Design For Six Sigma

A Brief Overview

November 11, 2009

St. Louis Product Management Association

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Agenda

- Introduction
- What is DFSS (and "Lean" and 6σ and...) ?
- Overview of the DFSS Process (DMADV/IDOV)
- Identify
- Design
- Optimize
- Validate
- DFSS Successes
- Some Best Practices
- Wrap Up

Introduction

> 10+ years in Product Management and Marketing

> Practiced Lean and DFSS at Cooper Bussmann and Energizer

> DFSS is a philosophy – a way of doing things

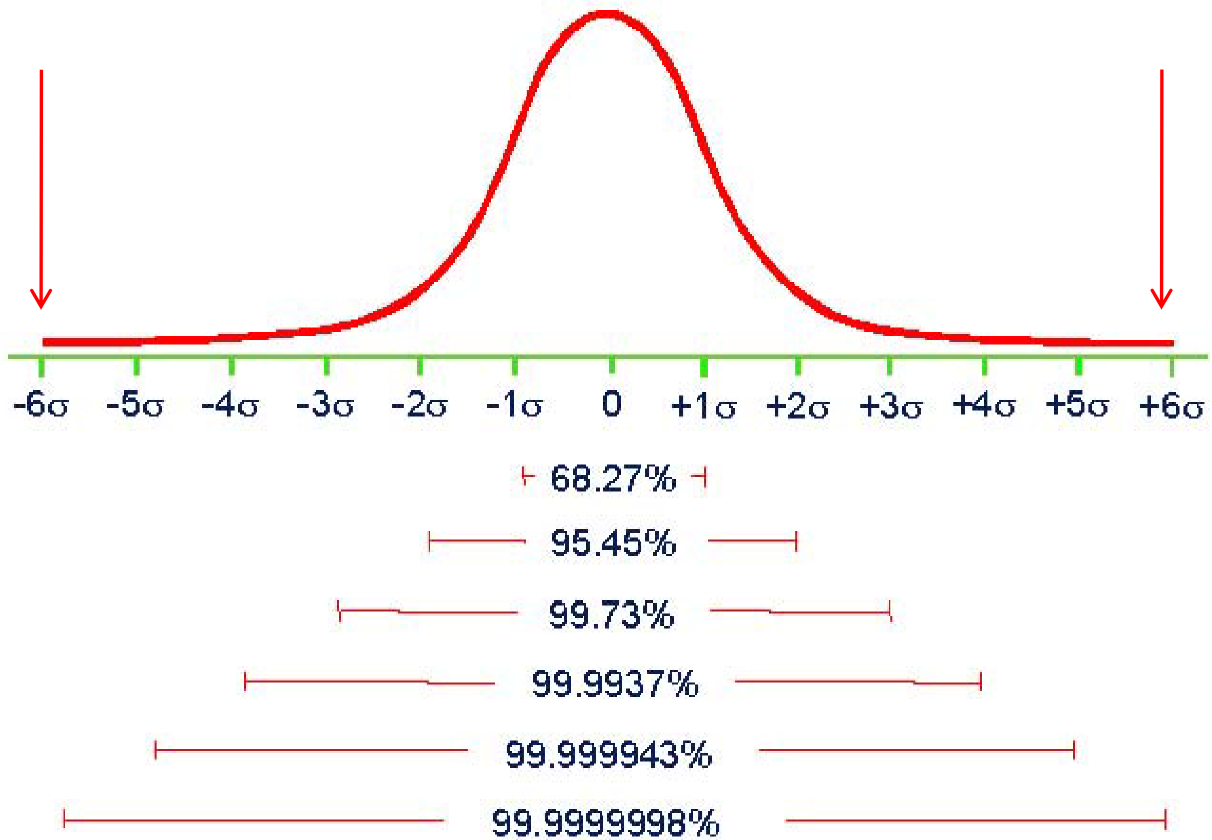
- It is NOT a certification, a specification or standard

> DFSS needs to be knowledge based

- Focus on knowledge generated to streamline the process – not adherence to strict timelines
- Technical competence versus procedural compliance
- Become innovation driven
- Empower employees to make decisions based on knowledge gained

What is DFSS (and lean, 6σ etc...)

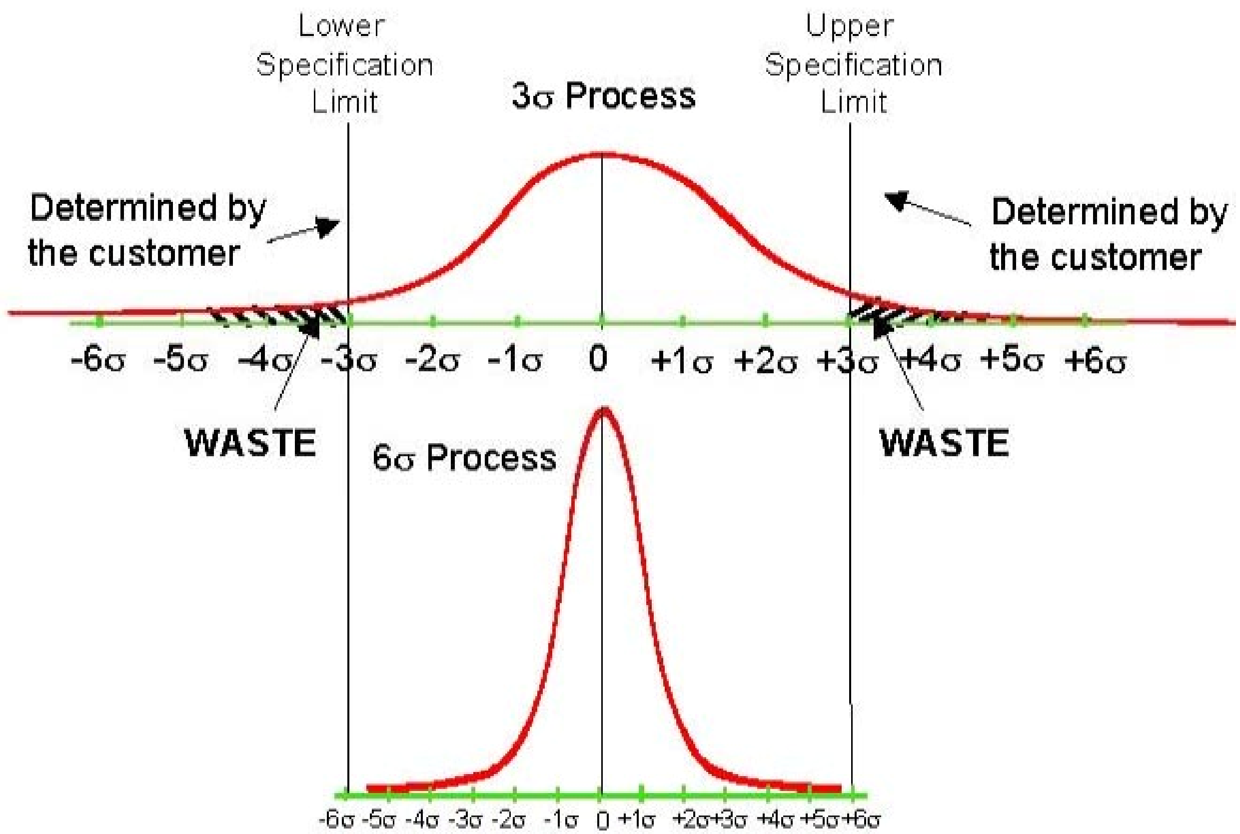
> Let's start with 6σ



What is DFSS (and lean, 6σ etc...)

> What is "good" or "bad" ?

