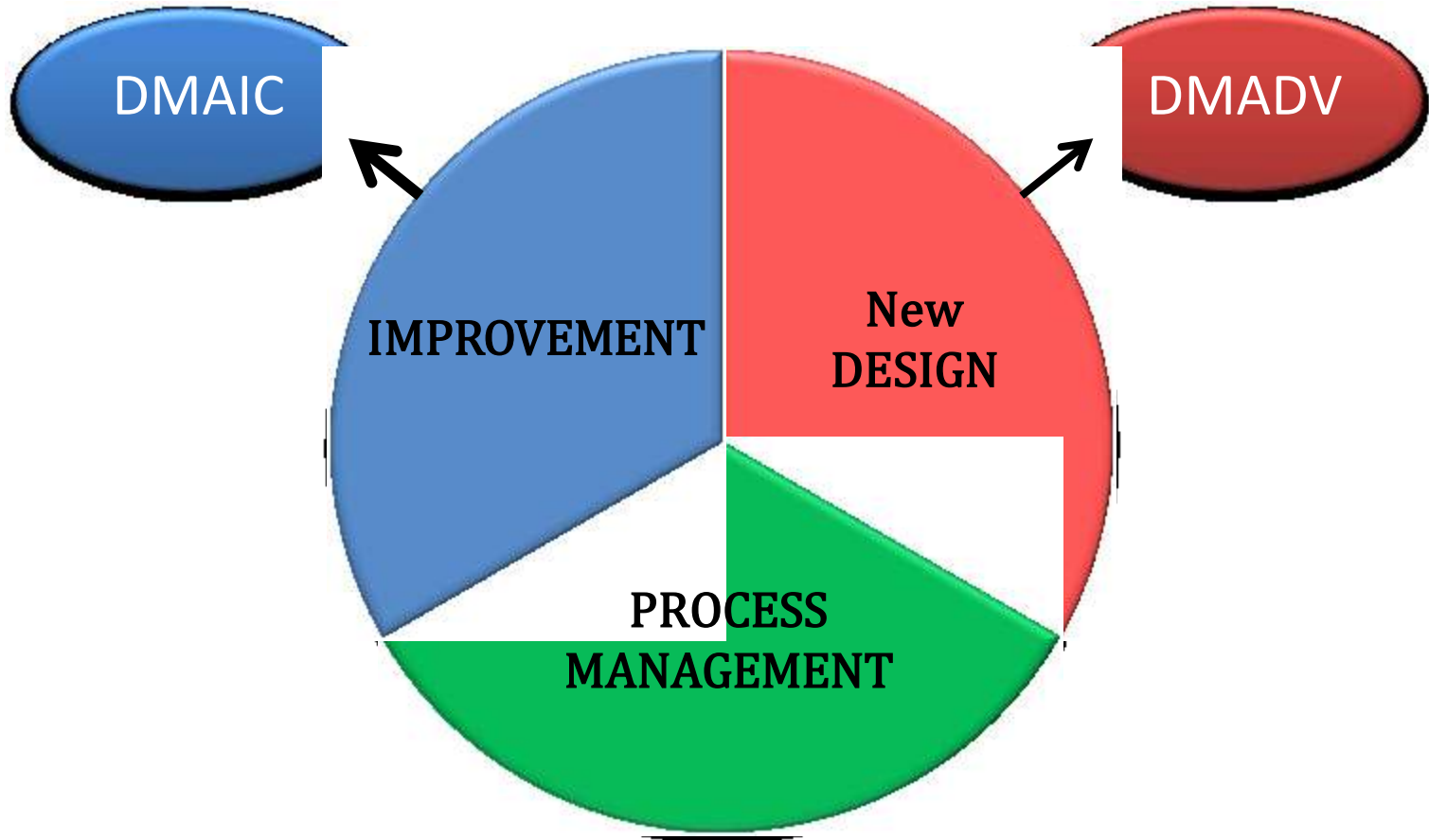
Example: Six Sigma in Pizza Express (3)

Three years later, new population moves in this town, but new pizza houses open.

