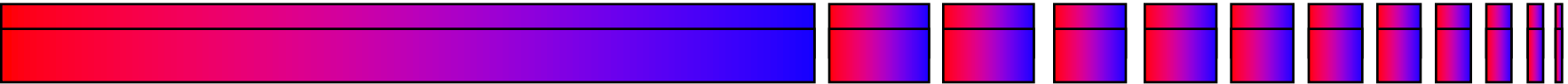


The Essence of Management



You cannot manage what you cannot measure.

You cannot measure what you cannot operationally define.

You cannot operationally define what you do not understand...

“You will fail if you do not manage!”

So what do you measure?

George A. Noyes III

Senior Manufacturing Engineer

Same Blueprint – Different Results


Ford Batavia Plant:

- Ford Escorts were selling so well that Ford had to subcontract out production of transmissions.
- Ford owned 20% of Mazda, so they sent them the blueprints and had them drop-ship the product to the Ford assembly plant.
- Ford buyers began asking for the Escort with the Mazda transmission, when asked why, customers noted that the Mazda transmission had a reputation for reliability.
- Ford was surprised and began an investigation.


Mazda (Korean) Plant:

- Received the drawings and specifications and accomplished an analysis of the “**Key Characteristics.**”
- There are over 10,000 dimensional and other characteristics on a typical transmission.
- Mazda found that only four (4) of these characteristics were “**key or critical.**”
- Mazda used Statistical Process Control to manage those four characteristics.

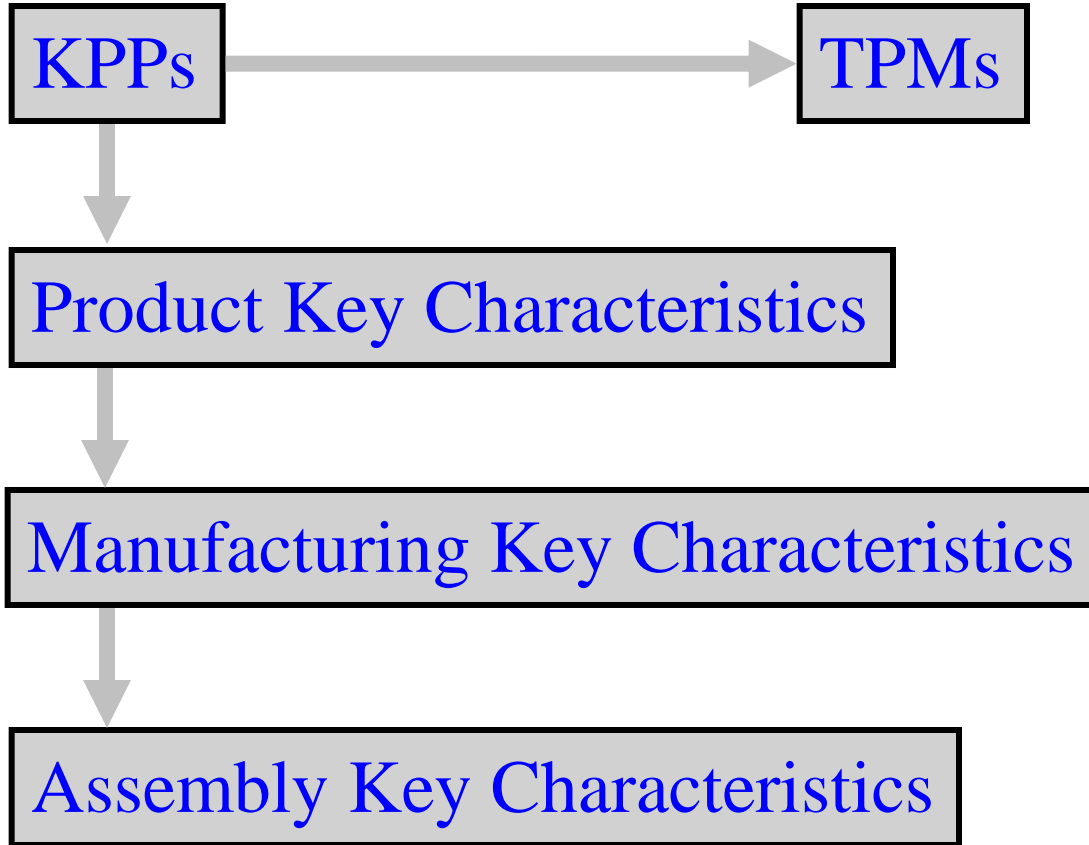
Key Characteristics

- 
- What's in your wallet? Can you afford to manage without a focus on key characteristics?
 - Are the most important requirements, attributes, or features of a material, part, assembly, installation, or system in which **variation from the normal** has the most adverse affect upon:
 - **fit,**
 - **performance or**
 - **service life!**

