Quality Function Deployment
or
The House of Quality

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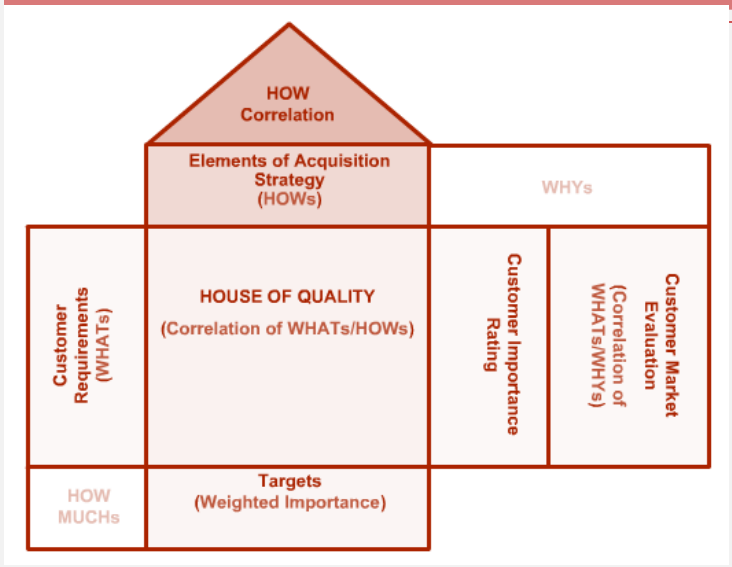
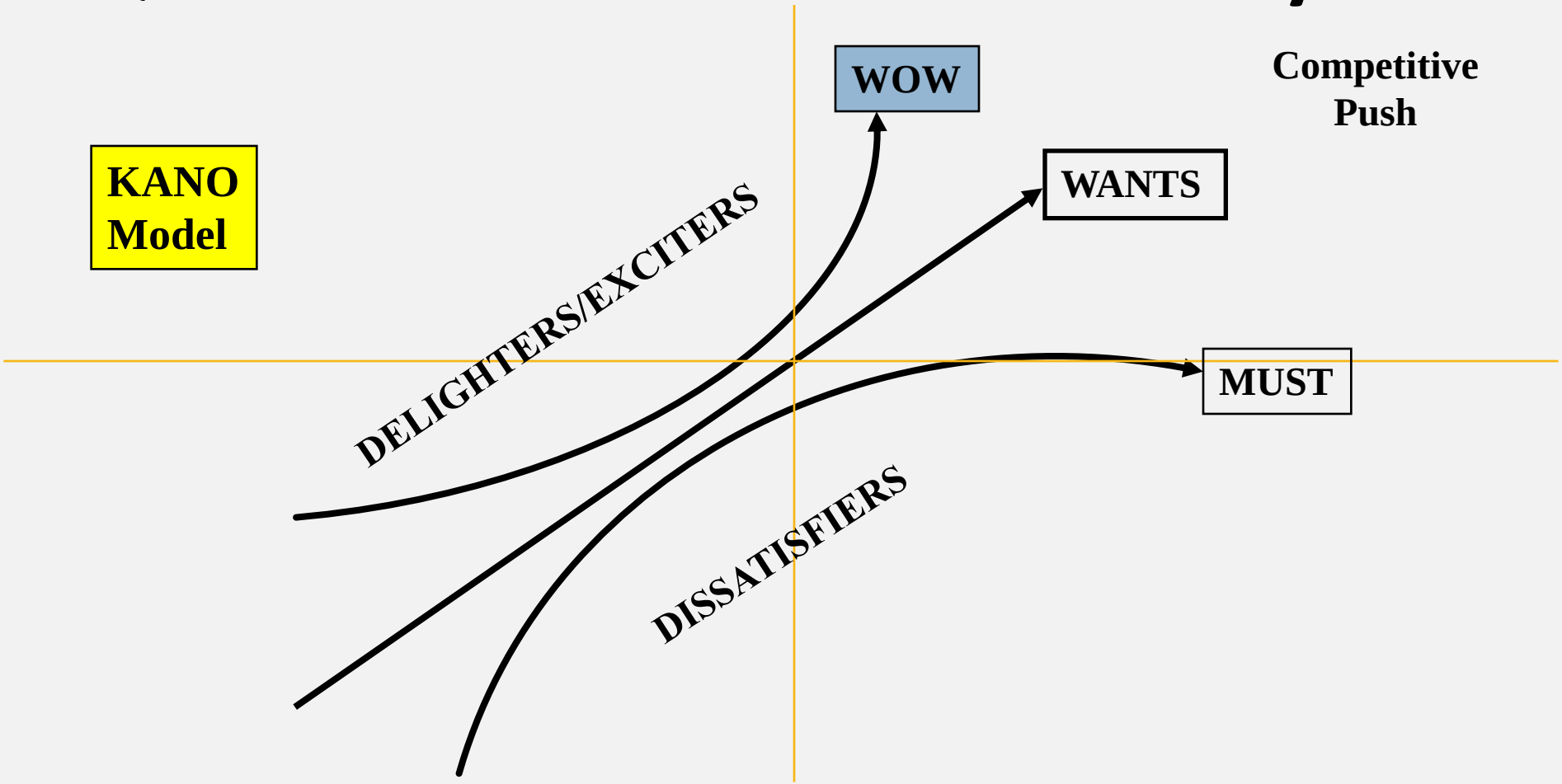


What's in a Name?

HIN SHITSU	*KI NO*	*TEN KAI*
Qualities	**Function**	**Deployment**
Attributes		
Features		

"Customer Driven Engineering"
"The House of Quality"
"The Voice of the Customer"

QFD - The Communications Catalyst



QFD Definition

QFD is:

- A disciplined approach using multifunctional teams to ensure quality in our products and services.

QFD focuses on:

- The needs and wants of customers by translating customer requirements into technical solutions.

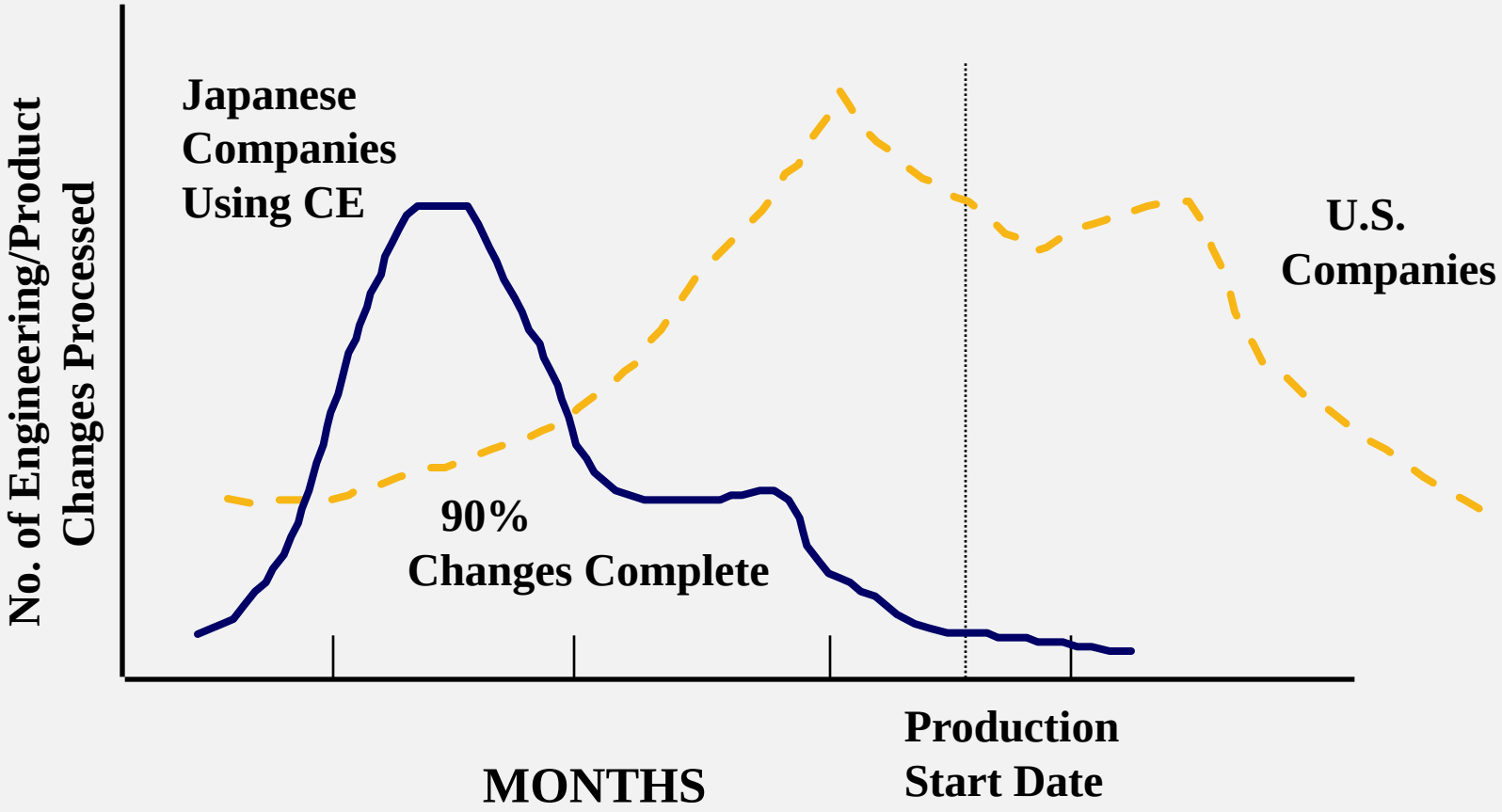
QFD is:

A systematic way to thoroughly:

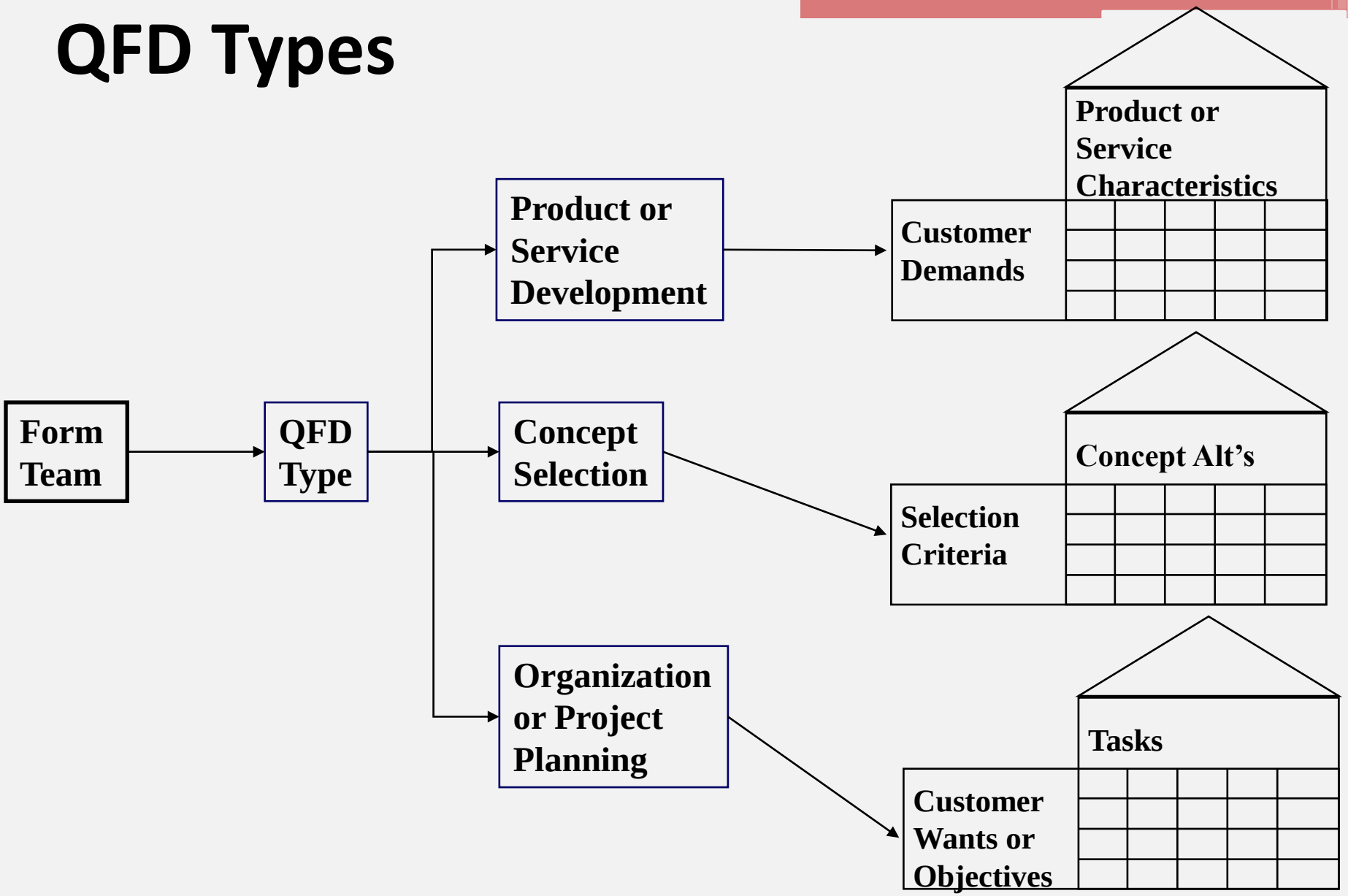
- Understand
- Prioritize
- Document

Customer Requirements

RESULTS


No. of Engineering/Product Changes Processed
Japanese Companies Using CE
U.S. Companies
90% Changes Complete
MONTHS
Production Start Date

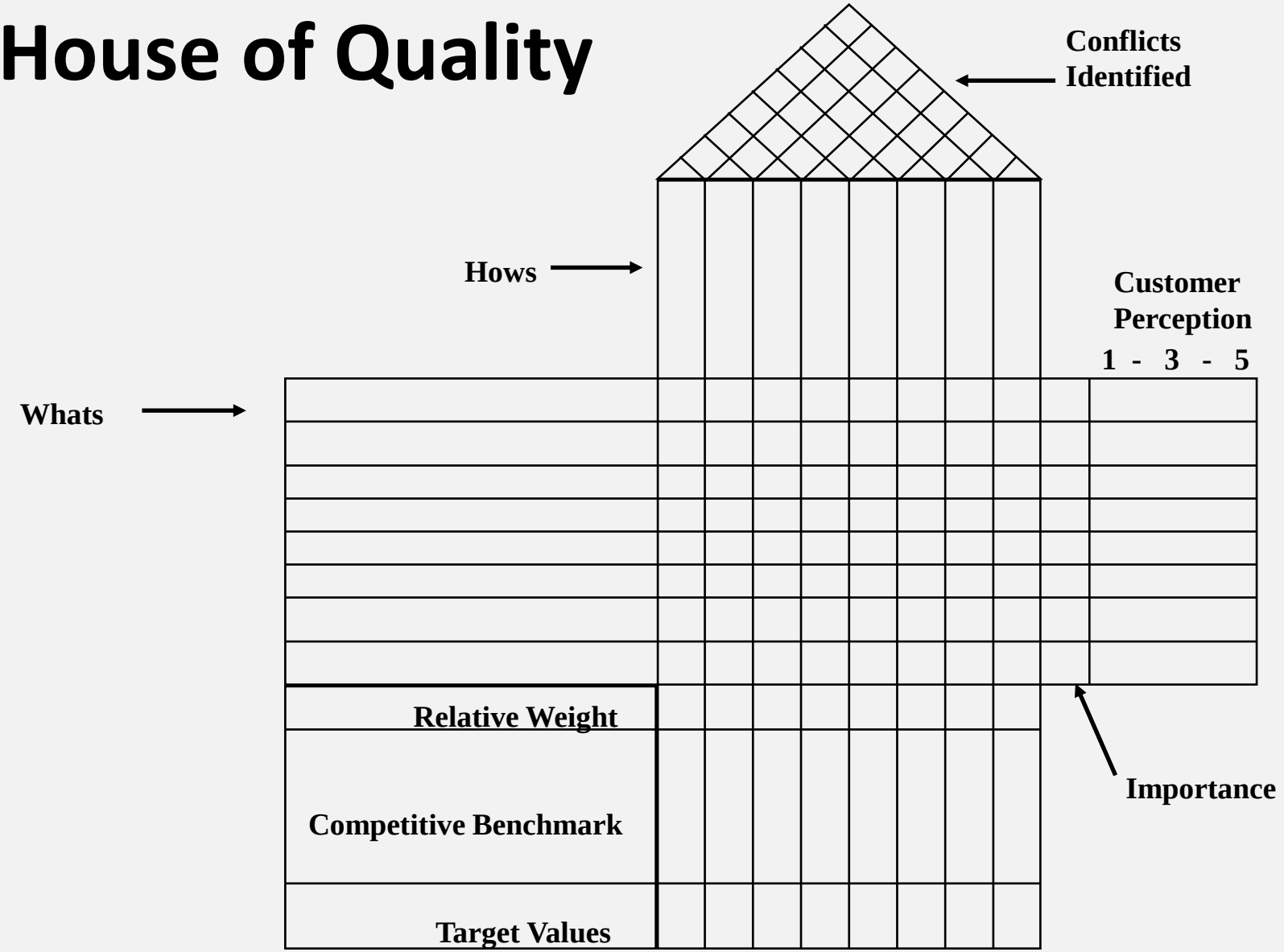
QFD Types


Form Team
QFD Type
Product or Service Development
Concept Selection
Organization or Project Planning
Product or Service Characteristics
Customer Demands
Concept Alt's
Selection Criteria
Tasks
Customer Wants or Objectives

