Proactive Design Simplification™ in New Product Development

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Maximum Opportunity

The Ability to Influence the result of Design is highest during the early concept and design phases and diminishes rapidly as the project progresses.

Actively addressing design impact on cost, complexity, & quality

Early in the development process

Maximizes the Opportunity to Realize

Producible, High Quality, Profitable Products - Proactively

Design Influence

Product Design Drives Everything Downstream

Seventy percent of Total Cost is determined by product design

Design decisions determine everything about the product and how it will be produced

Parts & Materials, Processes, Labor, Tools & Equipment, Quality, Total Costs

Overall Product & Process Complexity

Productivity & Profitability

Proactive Design Simplification

- An interdisciplinary approach to reducing complexity and cost in Product & Process Design
- Grounded in the Principles of DFMA, Lean & IPPD
- Provides the proactive, analytical mechanism to: Discover Opportunities, Define Creative Concepts, and Develop Innovative Solutions
- Applies throughout Product Development from early concept stages through product launch
- Structured Methodology for the Evaluation, Simplification and Innovation of Product Design, Manufacturing, and Life Cycle Processes
- Enhances product value, quality and profitability

Proactive Design Simplification

- Forward-looking Process for Defining New Product Designs
- Proactive Approach to Define What Should be Designed

DESIGN
for Manufacture & Assembly

It's not about how we'll manufacture & assemble what we've designed,

but how we'll <u>DESIGN</u> so it can be manufactured and assembled.

Think Differently

Simple, elegant, and smart designs require creative, innovative thinking and early analysis of design alternatives.

- Actively Address Design Complexity
- DFMA Analyses Lead the Design
- Innovate to Simplify
- Be Aggressive, Challenge Everything
- Think "DIFFERENTLY"

Think Differently to Define Creative Solutions

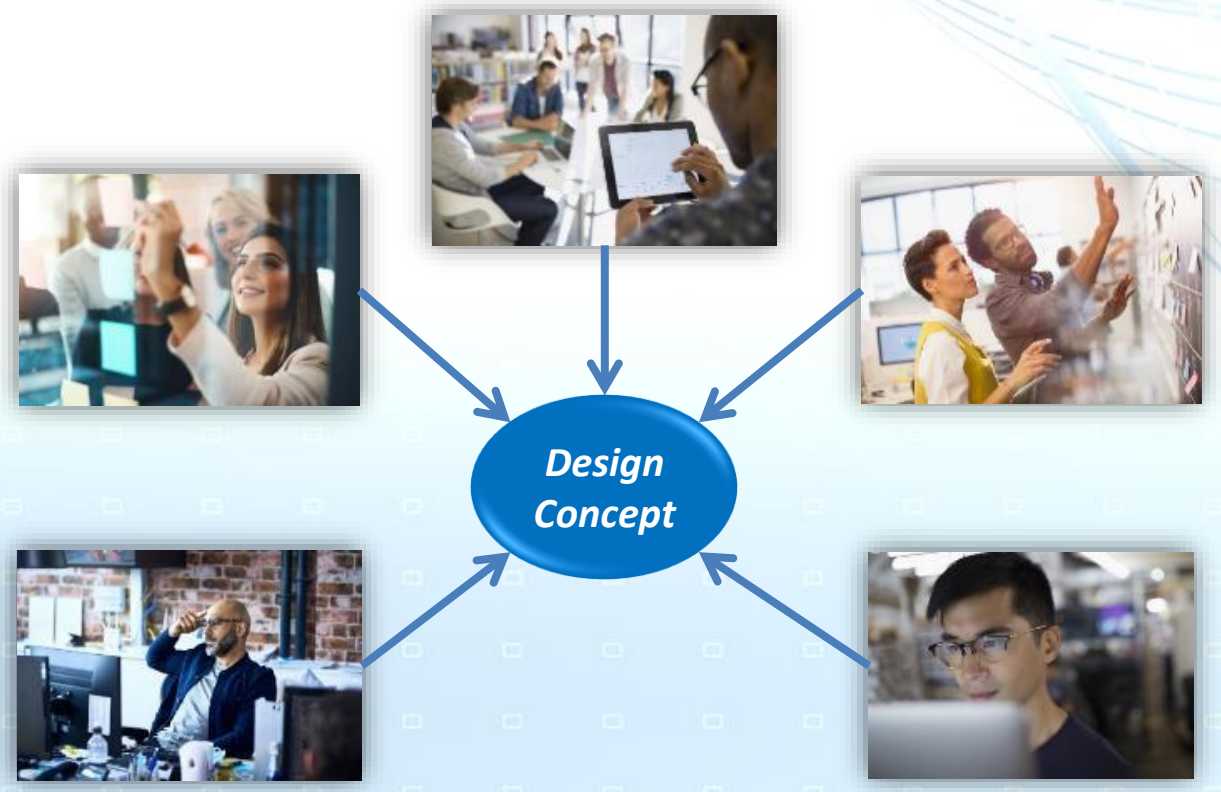
Work Differently to Define Better Designs