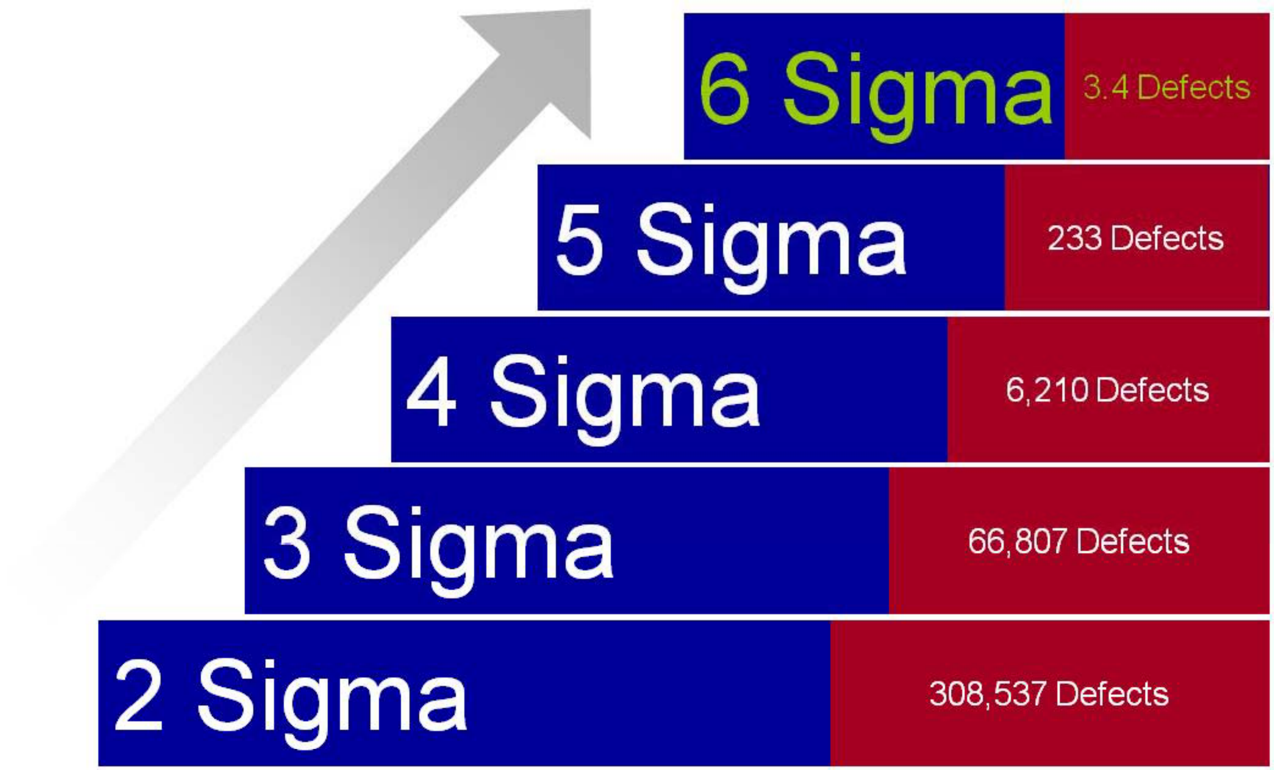
- Ultimately the customer determines this
- Six Sigma is a way to compare the "Voice of the process" with the "Voice of the customer"



What is DFSS (and lean, 6σ etc…)

> What does Six Sigma actually mean ?

- A measurement of process capability
- Reduce variations (defects)



What is DFSS (and lean, 6σ etc…)

> OK – So what's Lean ?

- Lean is related to six sigma – but NOT the same
- Lean focuses on reducing the steps or parts of the process
- Simplify the "flow" of a process

What is DFSS (and lean, 6σ etc…)

> So Lean and Six Sigma Together

- Reduce steps in the process (simplify) and center the process (reduce variations) so that the number "defects" (ie: unwanted results) gets very, very small

OVERALL YIELD vs SIGMA
(Distribution Shifted ±1.5σ)

# of Parts (Steps)	±3σ	±4σ	±5σ	±6σ
1	93.32%	99.379%	99.9767%	99.99966%
7	61.63	95.733	99.839	99.9976
10	50.08	93.96	99.768	99.9966
20	25.08	88.29	99.536	99.9932
40	6.29	77.94	99.074	99.9864
60	1.58	68.81	98.614	99.9796
80	0.40	60.75	98.156	99.9728
100	0.10	53.64	97.70	99.966
150	---	39.38	96.61	99.949
200	---	28.77	95.45	99.932
300	---	15.43	93.26	99.898
400	---	8.28	91.11	99.864
500	---	4.44	89.02	99.830
600	---	2.38	86.97	99.796
700	---	1.28	84.97	99.762
800	---	0.69	83.02	99.729
900	---	0.37	81.11	99.695
1000	---	0.20	79.24	99.661
1200	---	0.06	75.88	99.593
3000	---	---	50.15	98.985
17000	---	---	1.91	94.384
38000	---	---	0.01	87.880
70000				78.820
150000				60.000

Lean

Use for Benchmarking

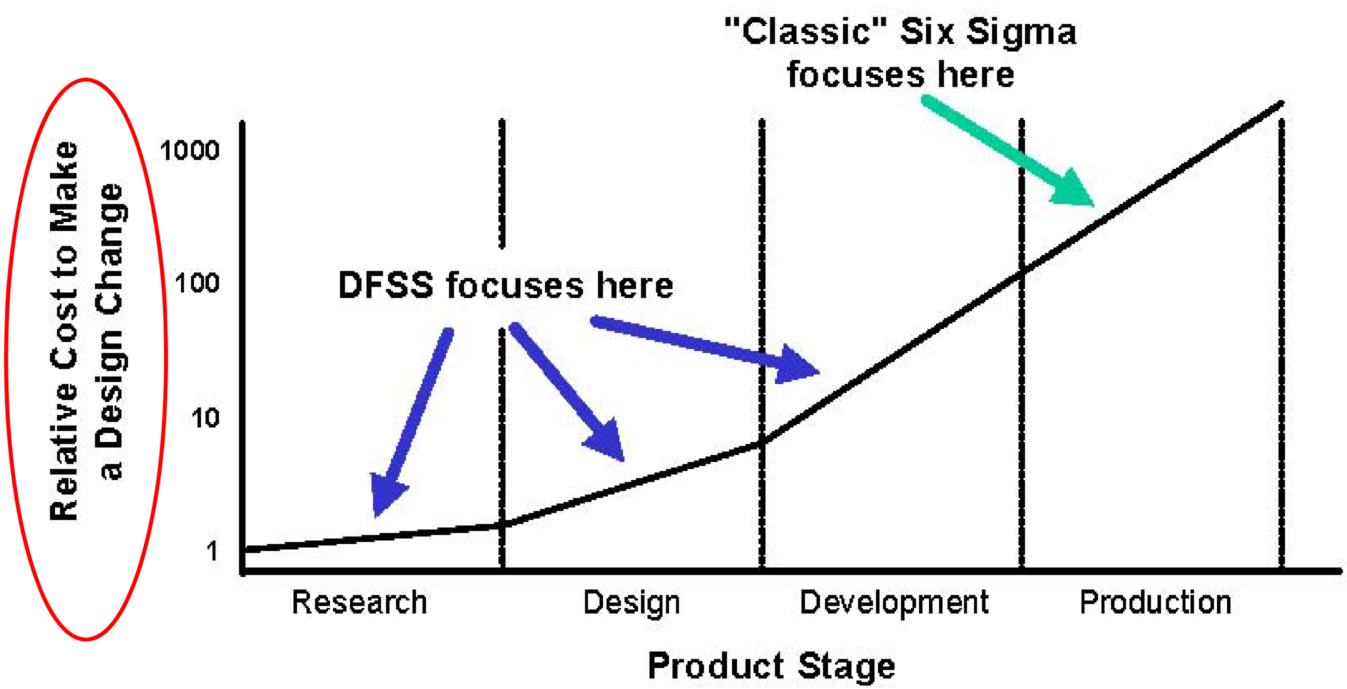
Source: Six Sigma RESEARCH INSTITUTE Motorola University Motorola, Inc.

What is DFSS (and lean, 6σ etc…)

- Now that we've looked at 6σ and Lean, what about DFSS
  - We now know that six sigma is a set of tools to reduce the variability in a process
  - Lean is a set of tools to reduce the complexity (steps) in a process
- The end result of the "process" being standardized and simplified is your product or service
- The traditional focus of six sigma and lean is the manufacturing or production or delivery (service) part of the process
- DFSS is focused on the research, design and development part of the process
- Intent is to "design in" reduced variability and increased simplification

What is DFSS (and lean, 6σ etc...)