Problem: customers ask for varieties of pizza
and much lower price

Solution: “Design It Right the First Time”
(by DMADV)

Management of Six Sigma



When to use DFSS?

1. Replacing, rather than repairing
2. Improving an existing process will never meet the customers requirements
3. An opportunity to offer an entirely new product or service

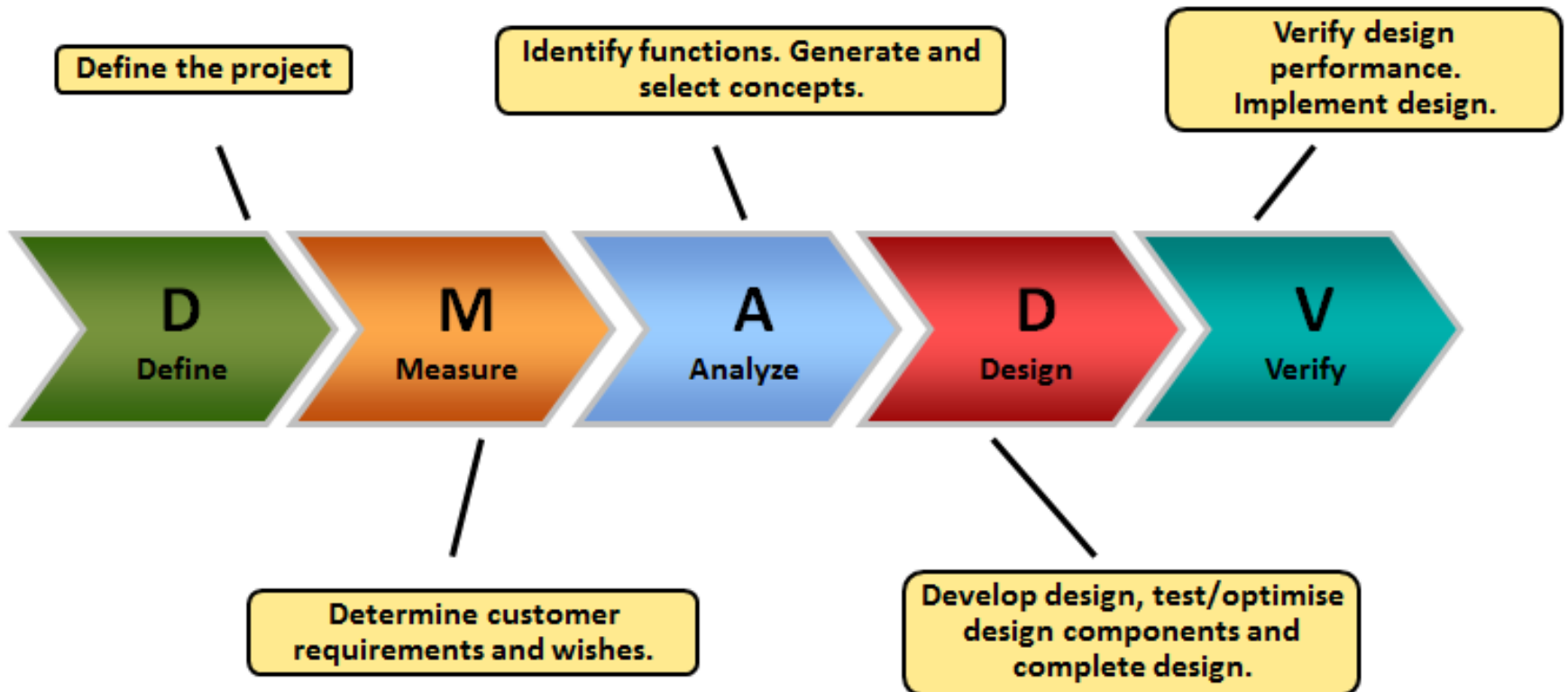
Why DFSS is slow to be taken up?