Key Characteristics (continued)

- 
- A product feature that affects form, fit or function.
 - A product feature that has the greatest affect on safety, cost, reliability or customer satisfaction.
 - A key characteristic is **not** the same as a key performance parameter, but there are relationships between them.
 - Key characteristics are quickly becoming a best commercial practice that is a communication tool leading to ways of focusing design and manufacturing resources.

Key Flowdowns



Goals



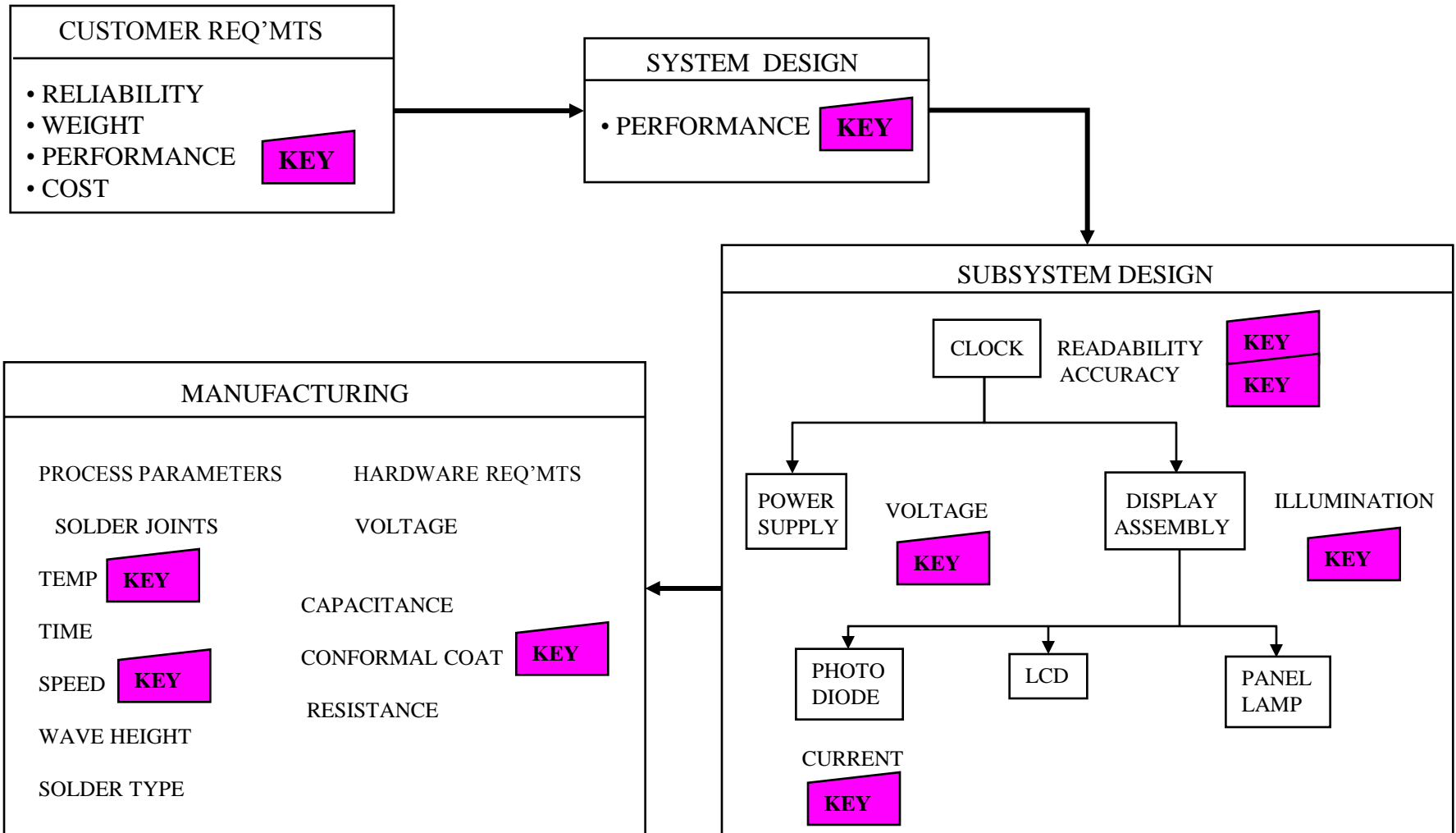
- Key Characteristics provide a focus for product improvement
- Quality is conformance to nominal on all key characteristics
- Reduce variation on key characteristics by:
 - Elimination of special causes
 - Improving consistence of measurement systems
 - Control product by controlling process
 - Reduce loss and eliminate waste