- There is a cost associated with optimizing and simplifying a process
- Not all costs are created equal, though



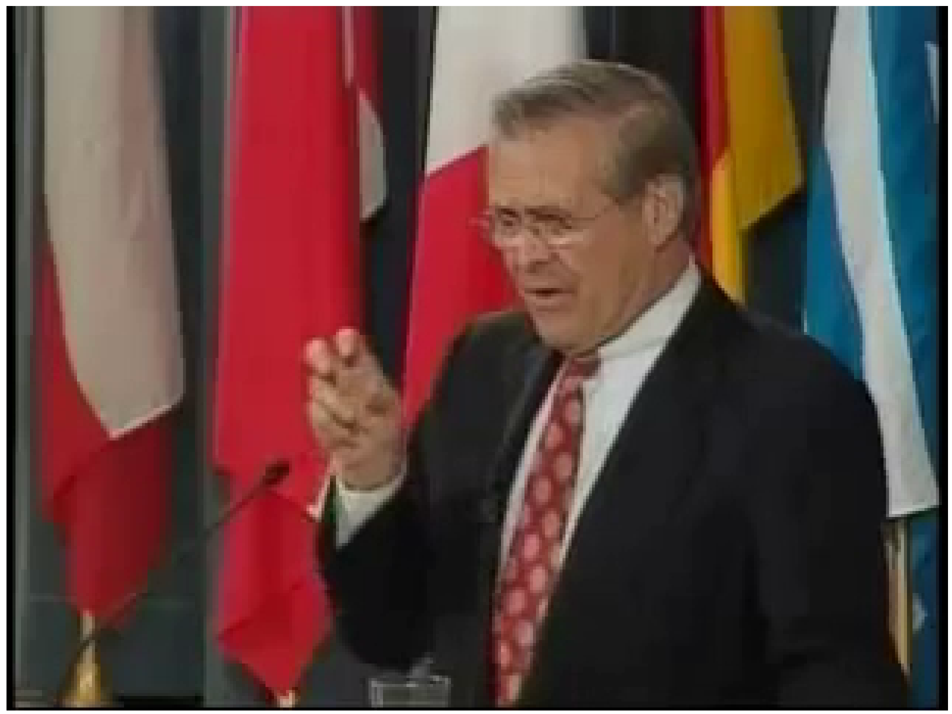
What is DFSS (and lean, 6σ etc...)

- DFSS has 4 main goals
  - Reduce cycle time in the design and development process
  - Reduce "Time To Money" or TTM
  - Reduce the cost of poor quality
  - Improve predictability (in cost, quality and delivery)

- Does it work ? GE thinks so
- When they implemented DFSS, they documented the following:
  - A +1σ increase in quality at launch versus previous designs
  - A 25% or greater DECREASE in time to market versus previous launches
  - An estimated total cost savings in resources utilized of 20% - 40%

What is DFSS (and lean, 6σ etc…)

> So finally, why DFSS ?
  - Lean Six Sigma is intended to fix known problems
  - DFSS is intended to PREVENT UNKNOWN problems



UNKNOWNS

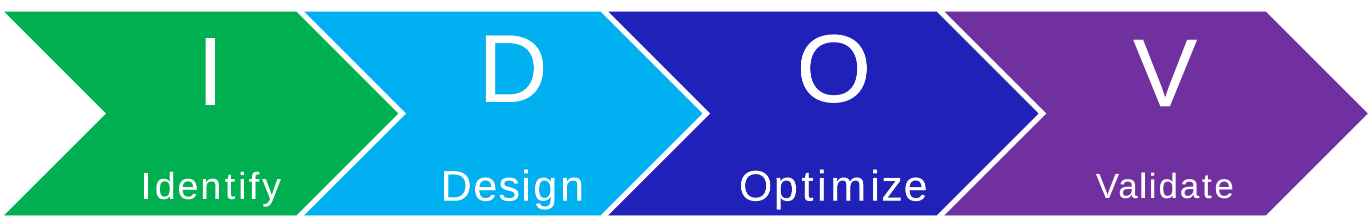
The DFSS Process

> The DFSS process is a structured way to step through the design process
- Applying a variety of tools along the way

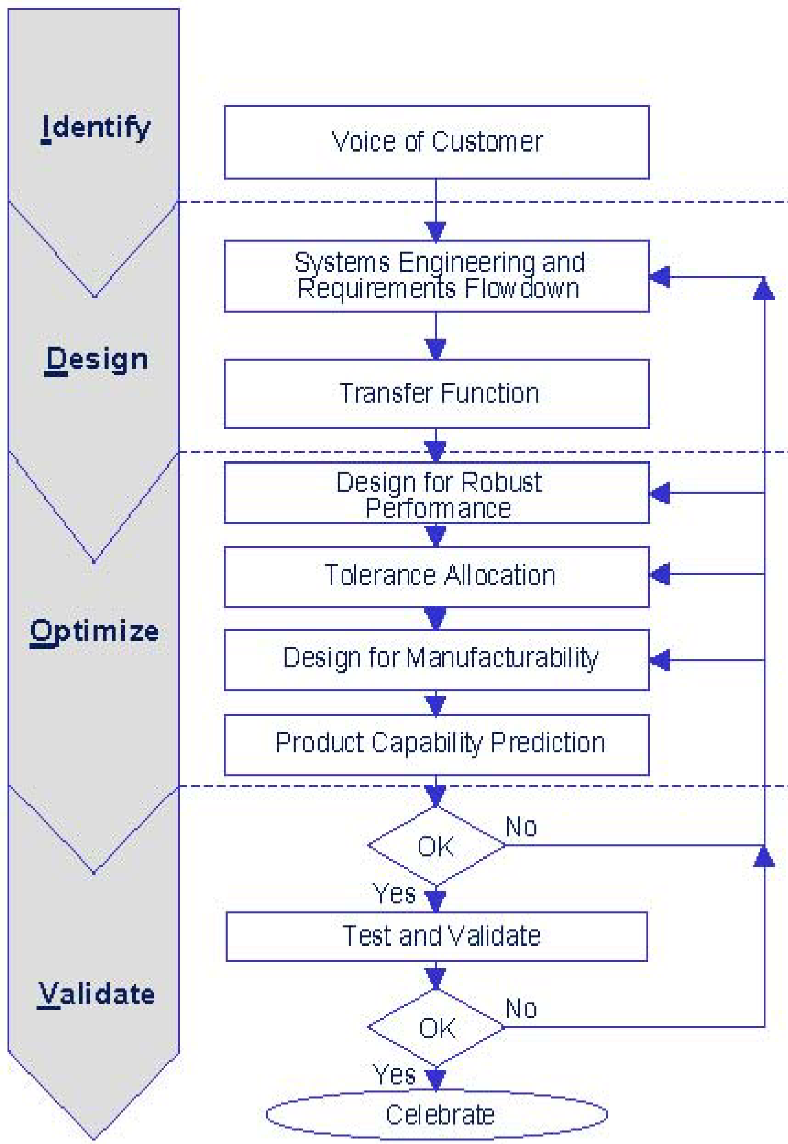
The traditional DFSS process steps

D	M	A	D	V
Define	Measure	Analyze	Design	Verify

The GE modified process steps



The DFSS Process



- Strategic Plan
- Benchmark Results
- Prioritized Customer Requirements
- Prioritized CTC's
- House of Quality #1
- Initial Performance Scorecard

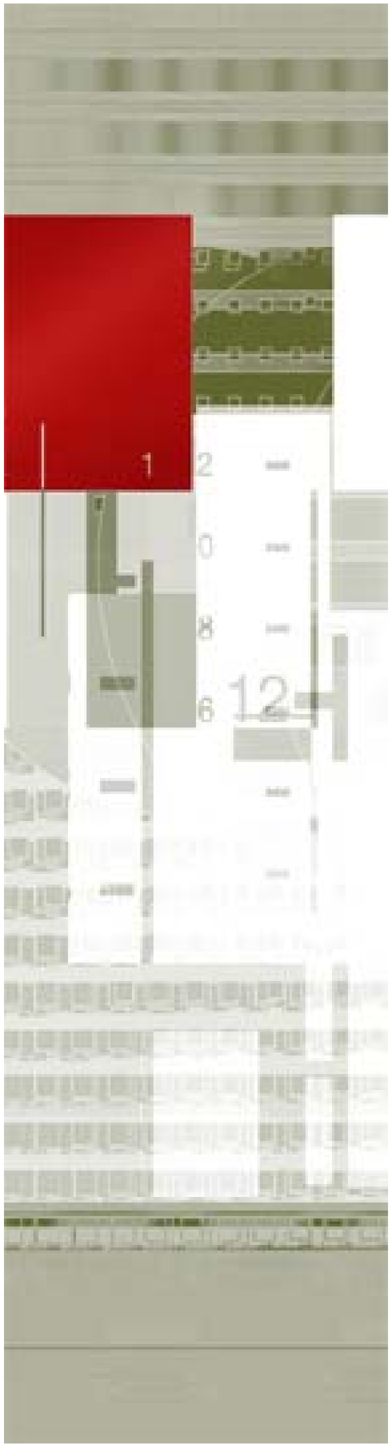
- For each CTC, Identify Design Parameters
- House of Quality #2
- Prioritized Product Design Characteristics
- Transfer Function(s)
- Preliminary Design Risk Assessment
- Performance/Process Scorecard