1. Number of Design < Number of Improvement
2. Risk and amount of resources to design a new product is much higher than that to improve an existing product
3. Methods and tools are complicated, and knowledge requirement is high
4. Success of DFSS demand on mind-set and attitude (leadership and culture)

Design For Six Sigma (DFSS)

DFSS is Free

DFSS DMADV Roadmap



Roadmaps

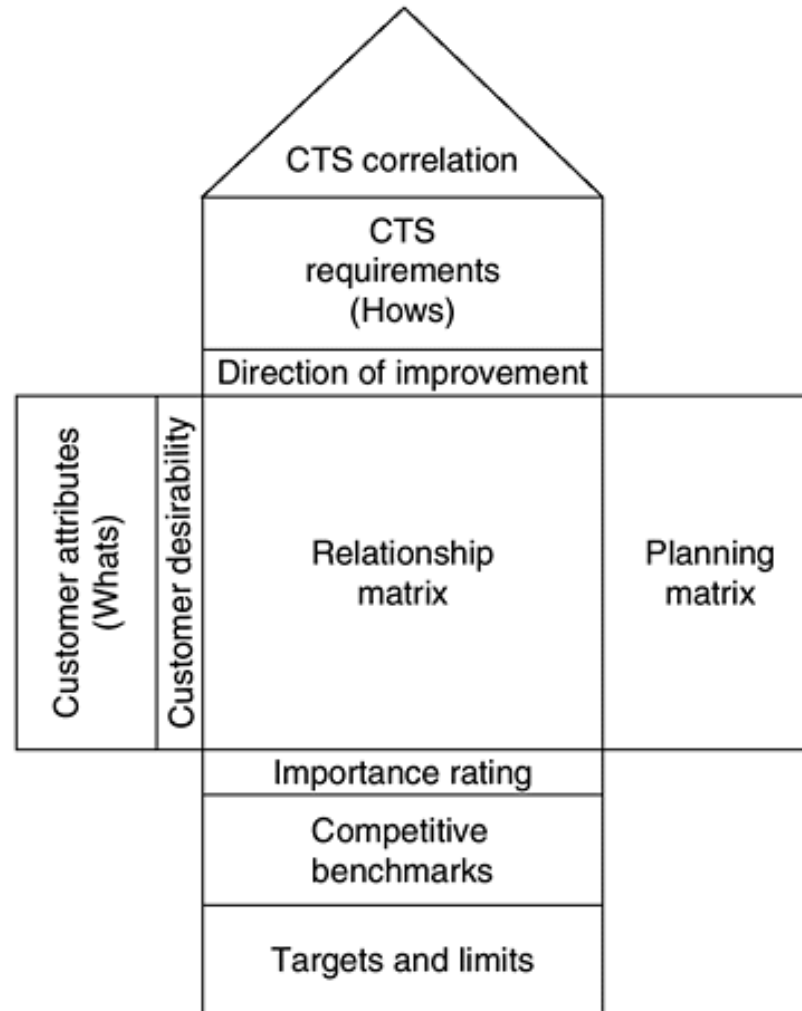
Six Sigma vs Design For SS

<i>Six Sigma Improvement (DMAIC)</i>		<i>Design For Six Sigma (DMADV)</i>	
D	define the problem define the process define customer requirement not met	D	define customer needs define "ALL" requirements and gain consensus on design generation
M	measure extent of the problem data from process, product and customers	M	develop measure of success establish tolerance determine how crucial features be evaluated
A	analyze the data and process to find the causes of problem	A	create innovative concepts narrow list of concept proposals
I	improve by eliminating causes of problem build safeguards	D	detail the design alternatives list select the best of the best testing, testing and testing
C	control by regular measure, checking opportunities for future improvement	V	validate by testing and deployment establish the monitoring system response planning