Key Characteristic - Top Down Approach

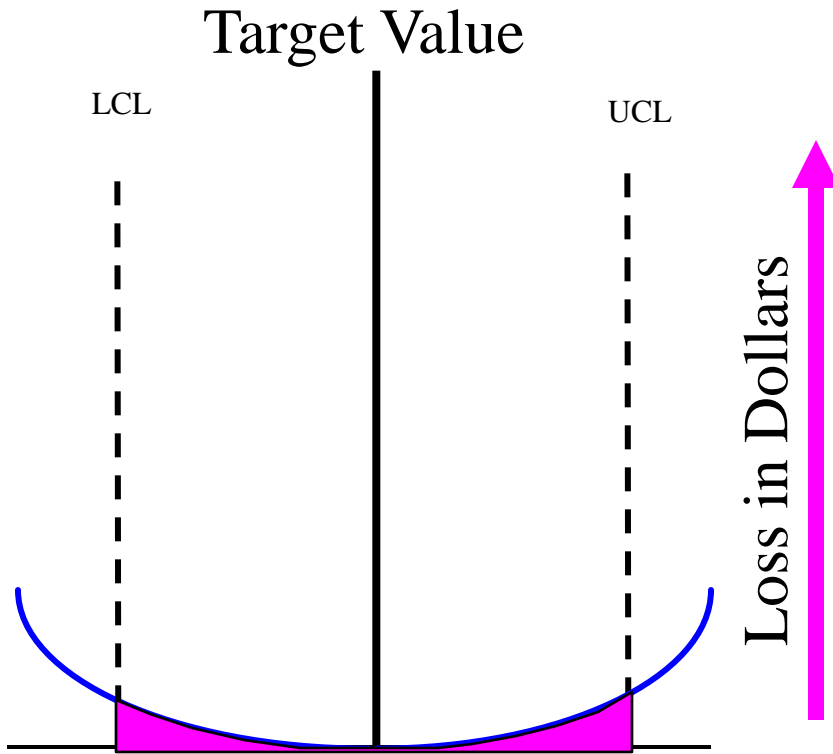


- Customer requirements transform into “Top-Level” Keys
- Top-Level Keys create installation Keys
- Installation Keys create assembly Keys
- Assembly Keys create detail part Keys
- Any Key can create process parameter Keys
- Guide: 3-to-5 Keys per level