- Process Capability Studies
- Reliability Studies
- Capability Flowup
- Optimal Design
- Tolerances on X's
- Complete Scorecard

- Capable Product and Process
- Sensitivity Analysis
- Assess Performance, Reliability, and Risks

The DFSS Process

- Identify Phase
  - The DFSS Scorecard
  - Voice of Customer (VOC)
- Design Phase
  - Translate VOC (requirements flow-down)
  - Concept generation and selection
  - TRIZ, Axiomatic Design, Pugh Concept Selection
- Optimize Phase
  - Multiple Response Optimization
  - Expected Value Analysis (using Monte Carlo sim.)
  - Parameter Design
  - Tolerance Allocation
- Validate Phase
  - High Throughput Testing
  - Discrete Event Simulation



The DFSS Process

- MANY tools are available to determine outputs for each of the phases
  - We will just highlight a few along the way

Identify	Design	Optimize	Validate
Project Charter	Assign Specifications	Histogram	Sensitivity Analysis
Strategic Plan	to CTC's	Distributional Analysis	Gap Analysis
Cross-Functional Team	Customer Interviews	Empirical Data Distribution	FMEA
Voice of the Customer	Formulate Design Concepts	Expected Value Analysis (EVA)	Fault Tree Analysis
Benchmarking	Pugh Concept Generation	Adding Noise to EVA	Control Plan
KANO's Model	TRIZ or ASIT	Non-Normal Output Distributions	PF/CE/CNX/SOP
Questionnaires	Pugh Concept Synthesis	Design of Experiments	Run/Control Charts
Focus Groups	Controlled Convergence	Multiple Response Optimization	Mistake Proofing
Interviews	FMEA	Robust Design Development	MSA
Internet Search	Fault Tree Analysis	Using S-hat Model	Reaction Plan
Historical Data	Brainstorming	Using Interaction Plots	
Quality Function Deployment	QFD	Using Contour Plots	
Pairwise Comparison	Scorecard	Parameter Design	
Design of Experiments	Transfer Function	Tolerance Allocation	
Specify CTC's	Design of Experiments	Reducing Standard Deviations	
Performance Scorecard	Deterministic Simulators	of Inputs	
Flow Charts	Confidence Intervals	Design For Manufacturability	
FMEA	Hypothesis Testing	Mistake Proofing	
Visualization	MSA	Product Capability Prediction	
	Computer Aided Design	Part, Process, and SW Scorecard	
	Computer Aided Engineering	Risk Assessment	
	High Throughput Testing	Reliability	
		Multidisciplinary Design Optimization (MDO)	

The Identify Phase

> Key questions to ask in the IDENTIFY phase

1. Why are we working on this project ? What need does it address and how has it’s value been determined ?
2. Who are the external customer who will benefit from this project… who may NOT benefit from it ? Who are the internal customers (stakeholders) that may be affected ?
3. What are the prioritized functional requirements (Critical To Customer) in measurable terms – how do they relate to our VOC data ?
4. How will we determine success ? What are the measureable attributes of the project – and what are the goals for those measurements ?

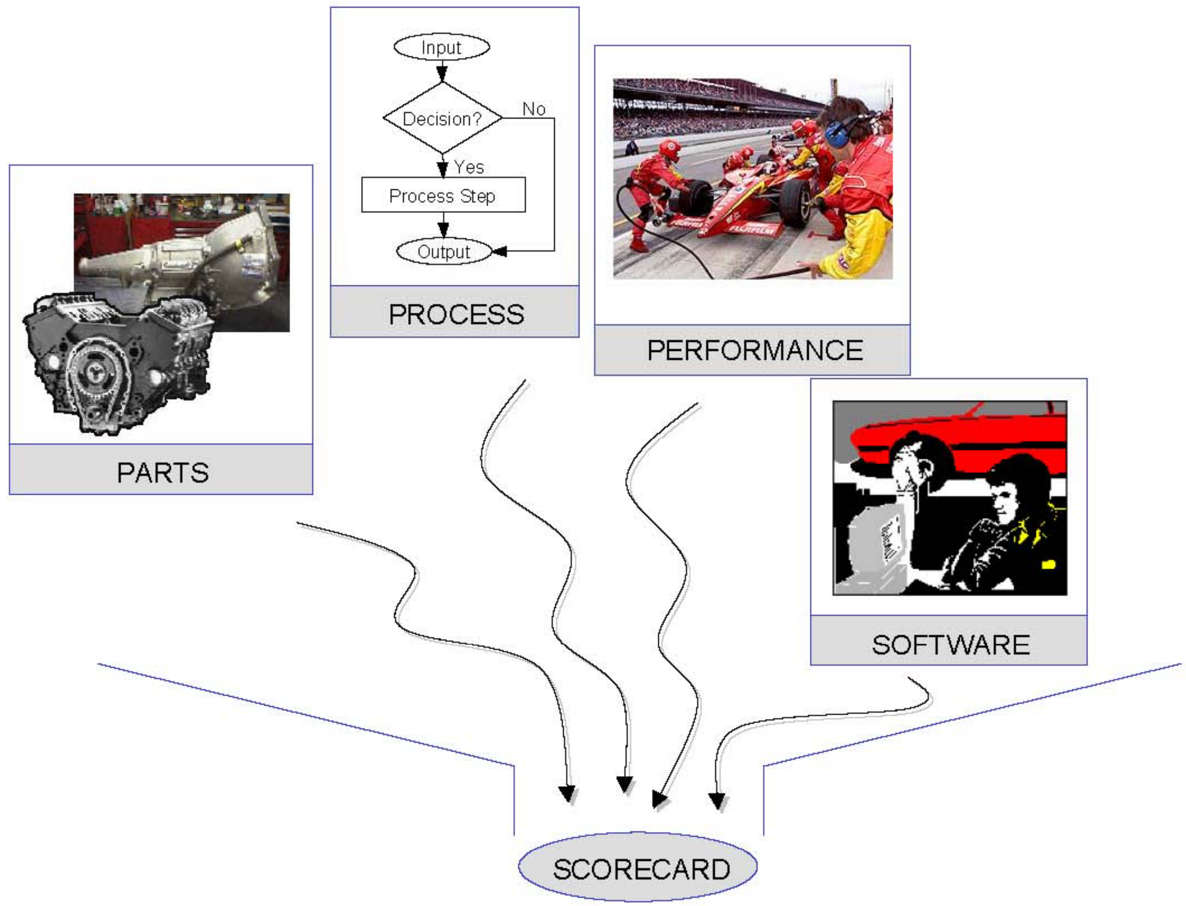
The Identify Phase

> Key questions to ask in the IDENTIFY phase

5. Do measurement systems exist to support the project ? If so, what is the capability of the system ?
6. Have the performance CTC's been entered into the DFSS scorecard (more on this later) ? If so, is the data good ?
7. Is there a gap between the performance and goals ? If so, what is the risk of this gap ?
8. Do we have the right people/skills to undertake this project ? Are there resource gaps – and if so where are they ?