DFSS Toolbox

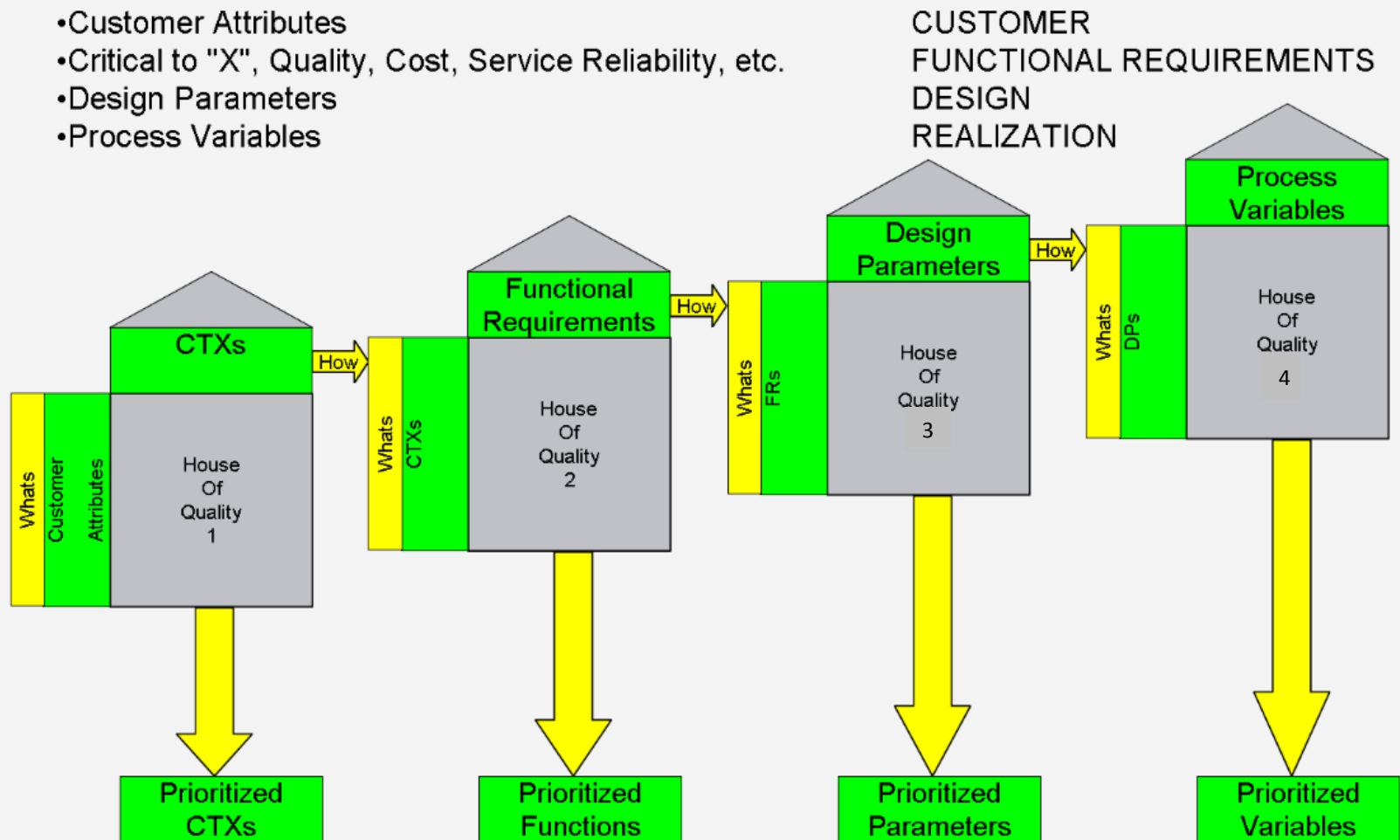
1. Define
 - Voice Of Customers (VOC)
 - Quality Function Deployment (QFD)
 - Kano Analysis
2. Measure
 - Benchmarking
 - Capability Performance
3. Analyze
 - TRIZ
 - Process Simulation
4. Design
 - Failure Mode and Effects Analysis (FMEA)
 - Design Of Experiences (DOE)
 - Pugh Matrix
5. Verify
 - Statistics Process Control (SPC)
 - Response Planning
 - Process Management

Quality Function Deployment (QFD)