QFD Matrix

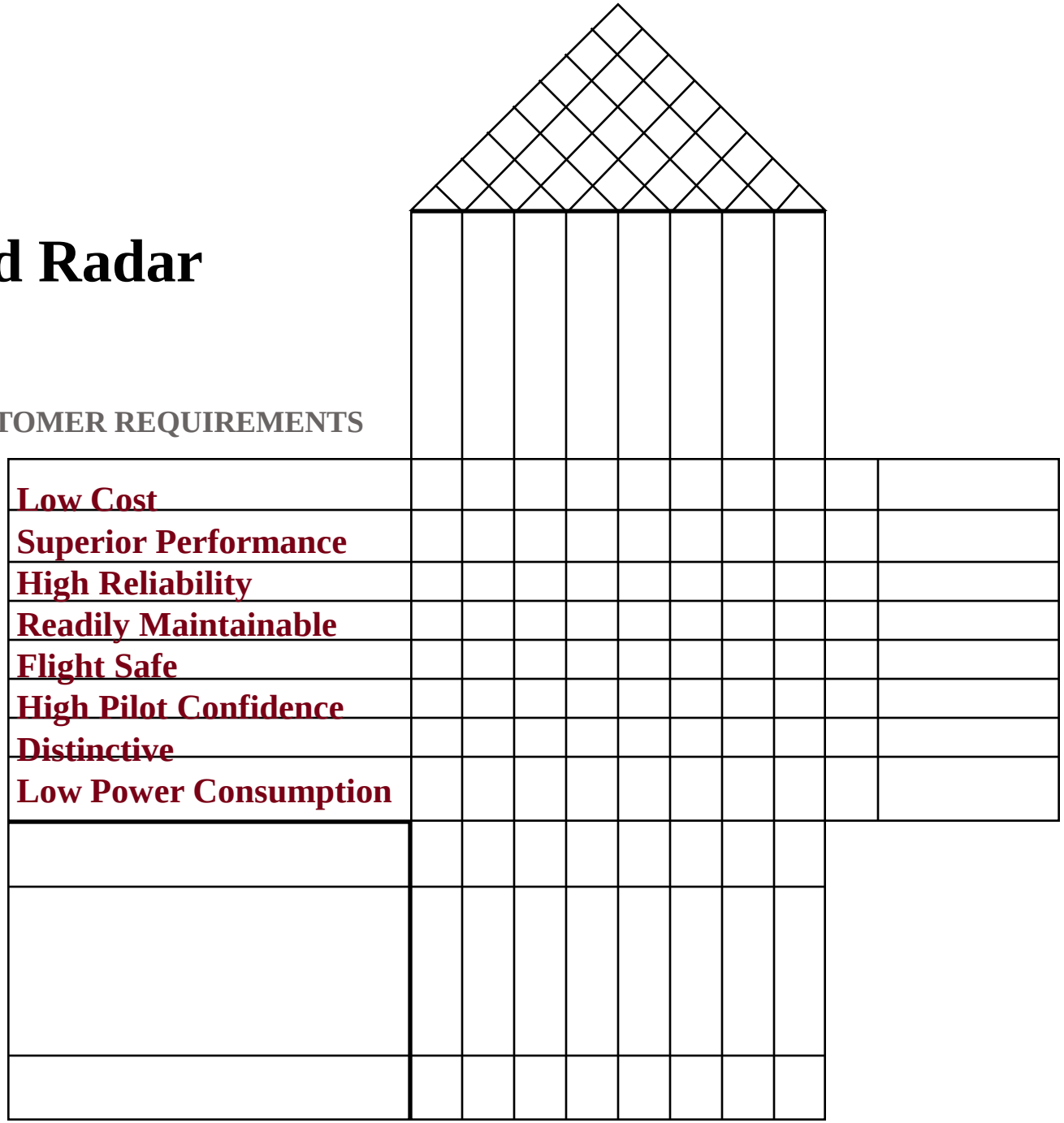
- Identifies Customer Requirements (Whats)
- Prioritizes
- Customer Perception
- Identifies Design Solutions (Hows)
- Competitive Benchmarking
- Identifies Design Conflicts
- Identifies Interrelationships
- Determines Relative Importance
- Sets Target Values

House of Quality

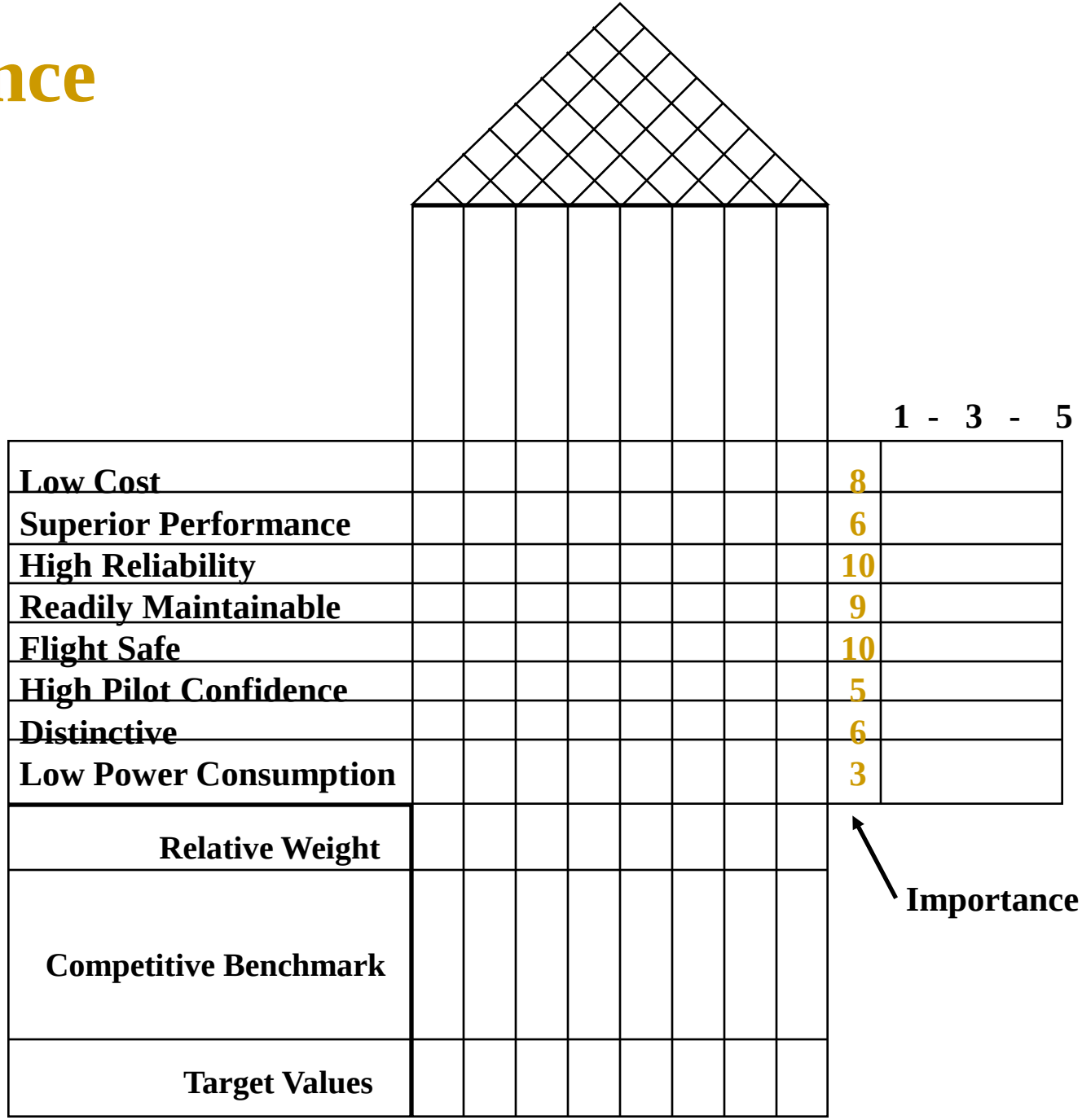


Whats:

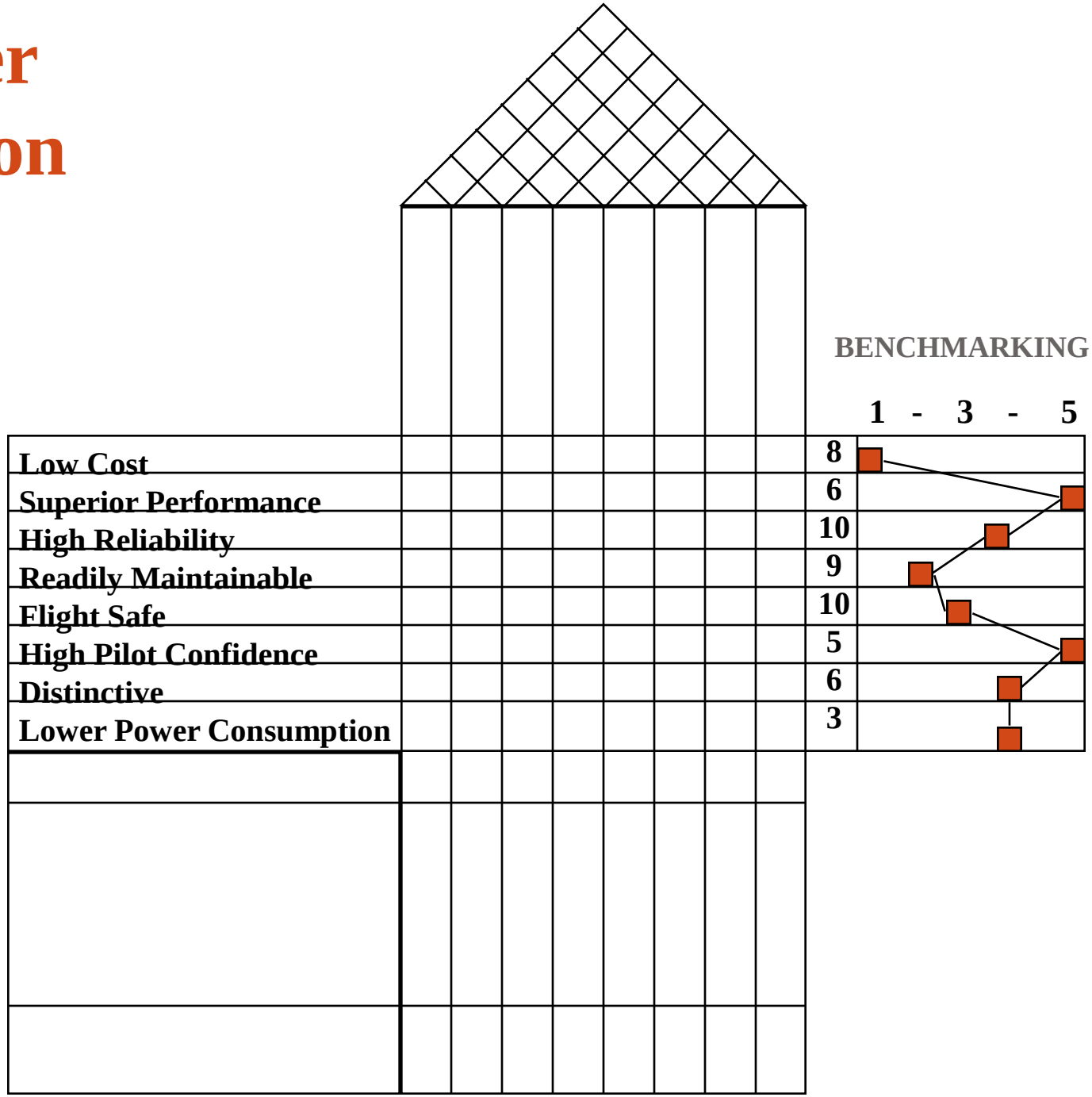
– Improved Radar



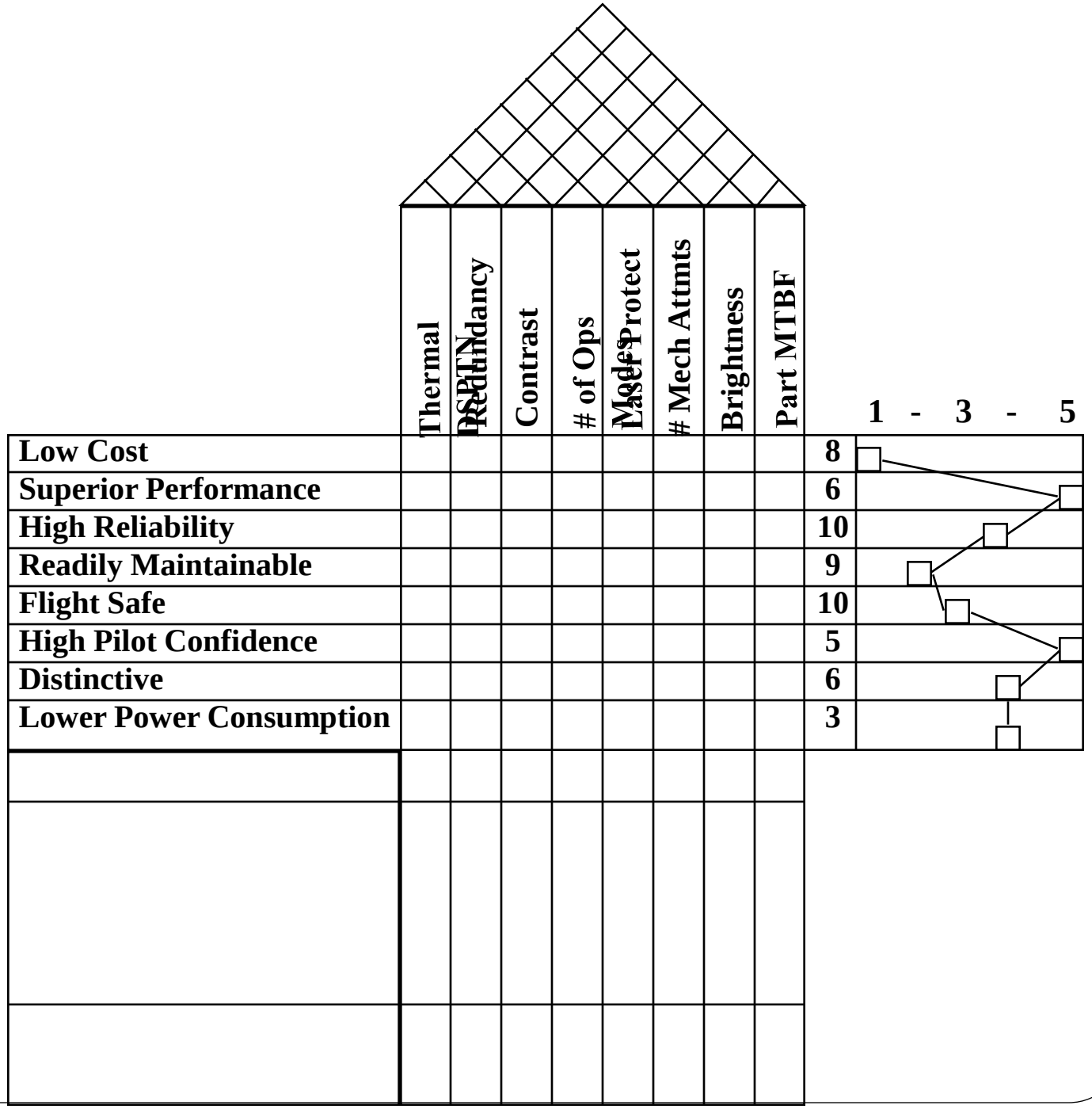
Importance


1 - 3 - 5
Low Cost
8
Superior Performance
6
High Reliability
10
Readily Maintainable
9
Flight Safe
10
High Pilot Confidence
5
Distinctive
6
Low Power Consumption
3
Relative Weight
Competitive Benchmark
Target Values
Importance