The Identify Phase

> The DFSS Scorecard



The Identify Phase

> The DFSS Scorecard

- Each identified items is then measured for its Defects per Unit (DPU), target values are identified and then samples taken to determine the mean values, deviations and ultimately a defects per million (yield) which give us the “sigma” of the process

Part Scorecard

				Continuous Variable						Sample Size Known		ppm Only
#	Part Name	DPU	Qty	Target	Mean	Std Dev	LSL	USL	UOM	Sample Size	# Defective	ppm
1	Wire	0.0000220	1									22
2	Power Supply	0.0008582	1	1.1	1.1	0.015	1.05	1.15	Amps			
3	Core (Length)	0.0000044	1	15	15	0.45	13	18	cm			
4	Core (Radius)	0.0008582	1	2	2	0.3	1	3	cm			
5												
6												
7												

Process Scorecard

				Continuous Variable						Sample Size Known		ppm Only
#	Process Step	DPU	Qty	Target	Mean	Std Dev	LSL	USL	UOM	Sample Size	# Defective	ppm
1	Apply Wire to Core	0.000063	1	110	110	1	106	114	Twist			
2	Attach Power Supply	0.000200	1							10000	2	
3												
4												
5												
6												

Performance Scorecard

				Continuous Variable						Sample Size Known		ppm Only
#	Performance	DPU	Qty	Target	Mean	Std Dev	LSL	USL	UOM	Sample Size	# Defective	ppm
1	Mag Force 4cm from center	0.0000921	1	7.5	7.47	0.254	6.5	8.5	Amp/cm			
2												
3												
4												

The Identify Phase

> The DFSS Scorecard

- The end result is a rolled-up scorecard that provides a sigma for each component and for the overall product/project

Scorecard Summary

	# Steps/Parts	Total dpu	Yield	dpmo	ST Sigma	LT Sigma
Part	4	0.001743	99.826%	435.72	4.8289	3.3289
Process	2	0.000263	99.974%	131.69	5.1485	3.6485
Performance	1	0.000092	99.991%	92.12	5.2393	3.7393
Software						
Total	7	0.002098363	99.790%	299.766	4.932	3.432

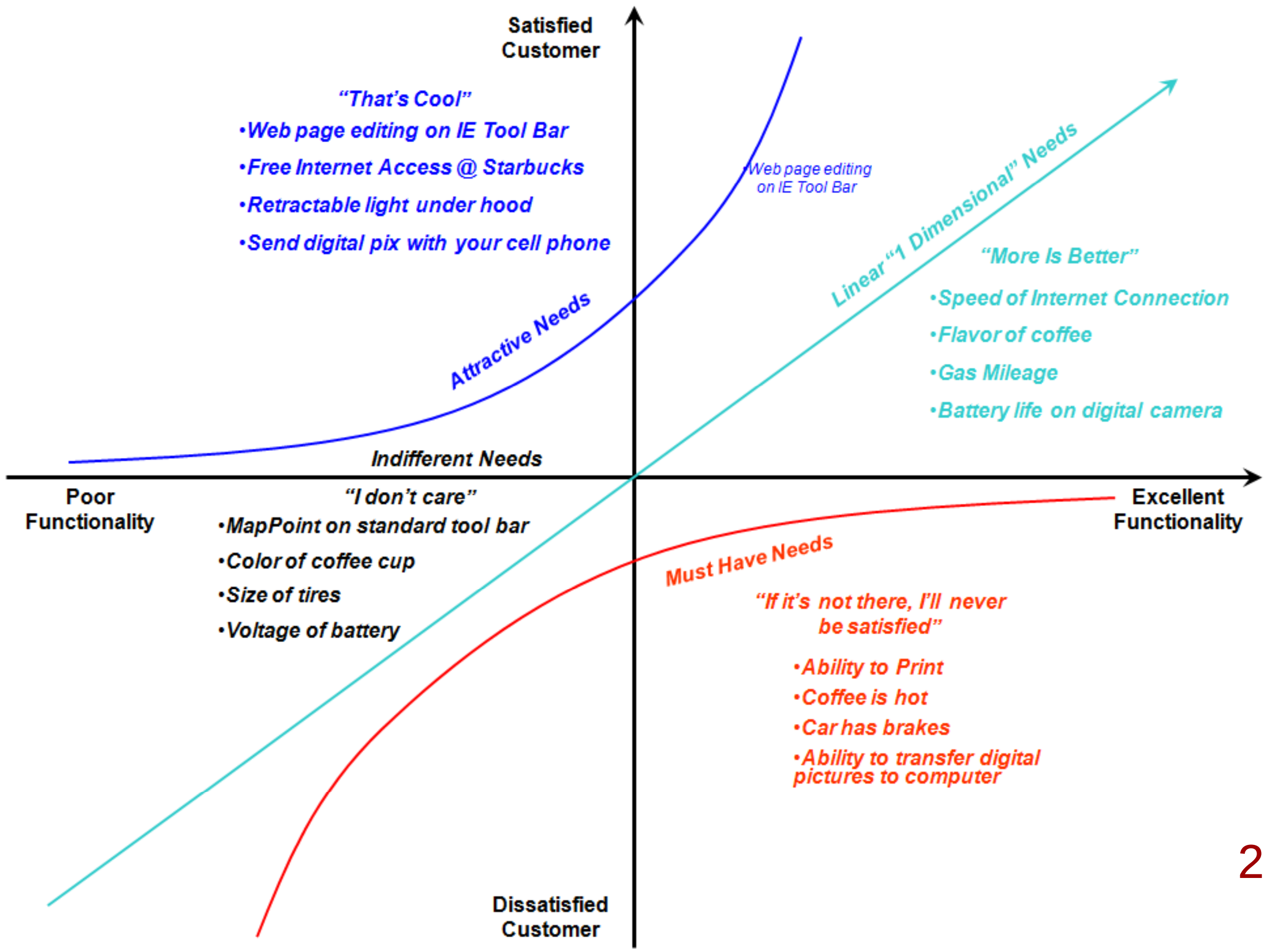
> Software Scorecard

- This same process can be done for software as well. It's too involved for this presentation – but software AND services can be fully comprehended by DFSS

The Identify Phase

> Voice of the Customer (VOC)

- Basis can be viewed via the Kano model of customer satisfaction



The Identify Phase

- Identify your customers – external AND internal
- Segment them in ways that make sense for the project
  - Age, income, geography, price etc.
- Obtain the customer requirements
  - Some will be given to you by the customer directly
  - However, customers do not always know what they want or cannot verbalize it – so consider observing or interviewing
  - Put yourself in their shoes
  - Consider using existing customer data 3rd party research, user tests etc.
- Using your customer (functional) requirements, you identify the performance requirements
  - The performance requirements are a measure of the customer's functional requirement