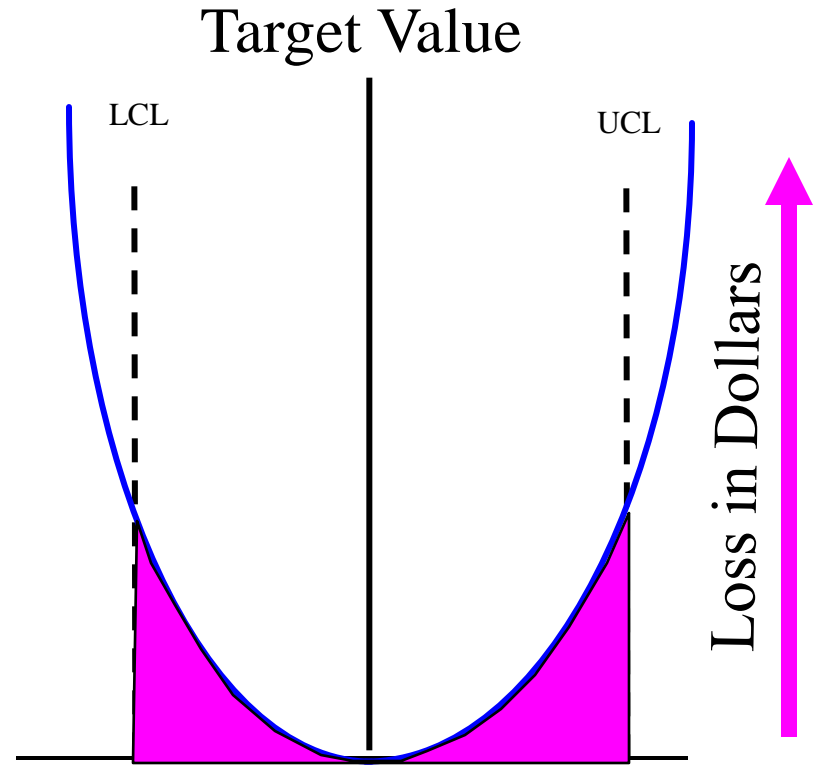
Key Characteristic - Top Down Approach



The Loss Function



Low Loss Function



High Loss Function

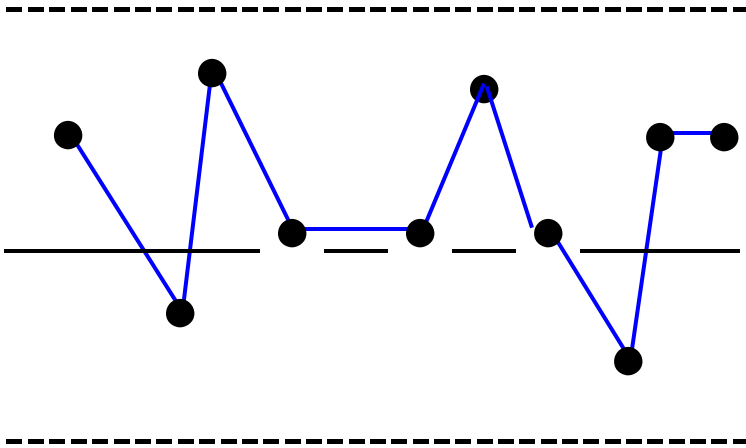
Note: Some Characteristics Have Higher Loss Functions Than Others.

The High Loss Functions Become Your Key Characteristics!

Two Aspects of SPC

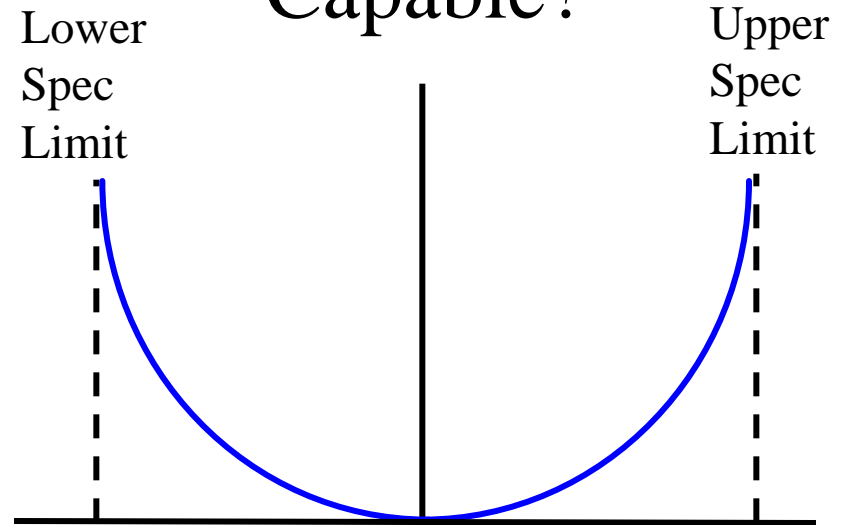


Control?




Answers the question:
Is the process in control or
is it changing?

Capable?