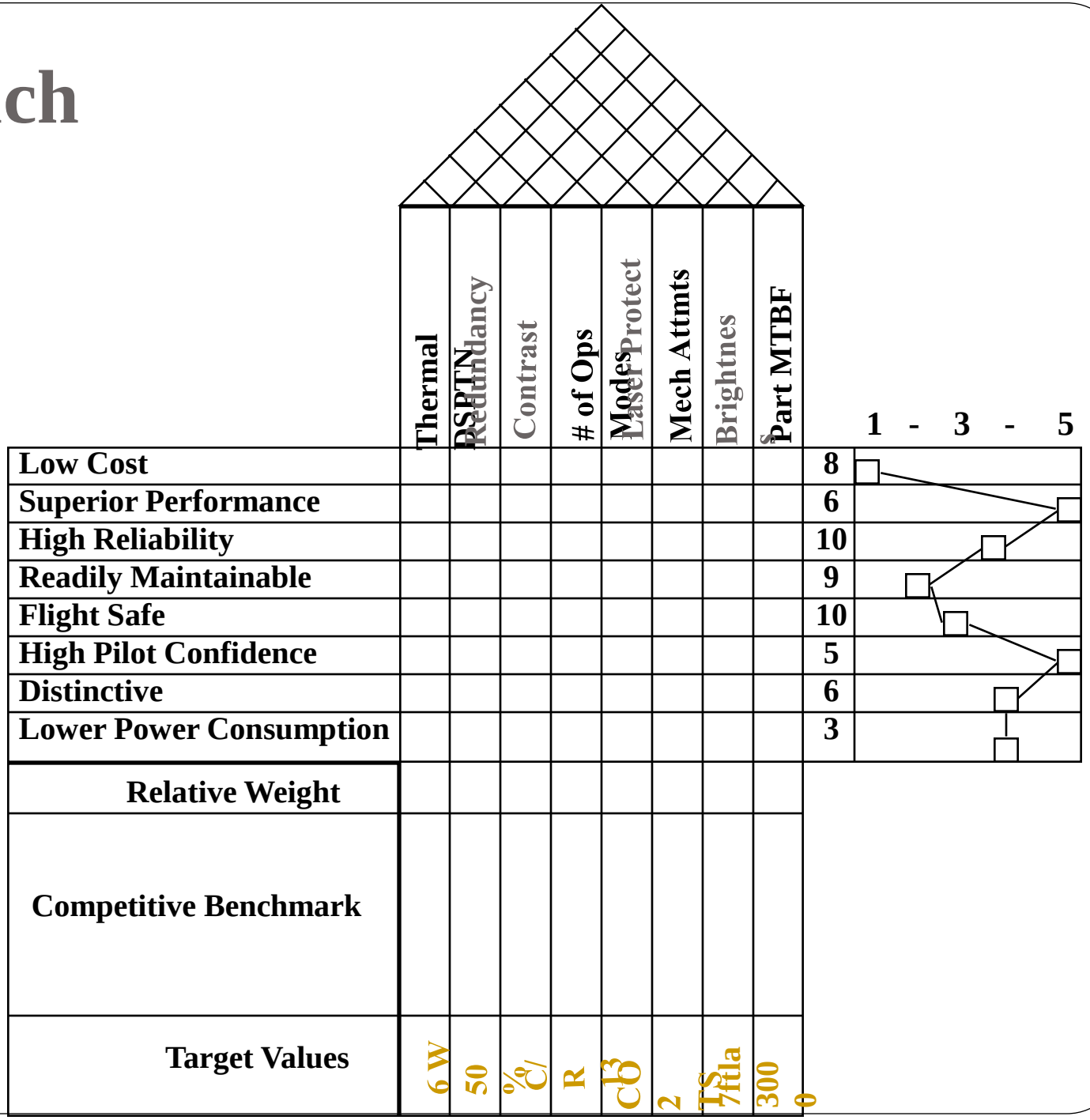
Customer Perception



Hows


Thermal
Redundancy
Contrast
# of Ops
Laser Protect
Mech Attmts
Brightness
Part MTBF
1 - 3 - 5
Low Cost 8
Superior Performance 6
High Reliability 10
Readily Maintainable 9
Flight Safe 10
High Pilot Confidence 5
Distinctive 6
Lower Power Consumption 3

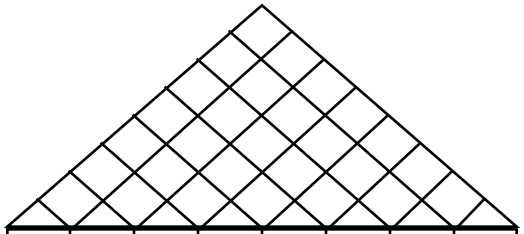
How Much



	Thermal	BSPTN	Redundancy	Contrast	# of Ops	Modes	Laser Protect	Mech Attmts	Brightnes	Part MTBF	1 - 3 - 5
Low Cost											8
Superior Performance											6
High Reliability											10
Readily Maintainable											9
Flight Safe											10
High Pilot Confidence											5
Distinctive											6
Lower Power Consumption											3
Relative Weight											
Competitive Benchmark											
Target Values	6 W	50	%C/	R	cB		2	TS	7fla	300 0	

Interrelationships

STRONG POSITIVE
MEDIUM POSITIVE
WEAK



	Thermal DSPTN	Redundancy	Contrast	# of Ops Modes	Laser Protect	Mech Attmts	Brightness	Part MTBF	1 - 3 - 5
Low Cost		⊕			⊕	▲		●	8
Superior Performance	▲		⊕			⊕	⊕	▲	6
High Reliability	⊕	⊕						⊕	10
Readily Maintainable				●		●		⊕	9
Flight Safe		⊕		●	⊕	⊕	▲		10
High Pilot Confidence		⊕	⊕	▲	●	⊕	⊕		5
Distinctive				●					6
Lower Power Consumption	⊕	⊕		▲			●		3
Relative Weight									
Competitive Benchmark									
Target Values	6 W	50%	C/R	13	CO	2 TS/ftla		300 0	