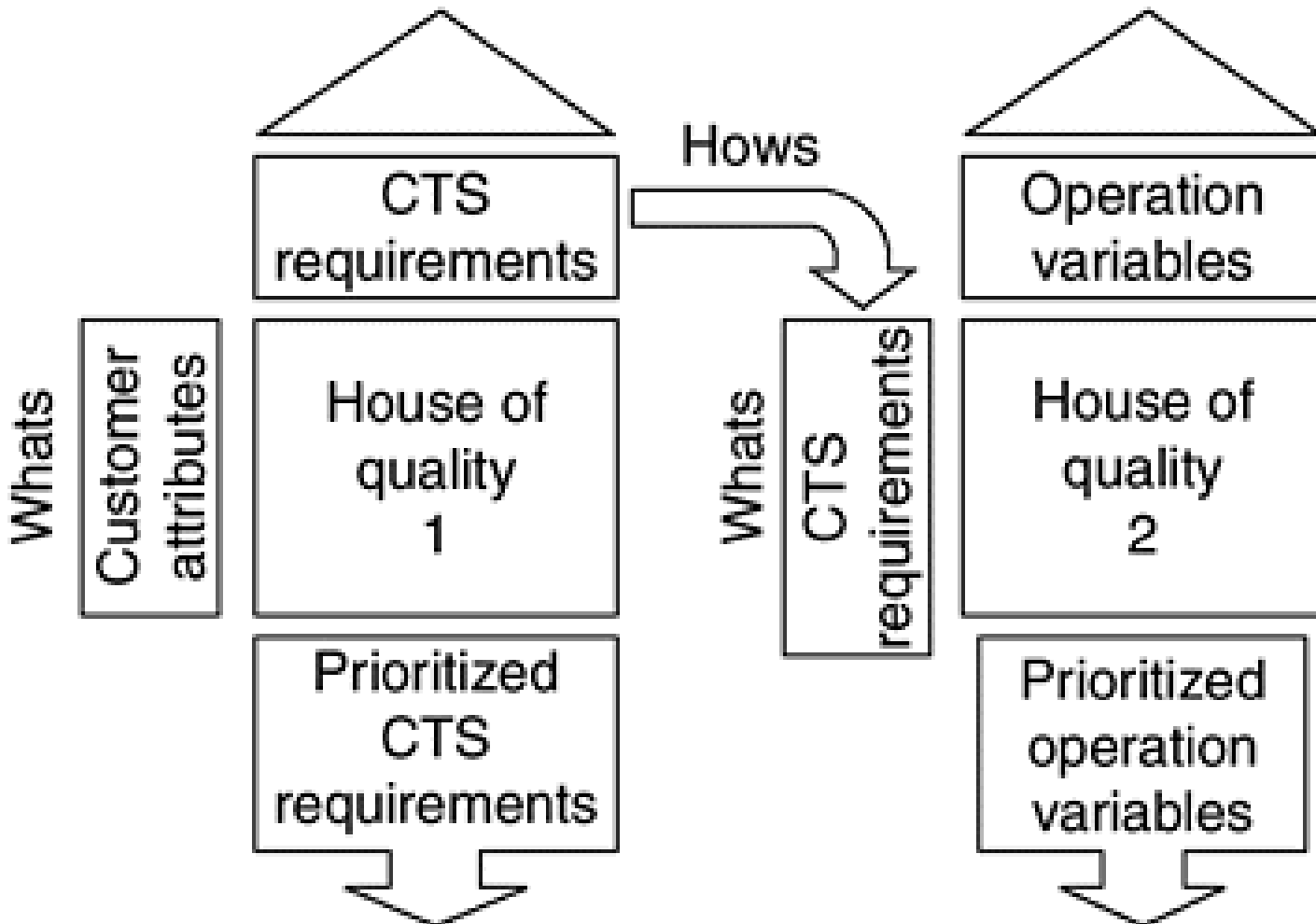


Four Phases of QFD in manufacturing

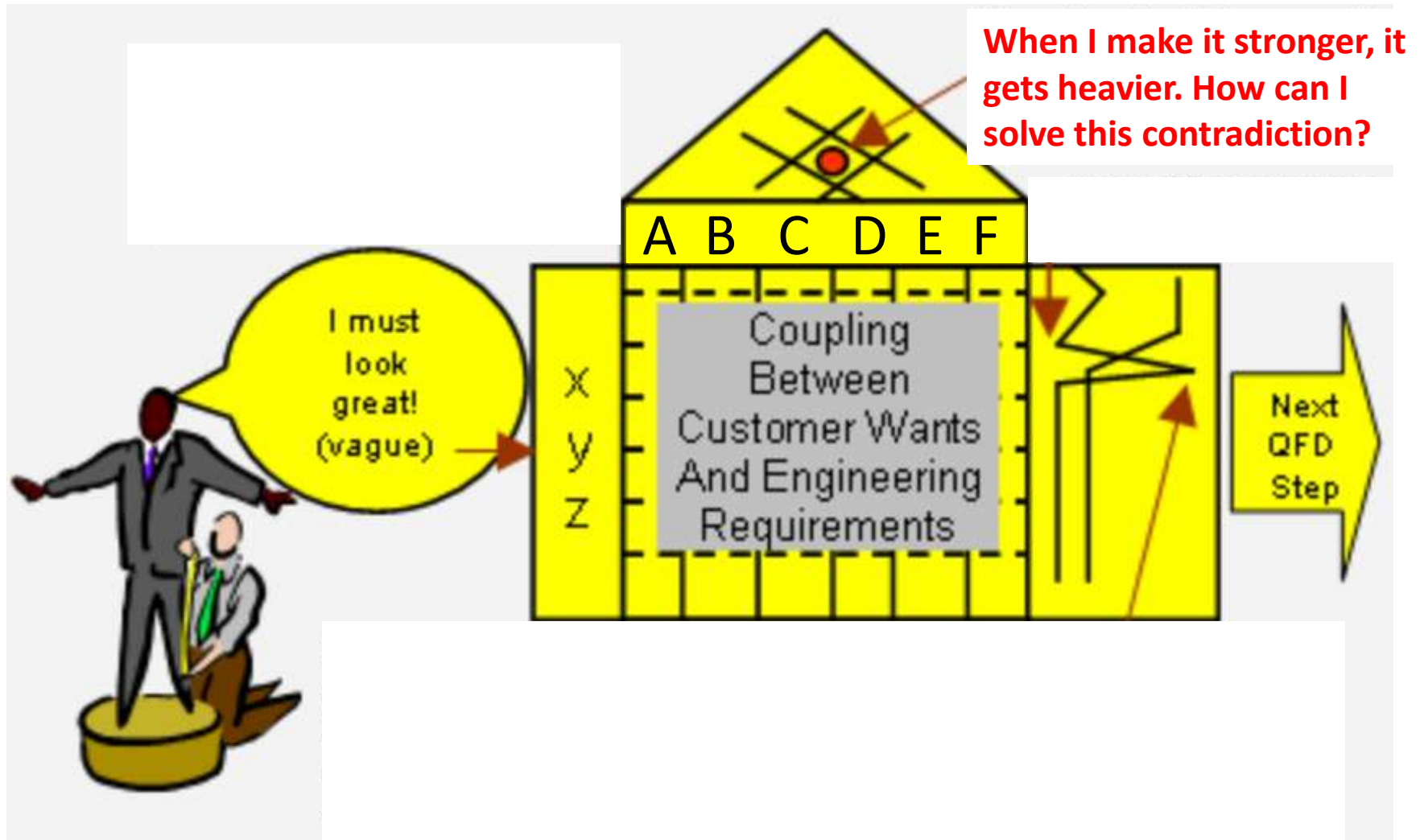
- Customer Attributes
- Critical to "X", Quality, Cost, Service Reliability, etc.
- Design Parameters
- Process Variables