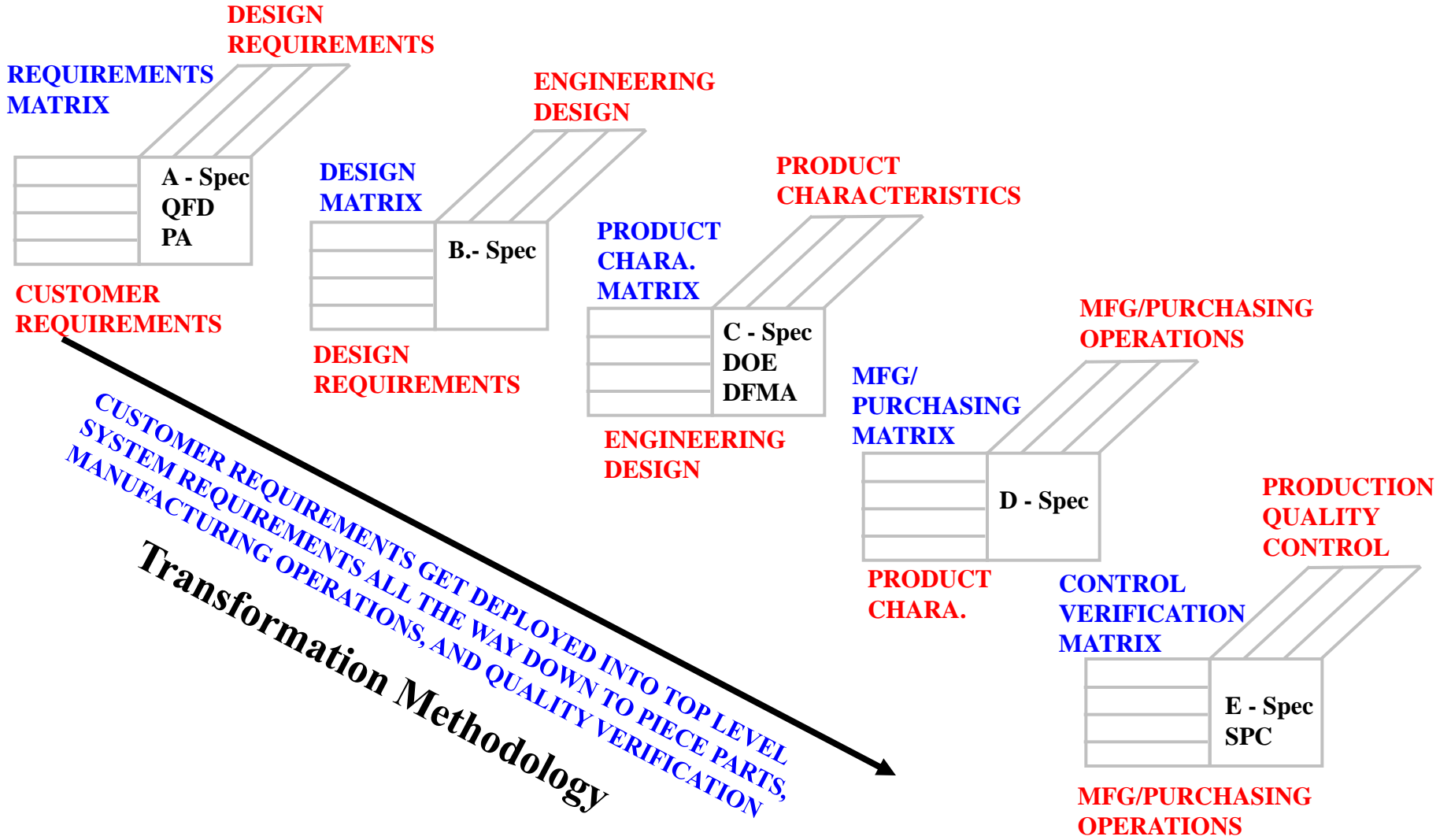


Answers the question:
Are we making good parts?

SPC Goals

- 
- Plot output of a process across time in order to manage and decrease variability.
 - Discover processes heading for trouble before defects are made.
 - Provide a basis for operator self-inspection.
 - Enable management to focus on root causes of systematic defects.
 - Distinguish between variation intrinsic to the process and variation caused by an outside disturbance.
 - Transform waste to profit.