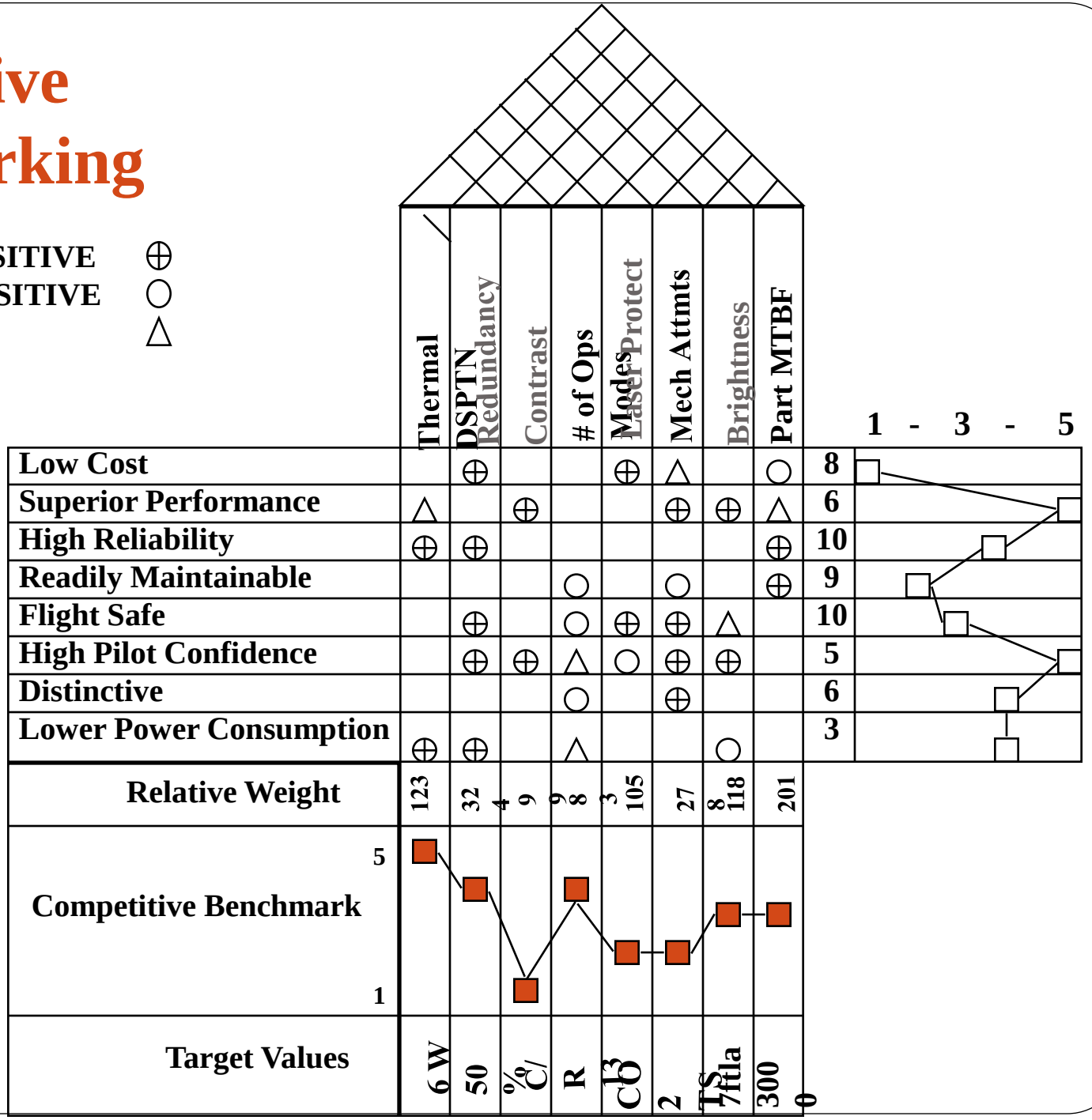
Relative Weight

STRONG POSITIVE ⊕
MEDIUM POSITIVE ○
WEAK △

	Thermal DSPTN	Redundancy	Contrast	# of Ops	Modes	Mech Attmts	Brightness	Part MTBF	1 - 3 - 5
Low Cost		⊕			⊕	△		○	8
Superior Performance	△		⊕			⊕	⊕	△	6
High Reliability	⊕	⊕						⊕	10
Readily Maintainable				○		○		⊕	9
Flight Safe		⊕		○	⊕	⊕	△		10
High Pilot Confidence		⊕	⊕	△	○	⊕	⊕		5
Distinctive				○		⊕			6
Lower Power Consumption	⊕	⊕		△			○		3
Relative Weight	123	324	99	83	105	278	118	201	
Competitive Benchmark (5 / 1)									
Target Values	6 W	50	%C/	R	cb3	2	TS 7ftla	300 0	

Competitive Benchmarking

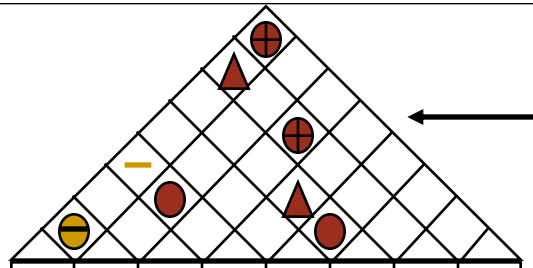
STRONG POSITIVE ⊕
MEDIUM POSITIVE ○
WEAK △