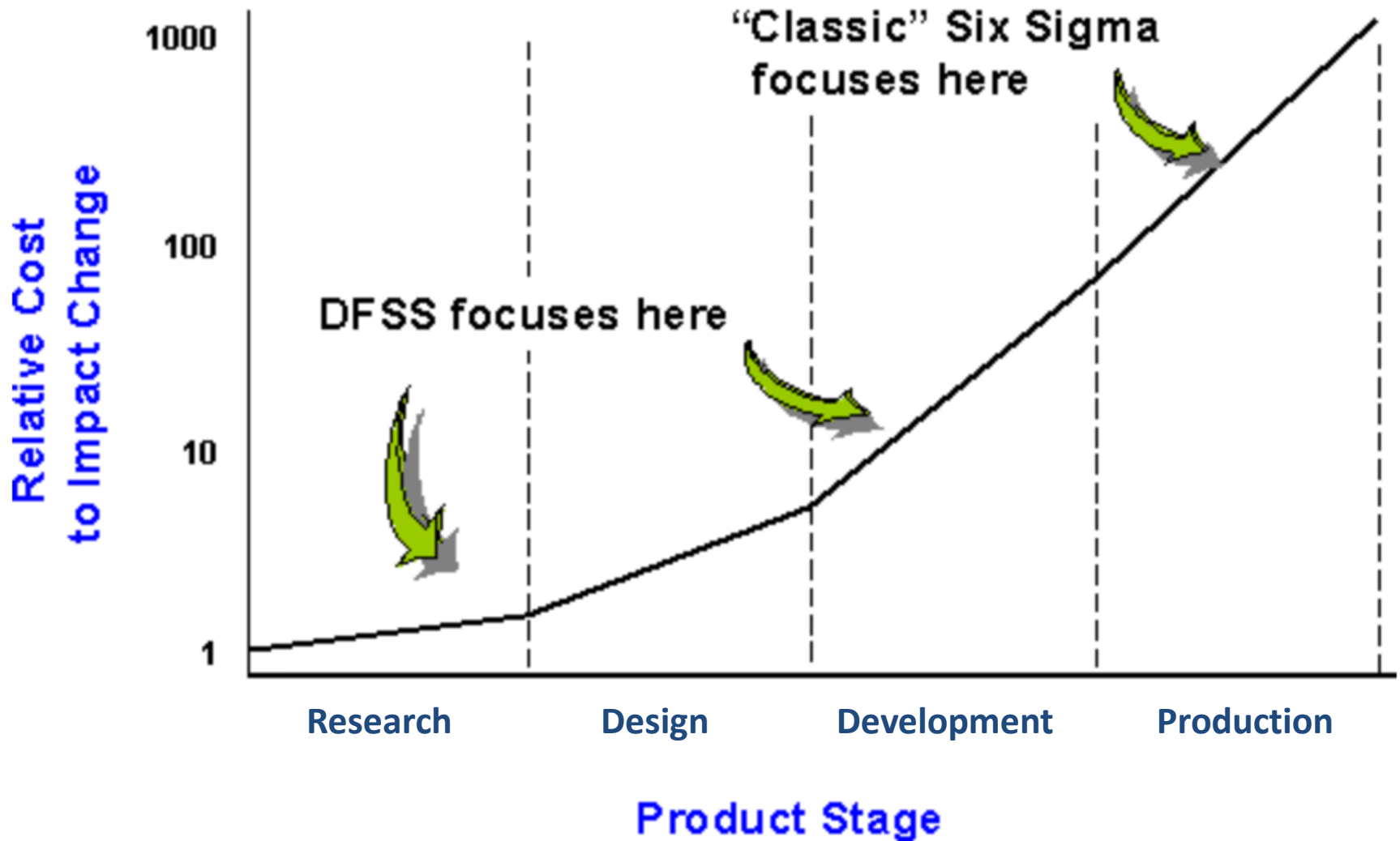
Two Phases of QFD in Service



Correlation of Operation Items in QFD



Summary (1)



Summary (2)