The Identify Phase

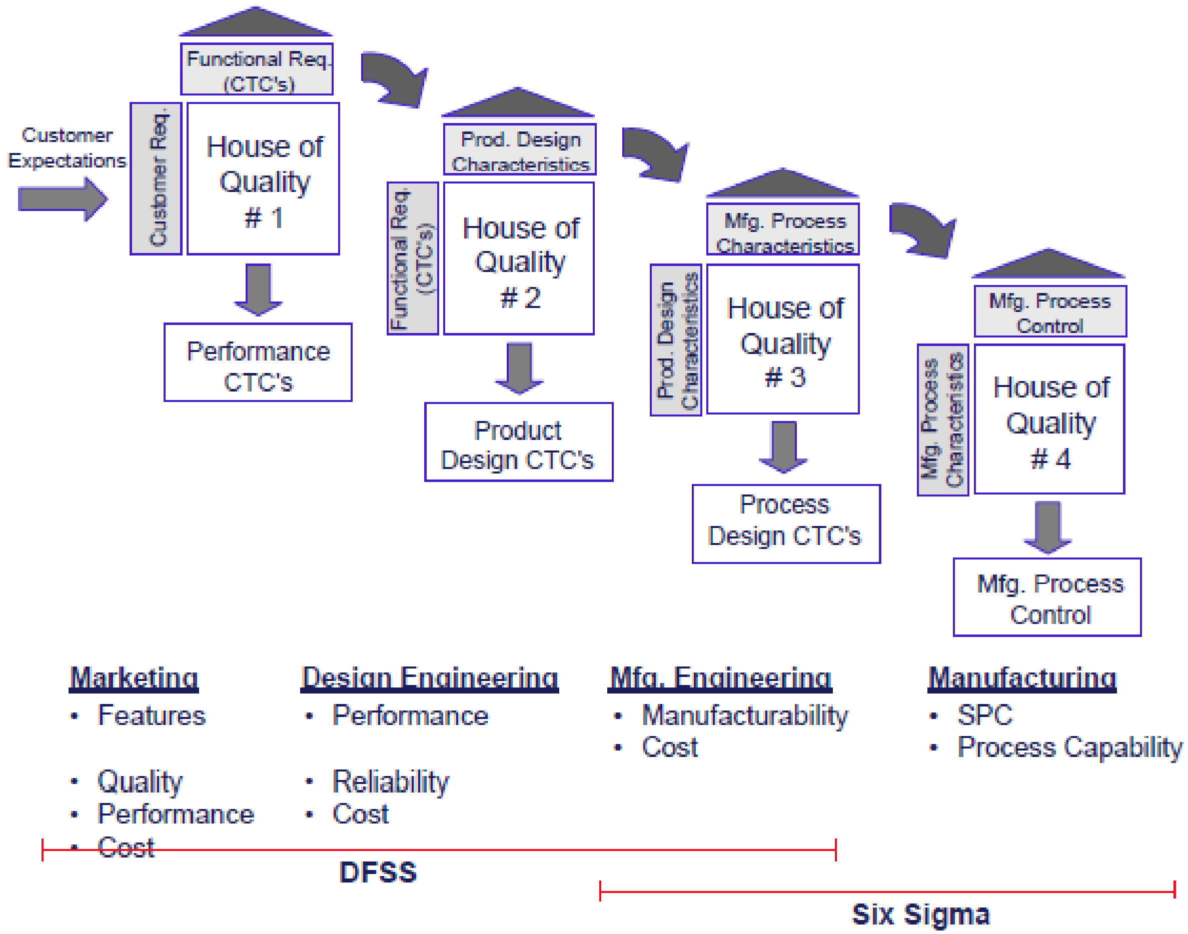
> You now have the start of a VOC based House of Quality

Customer Attributes		Relative Importance	Maximum launch velocity	Maximum mass launch capability	Storage volume	Mean cycles to failure	Breaking force of critical components	Repair part cost	Tensile strength of home-applied adhesive bo	Time for disassembly and reassembly	Material cost	Time to manufacture
Fun	Toy is fun for parent and child	0.25										
Safe	Toy is safe for pre-schoolers	0.20										
Stor-able	Toy is easy to store away	0.07										
Reli-able	Toy is reliable	0.10										
Repair-able	Toy is easy to repair	0.07										
Appeal ing	Toy appeals to parent and child	0.25										
Afford-able	Toy is inexpensive	0.06										

Performance Requirements (CTC)

The Identify Phase

> The CTC's are ranked by using the importance rating. These ranked CTC's from the HOQ1 then become the side of HOQ2. This then repeats.



The Identify Phase

> The end result is a collection of data that allows you to identify in order of importance the critical to customer requirements. These are then used to flow down through the design and manufacturing process to identify all the critical performance items.

The Design Phase

> Key questions to ask in the Design phase

1. What are the conceptual designs and technologies necessary to support the functional requirements ?
2. What are the risks associated with these designs ? Have we done FMEA or Pugh on the designs ?
3. What are the potential trade-offs to eliminate any identified failure modes ?
4. Have we completed a requirements flow down maintaining links to the CTC's ?
5. What are the key input variables that affect the standard deviations ?
6. What are the transfer functions for each critical output or CTC ?
7. Have the DFSS scorecards been updated ?

The Design Phase

- Design Concepts
  - Create alternative designs that fulfill the CTC's
  - Compare designs with the functional requirements
  - Choose the best design
  - Assess risks of chosen design
- Selecting design concepts
  - Pugh Concept Selection
  - Functional Analysis System Technique (FAST)
  - Axiomatic Design
  - TRIZ
  - Transfer Functions

The Design Phase

> Pugh Concept Selection

- Applicable to a variety of situations
- Prevents team from focusing on small number of “pet” projects
- Customer requirement driven
- Excellent tool to aid decision making
- Provides good documentation

Pugh Matrix

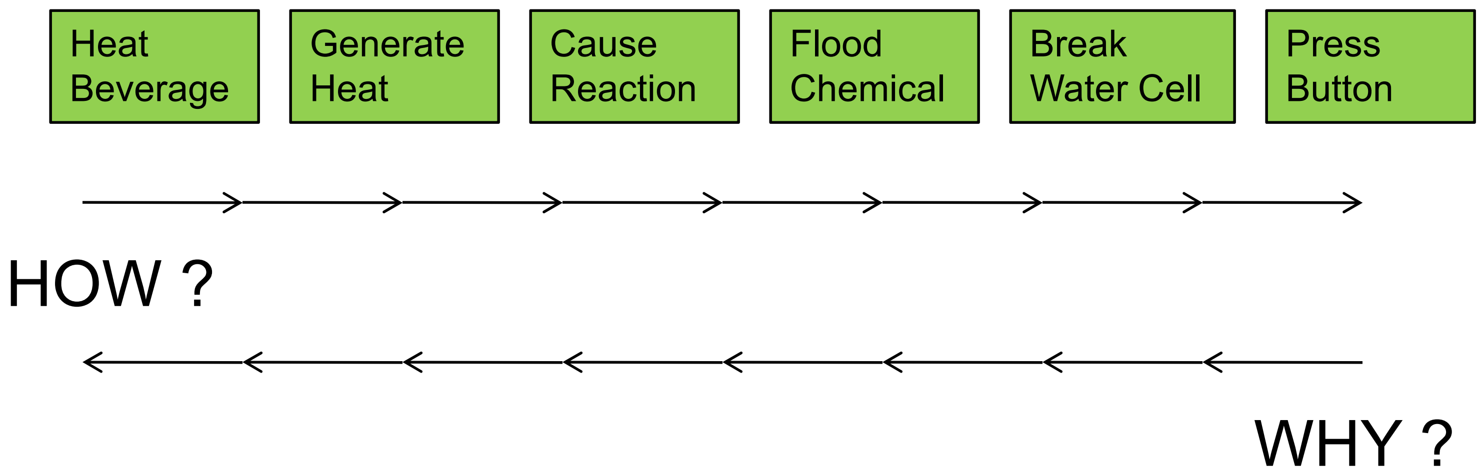
Expectations	0	1	2	3	4	5
Easy to use	DATUM	+	-	-		
Good quality image		+	-	+		
zoom capability		-	-	-		
adjustable light levels				+		
Total +'s (better than datum)		2	0	2	0	0
Total -'s (worse than datum)		1	3	2	0	0
Total S's (same as datum)		0	0	0	0	0
Comparison						

Concept Summary	
0	
1	
2	
3	
4	
5	

The Design Phase

> FAST

- Allows users to quickly design the key functionality of the system



The Design Phase

- Axiomatic Design
  - Helps design teams evaluate the "goodness" of designs
  - Decomposes customer requirements into 4 "domains": Customer, Functional, Physical, Process
- TRIZ
  - Formed by Altshuller – Russian patent examiner post WWII
  - Breaks down all design into 39 problem parameters and 40 "inventive principles"
  - Results in a 39 by 39 matrix that is then populated with the inventive principles