Roof

Hows vs. Hows

STRONG POSITIVE ⊕
MEDIUM POSITIVE ●
WEAK ▲
MEDIUM NEGATIVE −
STRONG NEGATIVE ⊖

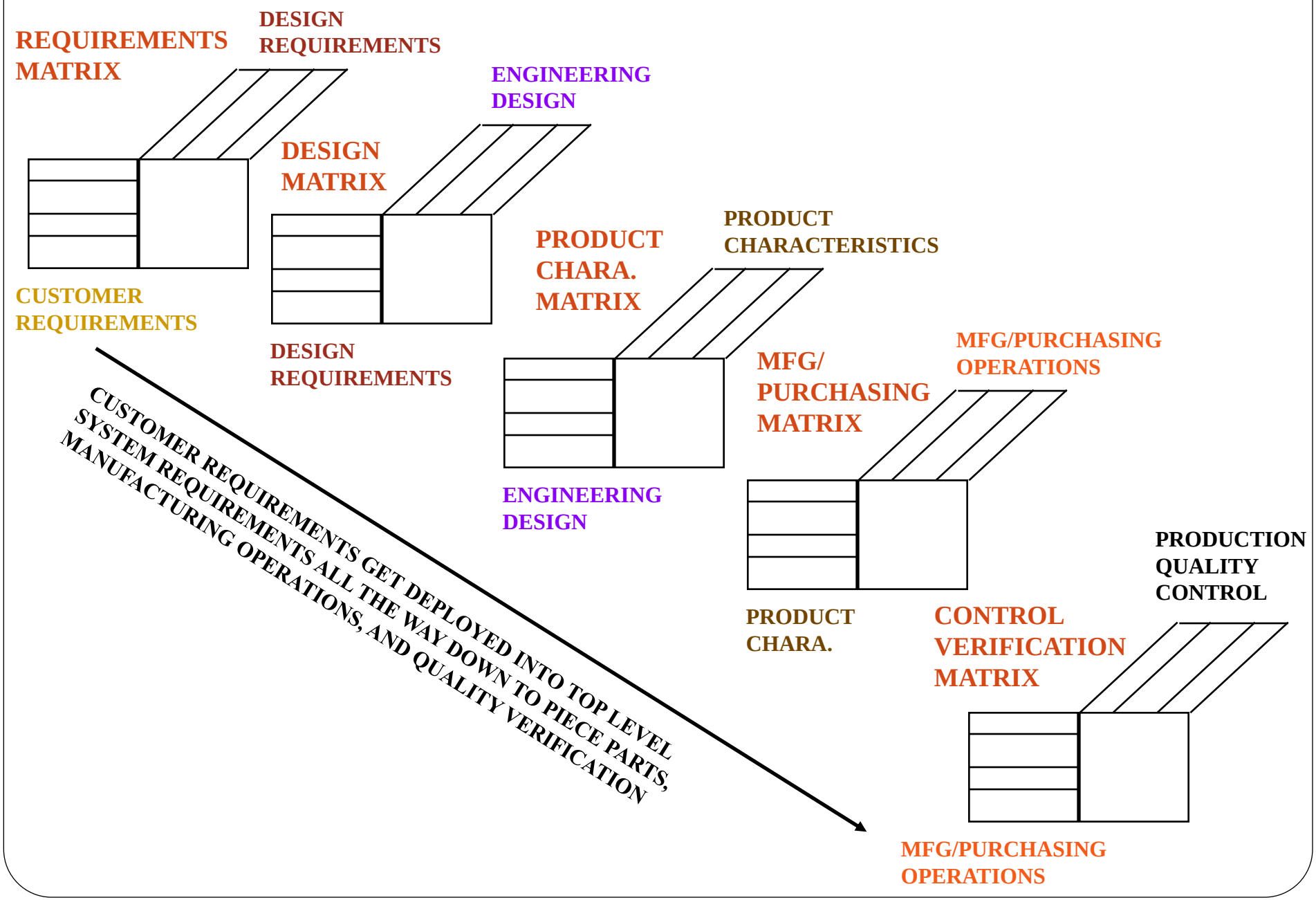


TECHNICAL INTERACTIONS

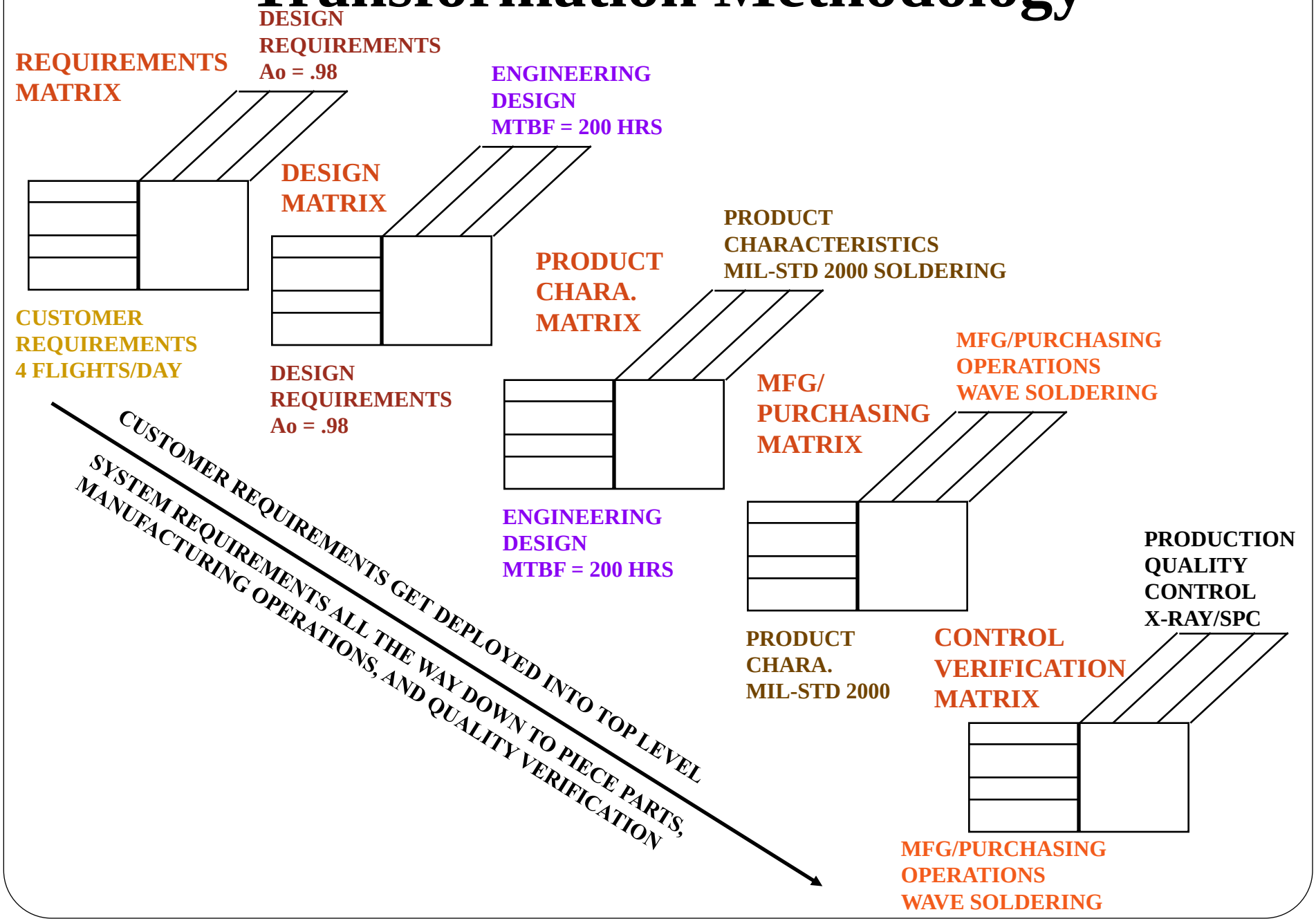
	Thermal	DSPTN Redundancy	Contrast	# of Ops	Modes Laser Protect	Mech Attmts	Brightness	Part MTBF	
Low Cost		⊕			⊕	△		○	8
Superior Performance	△		⊕			⊕	⊕	△	6
High Reliability	⊕	⊕						⊕	10
Readily Maintainable				○		○		⊕	9
Flight Safe		⊕		○	⊕	⊕	△		10
High Pilot Confidence		⊕	⊕	△	○	⊕	⊕		5
Distinctive				○		⊕			6
Lower Power Consumption	⊕	⊕		△			○		3
Relative Weight	123	32	4 9	9 8	3 105	27	8 118	201	
Competitive Benchmark (5 / 1)									
Target Values	6 W	50	% C/	R	cb 3	2	TS /tla	300 0	

1 - 3 - 5

Transformation Methodology



Transformation Methodology



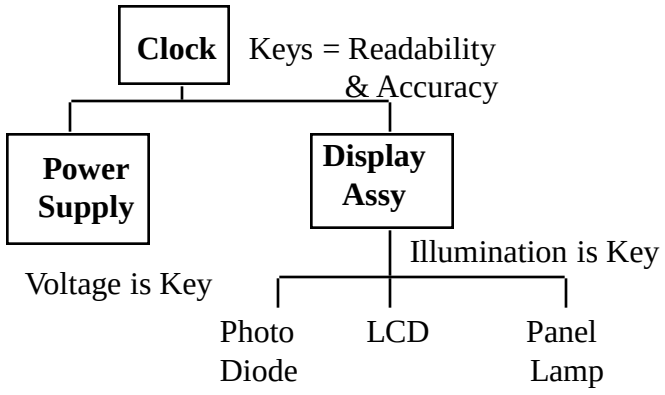
Transformation Methodology

From Customer Requirement to Material & Manufacturing Process Selection to Include Testing & Quality Assurance Verification

Customer Requirement

- **Support the SIOP**
  - **Be on Time (a Key Reqmt)**

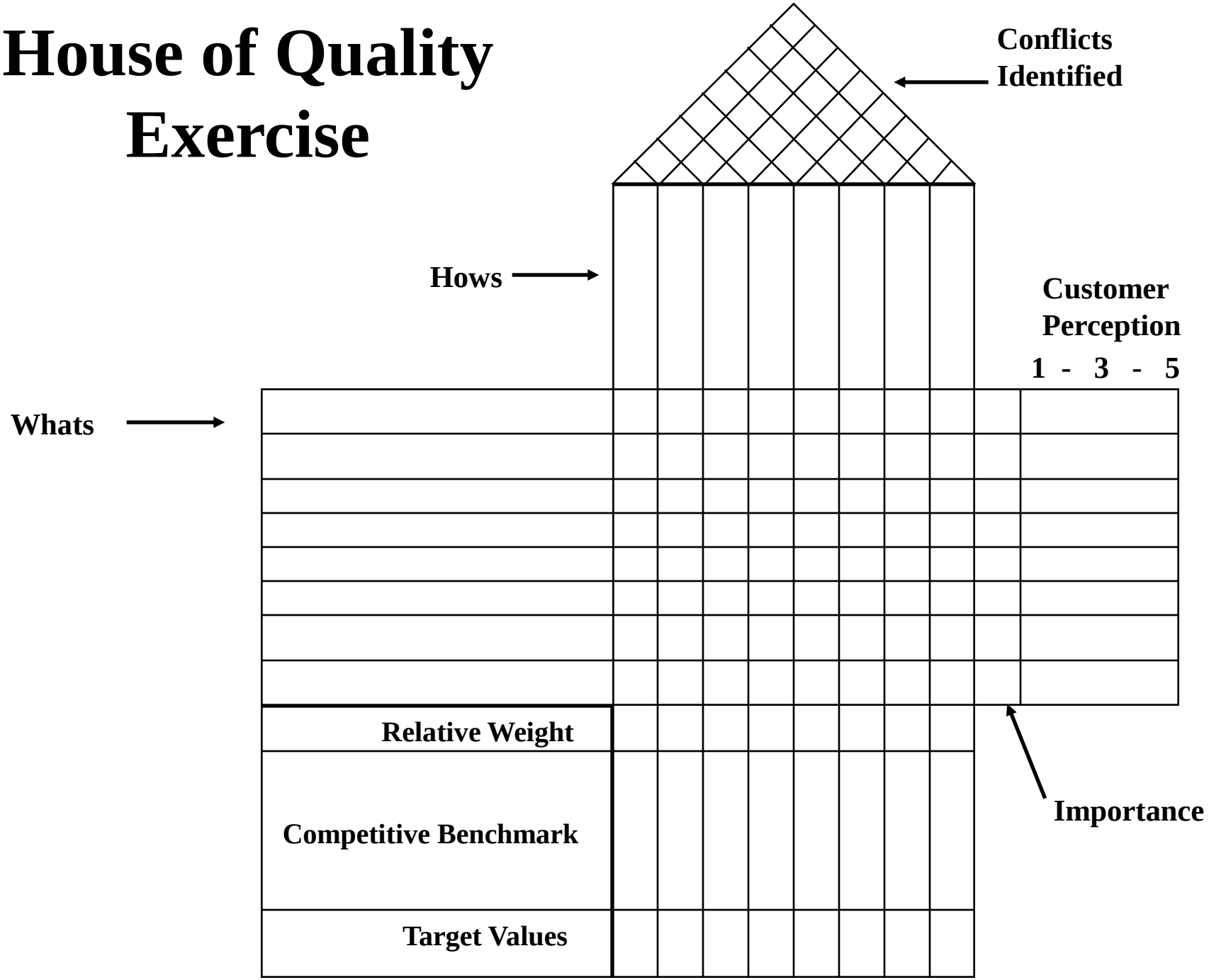
Subsystem Requirement



Manufacturing Requirements (Keys)