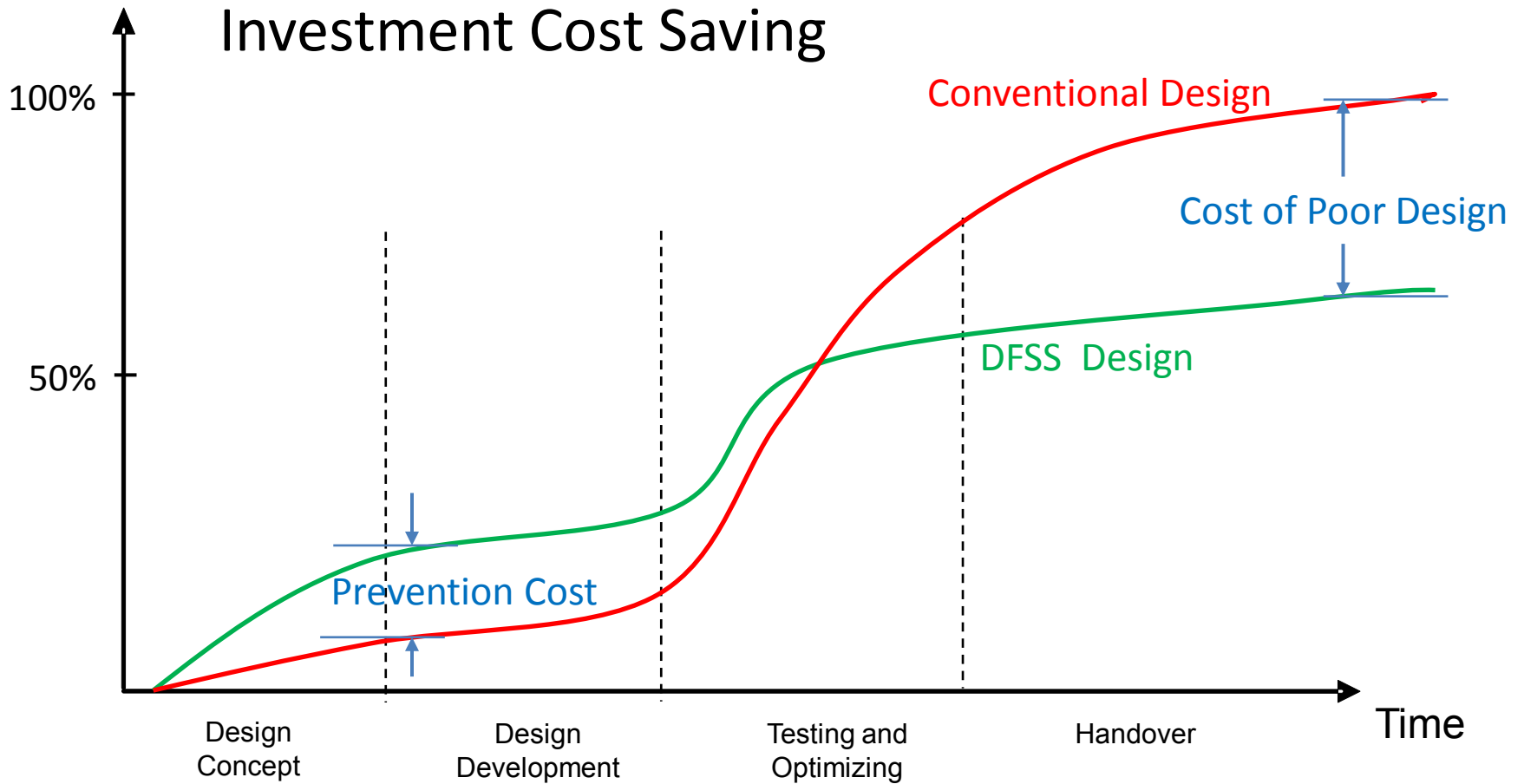
DFSS – DMDOV



Six Sigma - DMAIC



Summary (3)



Summary (4)

Design For Six Sigma Business Benefits:

- Zero Defects Design
- Faster Launch of Products
- Lower Design Costs
- Lower Product Costs
- Increasing Profit

Big Picture of Design For Six Sigma:

- Organization and People innovation and competency to Market Challenges

Conclusion

“DFSS is free. It is not a gift, but it is free.”

Crosby Management and Consultant

Philosophy: Cost of Poor Design