The Design Phase

> TRIZ

	Improving Feature ↓ / Worsening Feature →	Weight of moving object	Weight of stationary object	Length of moving object	Length of stationary object	Area of moving object	Area of stationary object	Volume of moving object	Volume of stationary object	Speed	Force (Intensity)	Stress or Pressure	Shape	Stability of the object's composition	Strength	Duration of action of moving object	Duration of action of stationary object	Temperature	Illumination intensity	Use of energy by moving object	Use of energy by stationary object	Power	Loss of Energy	Loss of Substance	Loss of Information	Loss of Time	Quantity of substance	Reliability	Measurement accuracy	Manufacturing precision	Object-affected harmful factors	Object-generated harmful factors	Ease of manufacture	Ease of operation	Ease of repair	Adaptability or versatility	Device complexity	Difficulty of detecting and measuring	Extent of automation	Productivity
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
1	Weight of moving object	+																																						
2	Weight of stationary object		+																																					
3	Length of moving object			+																																				
4	Length of stationary object				+																																			
5	Area of moving object					+																																		
6	Area of stationary object						+																																	
7	Volume of moving object							+																																
8	Volume of stationary object								+																															
9	Speed									+																														
10	Force (Intensity)										+																													
11	Stress or pressure											+																												
12	Shape												+																											
13	Stability of the object's composition													+																										
14	Strength																																							
15	Duration of action of moving object															+																								
16	Duration of action by stationary object																+																							
17	Temperature																	+																						
18	Illumination intensity																		+																					
19	Use of energy by moving object																			+																				
20	Use of energy by stationary object																				+																			
21	Power																					+																		
22	Loss of Energy																						+																	
23	Loss of substance																																							
24	Loss of Information																								+															
25	Loss of Time																									+														
26	Quantity of substance/the matter																										+													
27	Reliability																											+												
28	Measurement accuracy																												+											
29	Manufacturing precision																													+										
30	Object-affected harmful factors																														+									
31	Object-generated harmful factors																															+								
32	Ease of manufacture																																+							
33	Ease of operation																																	+						
34	Ease of repair																																		+					
35	Adaptability or versatility																																			+				
36	Device complexity																																				+			
37	Difficulty of detecting and measuring																																					+		
38	Extent of automation																																						+	
39	Productivity																																							+

The Optimize Phase

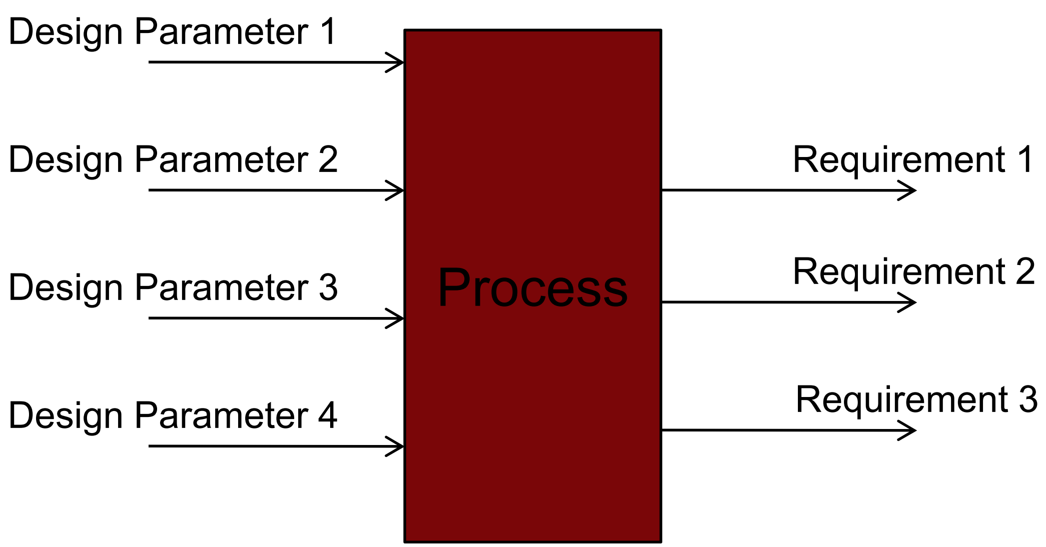
Key questions to ask in the IDENTIFY phase

1. Have we determined the optimal parameters for our design ?
2. How sensitive is the CTC performance measure to changes in parameters ? Have done a sensitivity analysis ?
3. What are the sources of variability in our system ? Which can we control and which can we not control ?
4. Is the variability supplier dependent ? If so, how can we minimize this variability ?
5. Have we confirmed that the design is actually producible (process capability) ?
6. What gaps and risks still exist ?
7. Have we updated the DFSS scorecards ?

The Optimize Phase

> Determining optimal parameters

- Multiple Response Optimization simulation
- Done computationally – example is SimWare ProAge, income, geography, price etc.



The Optimize Phase

> Determining optimal parameters
  - Monte Carlo simulation can also be used
  - Expected Value Analysis (EVA), Robust Parameter Design, Tolerance Allocation

> EVA
  - If we know the input variable distributions (mean, std dev., shape) and the transfer function, we can estimate the output and it's distribution characteristics

> Robust Parameter Design
  - A process of finding the optimal mean settings of input variables to minimize the resulting dpm (defects per million) or maximize the "sigma" of the process

> Tolerance Allocation
  - Look at all the input standard deviations of the system.
  - Determine which have the largest impact on the output variations
  - Focus on controlling those with the largest impact

The Validate Phase

> Key questions to ask in the VALIDATE phase

1. What validation testing has been done, and what are the results ?
2. Is there a large gap between actual capability and predicted capability from the DFSS scorecard ?
3. What is the gap between current performance and the CTC's ?
4. Is the existing production system under a state of quality control ?
5. What unintended consequences or problems of the design exist or could exist ? What is the contingency ?
6. How has ALL information been documented and communicated to stakeholders
7. What is the total project benefit in terms of quality, cost and delivery ?

The Validate Phase

- Validate performance
- Perform sensitivity analysis
- Compare predicted and actual capability
- Do a gap analysis
- Update scorecards

- Validate Performance
  - Actual values for critical parameters are compared against predicted values
  - Methods to use: prototyping, lab scale production, test fixturing of sub assemblies

If the validation provides poor results…. A gap analysis needs to be conducted

The Validate Phase

- One method to validate is called High Throughput Testing (HTT)

High Throughput Testing (HTT)

(for all two-way combinations)

Full Factorial = 8100 runs **HTT = 27 runs**

5 Levels Motherboard	*3 Levels* Ram	*3 Levels* BIOS	*3 Levels* CD	*5 Levels* Monitor	*3 Levels* Printer	*2 Levels* Voltage	*2 Levels* Resolution
Gateway	128 MB	Dell	Generic	Viewsonic	HP	220V	800 by 600
ASUS	256 MB	Award	Teac	Sony	Lexmark	110V	800 by 600
Micronics	512 MB	Dell	Sony	KDS	Cannon	110V	1024 by 768
Dell	128 MB	Generic	Teac	NEC	Lexmark	220V	1024 by 768
Compaq	256 MB	Generic	Sony	Generic	HP	110V	800 by 600
Dell	256 MB	Award	Generic	Viewsonic	Cannon	110V	1024 by 768
ASUS	512 MB	Award	Sony	Sony	HP	220V	1024 by 768
Micronics	128 MB	Award	Teac	Generic	Cannon	220V	800 by 600
Gateway	256 MB	Award	Teac	KDS	HP	220V	800 by 600
Compaq	512 MB	Dell	Teac	Viewsonic	Lexmark	220V	800 by 600
Gateway	128 MB	Generic	Sony	Sony	Cannon	110V	1024 by 768
Dell	256 MB	Dell	Sony	NEC	HP	110V	800 by 600
ASUS	128 MB	Generic	Generic	KDS	Lexmark	110V	800 by 600
Micronics	256 MB	Generic	Sony	Viewsonic	Lexmark	110V	800 by 600
Compaq	512 MB	Award	Generic	NEC	Cannon	110V	1024 by 768
ASUS	512 MB	Dell	Generic	Generic	Lexmark	110V	1024 by 768
Micronics	128 MB	Dell	Generic	Sony	HP	110V	800 by 600
Dell	512 MB	Generic	Teac	Sony	HP	110V	800 by 600
Gateway	512 MB	Award	Teac	NEC	Lexmark	110V	800 by 600
ASUS	128 MB	Award	Teac	Viewsonic	Cannon	110V	800 by 600
Compaq	128 MB	Award	Teac	Sony	HP	110V	800 by 600
Dell	128 MB	Award	Teac	KDS	HP	110V	800 by 600
ASUS	128 MB	Award	Teac	NEC	HP	110V	800 by 600
Dell	128 MB	Award	Teac	Generic	HP	110V	800 by 600
Micronics	128 MB	Award	Teac	NEC	HP	110V	800 by 600
Compaq	128 MB	Award	Teac	KDS	HP	110V	800 by 600
Gateway	128 MB	Award	Teac	Generic	HP	110V	800 by 600

The Validate Phase

> One method to validate is called High Throughput Testing (HTT)

- Used to test many factors at once
- Uses a minimum number of runs
- Software driven
- Not DOE – though similar terminology
- Started in the chemical industry where many compounds are combined together at different strengths to produce a specific reaction