- **Hardware Requirements**
  - MIL-SPEC Diode in Power Supply
  - Good Solder Joints
- **Process Requirements**
  - MIL-STD-2000 Requirement
  - Use Wave Solder Machine
- **Quality Verification Requirements**
  - UseDOE to identify Key Mfg process factors
  - Use SPC to control process & document variation on Key process factors

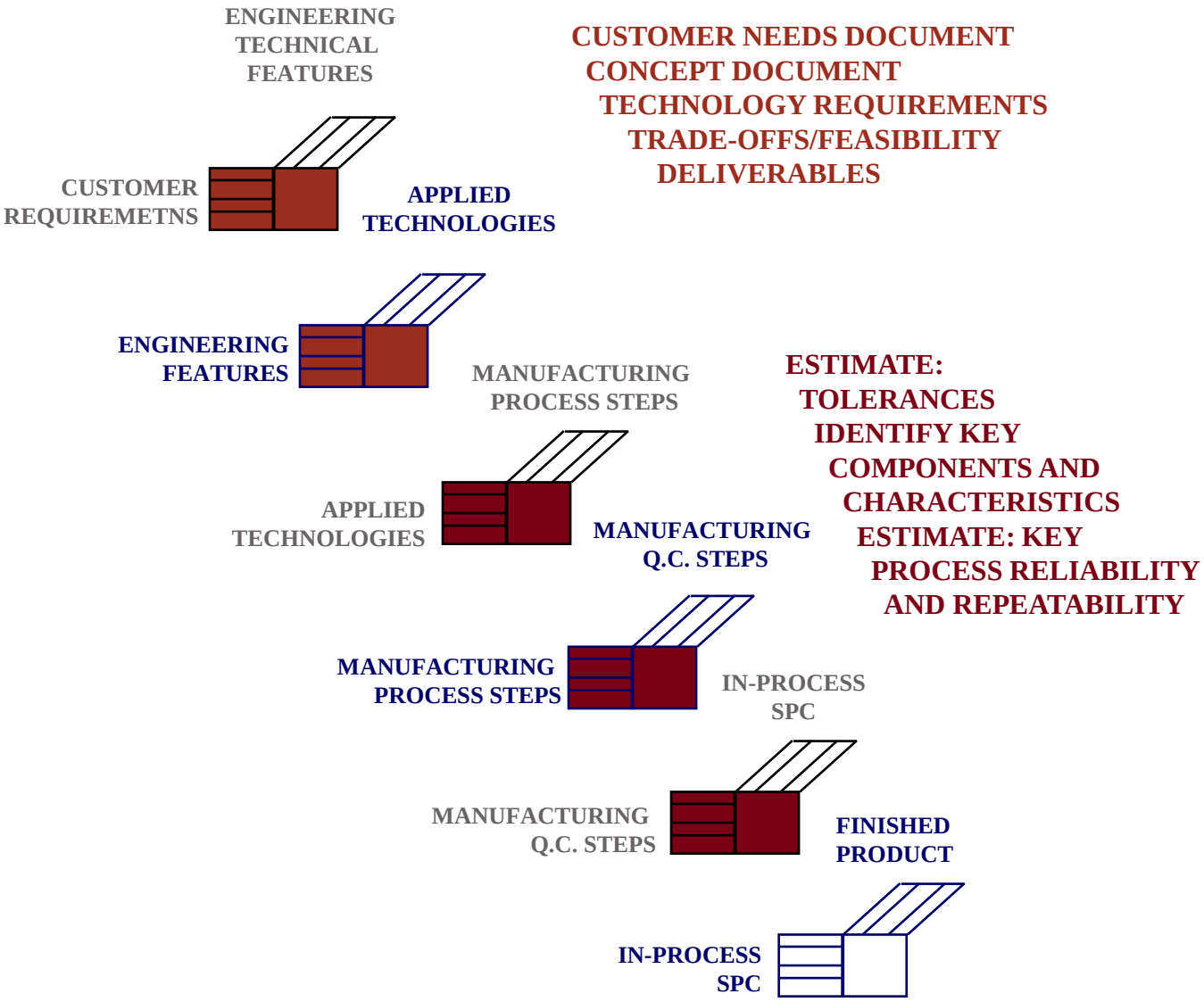
House of Quality Exercise



Tools to Complete the Task

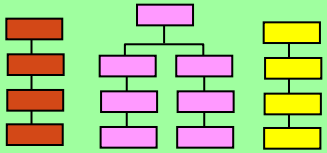
TOOLS

- AFFINITY DIAGRAM
- TREE DIAGRAM
- MATRIX DIAGRAM
- PARETO CHARTS
- CAUSE & EFFECT
- EXPERIMENTAL DESIGNS (TAGUCHI)
- CAPABILTIY STUDIES
- SENSITIVITIY ANALYSIS
- SPC



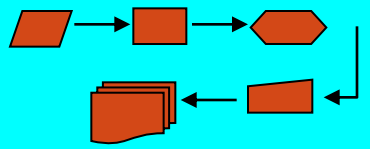
Six New Tools

Affinity Diagram



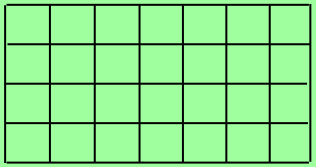
- **Group brainstorming tool used to Capture Ideas**
  - Brainstorm in silence by writing one idea per each yellow sticky
  - Stick the ideas onto a flat surface and then affinitize them in silence
  - Provide a Header at the top of each affinitized column

Flow Chart



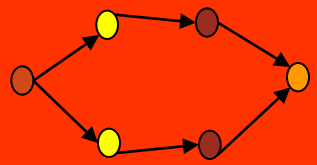
- **Used to understand the system by identifying the steps used in a process:**
  - Describe the system or process to be studied
  - Observe and record the "as is" system/process
  - List the steps and assign flow chart symbols to each step
  - Layout the steps and connect with arrows to indicate work flow
  - Study the process for improvements
    (eliminate NVA, reengineer, and reduce variation)

Matrix Diagram



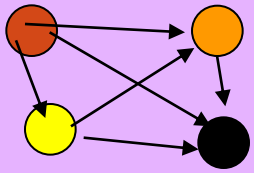
- **Used to Analyze multiple factors and priorities**
  - Create a "What" axis
  - Create a "How" axis
  - Establish a priorities column
  - Brainstorm on the "Whats" and "Hows"
  - Set priorities based on established criteria

PERT



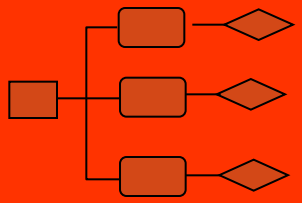
- **Used to show the sequence of tasks to be performed:**
  - Identify all tasks
  - Arrange tasks on a timeline
  - Add dates and task duration
  - Connect the tasks as applicable
  - Identify the critical path

Interelationship Diagraph



- **Used to study relationships between causes:**
  - Identify main causes of variation
  - Place causes in a large circle
  - Study the relationship between causes
  - Draw a line between causes if there is a relationship
  - Determine which cause affects the other
  - Put an arrowhead pointing to the affected
  - Continue the process until all relationships have been analyzed
  - Rank order adding up the number of tails on each cause
  - Develop a plan of action

Process Decision



- **Used to identify and prevent unplanned events:**
  - State the Project
  - Determine what could go wrong
  - Identify potential solutions to each problem
  - Determine probability of each event occurring
  - Develop risk mitigation plans

QFD Team Methodology

- **Select Team Carefully**
  - Crossfunctional
  - Team Players
- **Involve Your Customer**
- **Involve Your Supplier**

Team Operation

- **Key to Success ⟶ Gain Team Consensus**
  - **Use the 7 - Management Tools**
    - Agreement, not Voting
    - No One Dominates
    - Agree to Support Group Decisions
  - **Collect Data using 7- Quality Tools**

Role of Facilitator

- **Don’t Dominate**
- **Encourage Participation by All Members**
- **Keep Progress Moving**
- **Keep Charts Manageable**
- **Define Terms**
- **Focus on Organizational Priorities**

Applications of QFD

QFD Provides a Way to:

- **Capture Requirements**
- **Structure or Respond to RFPs**
- **Develop Source Selection Criteria**
- **Identify Key Areas for Contractual Awareness (Incentive or Award Fee)**
- **Structuring Acquisition Strategies**
- **Managing the Documentation and Decision Process**
- **Applying a Structured Systems Engineering Process**

In the “Analytical Tools Lesson” how could you have utilized QFD and integrated with other tools?