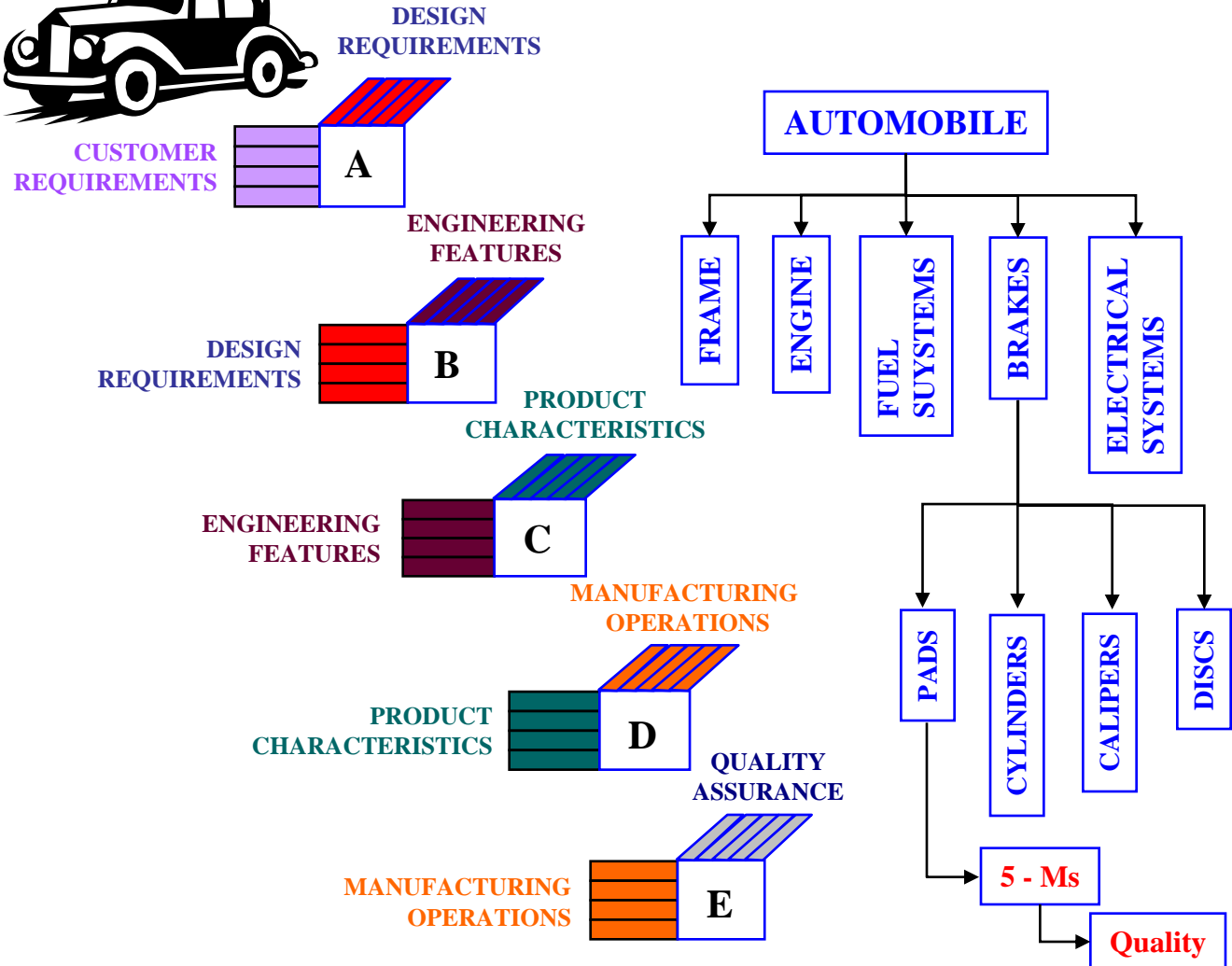
Flowdown



Tools for Product Development

TOOLS

- AFFINITY DIAGRAM (Quality Function Deployment)
- TREE DIAGRAM
- MATRIX DIAGRAM
- PARETO CHARTS
- CAUSE & EFFECT
- EXPERIMENTAL DESIGNS (TAGUCHI/DFMA)
- CAPABILITY STUDIES
- SENSITIVITY ANALYSIS
- SPC



“Contributions to Quality Improvement at Toyota”



- QFD helps to identify what is important
- Taguchi, FTA/RFTA and FMEA are used to make the continuous improvements (breakthroughs)
- SPC is used to hold the gains and monitor the process
- FTA = Fault Tree Analysis
- RFTA = Reverse Fault Tree Analysis
- FMEA = Failure Mode and Effect Analysis

Producibility Hotspot

When Manufacturing Meets:

- Technology & Industrial Base
- Design
- Materials
- Cost and Funding
- Process Capability & Control
- Quality Management
- Personnel (Manpower)
- Facilities & Machines
- Manufacturing Planning