DFSS Success Stories

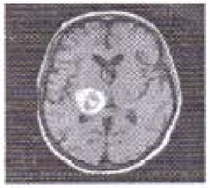
> General Electric GEMS Lightspeed CT Scanner

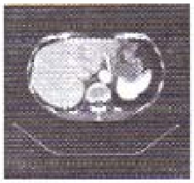
GE's First DFSS System ('98):
Full Use of Six Sigma/DFSS Tools

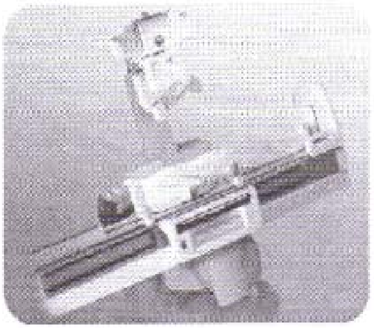
- Key customer CTQs identified
  - Image quality
  - Speed
  - Software reliability
  - Patient comfort
- Disciplined systems approach: 90 system CTQs
- 33 Six Sigma (DMAIC) or DFSS projects/studies
- Scorecard-driven
- Part CTQs verified before systems integration

Leading-Edge Technology

- World's first 16-row CT detector
- Multi-slice data acquisition
- 64-bit RISC computer architecture
- Long-life Performix™ tube







Results

Better image quality
- Earlier, more reliable diagnoses
- New applications; vascular imaging, pulmonary embolism, multi-phase liver studies,...

- Much faster scanning:
  - Head: from 1 min to 19 sec (9 million/yr)
  - Chest/abdomen: from 3 min to 17 sec (4 million/yr)
- Clinical productivity up 50%
- 10x improvement in software reliability
- Patient comfort improved – shorter exam time
- Development time shortened by 2 years
- High market share; significant margin increase

"Biggest breakthrough in CT in a decade." Gary Glazer, Stanford

DFSS Success Stories

> Xerox "Green" Paper

Wall Street Journal:
Xerox Develops a 'Green' Paper, But Will Firms Add it to Fold?
By William M. Bulkeley
July 30, 2007; Page B3

Xerox has invented an environmentally friendly copy paper that costs less. The new cut-sheet "High-Yield Business Paper" requires half as many trees, fewer chemicals and less energy to manufacture and it weights less, reducing postage and trucking costs. Merilyn Dunn of InofTrends suggests the paper will be used for transactions such as invoices and phone bills where people don't care about long-term archiving of documents. Xerox and others have tried to use cheap newsprint in copiers and laser printers in the past, but "you always had catastrophically bad results related to the curl in a digital printer," said Steve Simpson, Xerox's vice president in charge of paper and supplies. Bruce Katz, a paper technologist in Xerox's research facility in Webster, said he was able to overcome the curling problem by figuring out how to make cellulose fibers in the paper line up evenly, so they would shrink at the same rate when the toner fusing process took place.

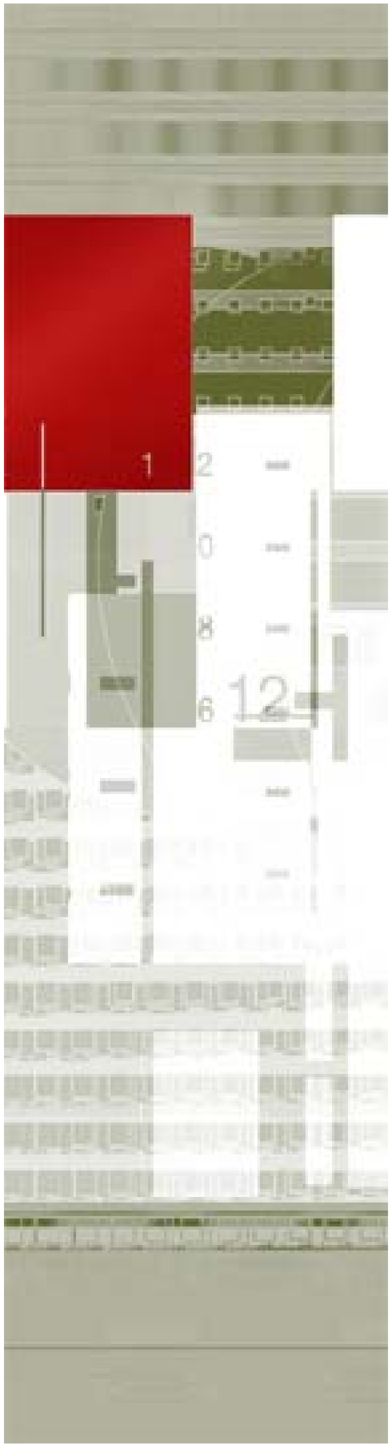
Note: Bruce Katz, a Xerox DFLSS GB, used the DesIgNNOVATION™ methods to accomplish this.

DFSS Success Stories

> Xerox Printer Belt Tensioning System

iSixSigma Magazine
July/August 2007, pp 47-55
By Bob Hildebrand, Xerox DFLSS Black Belt

The Xerox Corp. designs, manufactures and markets iGen3, a color printer that can produce photo-quality prints at 110 pages per minute. When the current iGen3 was to be modified, the engineering team was tasked with redesigning the belt tensioning mechanism on the photoreceptor into a smaller package without adjusting the length of the belt. The redesign had to take several noise factors into account. The outcome of the project was a design that met the constraints placed on i by the system. This IDOV project is a practical example of how Design for Lean Six Sigma (DFLSS) can bring about the best option available ir a constrained design.



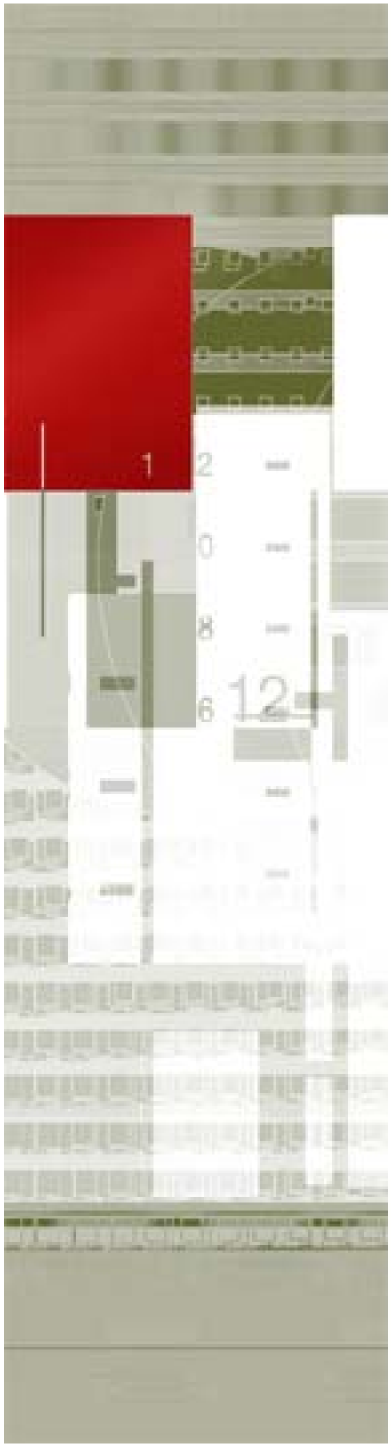
Characteristics Of Successful DFSS Implementation

- Commitment and leadership from the top
- Measureable “stretch” goals for each project
- Accountability for project success
- Involvement and commitment from EVERYONE
- Training and support for all the tools and knowledge necessary to do it right

IT IS VERY EASY TO FOCUS ON THE LAST ITEM – BUT WITHOUT THE FIRST 4 THE DFSS IMPLEMENTATION CANNOT SUCCEED

DFSS Best Practices

- Train leadership to build organizational commitment and momentum
- Begin using DFSS tools and techniques on ALL product development projects and provide COACHING
- Weave DFSS tools into your NPD process right away
- Review progress based on DFSS metrics and re-align as necessary
- Build the bridge to innovation – build and use the transfer function
- Build a strong capability in DOE / HTT
- Establish a good process capability database – both in house and with suppliers
- Link DFSS to business success
- View DFSS as a cultural change – a mindset – not just a set of tools



Thank You !

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