"We cannot solve our problems with the same thinking we used when we created them."

– Albert Einstein

Cross-Functional, Interdisciplinary Collaboration

Team Members Focus on Making Design Concepts Work!



Creates a Common

- Direction
- Goal
- Vision

… for the Project

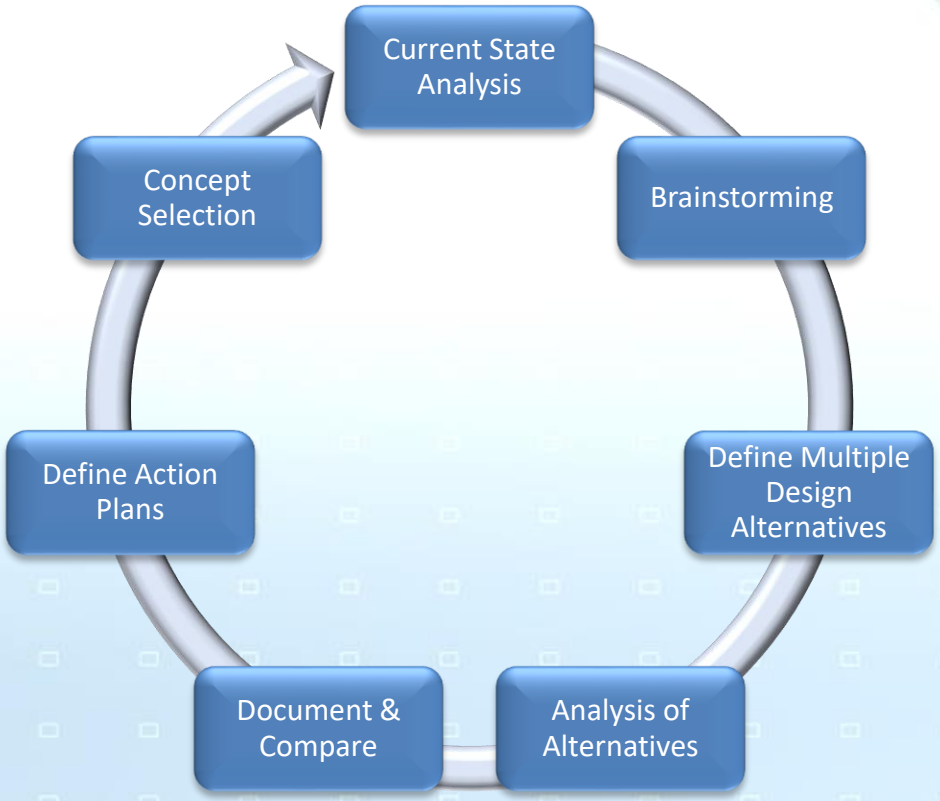
and Facilitates

- Communication
- Decision Making
- Team Consensus
- Innovation

… regarding Design Issues

Team Members Create the Value in Designs.
The Tools and Processes Guide and Accelerate Their Effort.

Proactive Design Simplification Process



- Forward-looking process for defining product designs
- Collaborative Team Process
- Design Analyses with Metrics & Costs
- Generate Multiple Design Alternatives with Measured Improvements
- Data-Driven Decisions at Concept Selection

Generate & Define Design Alternatives

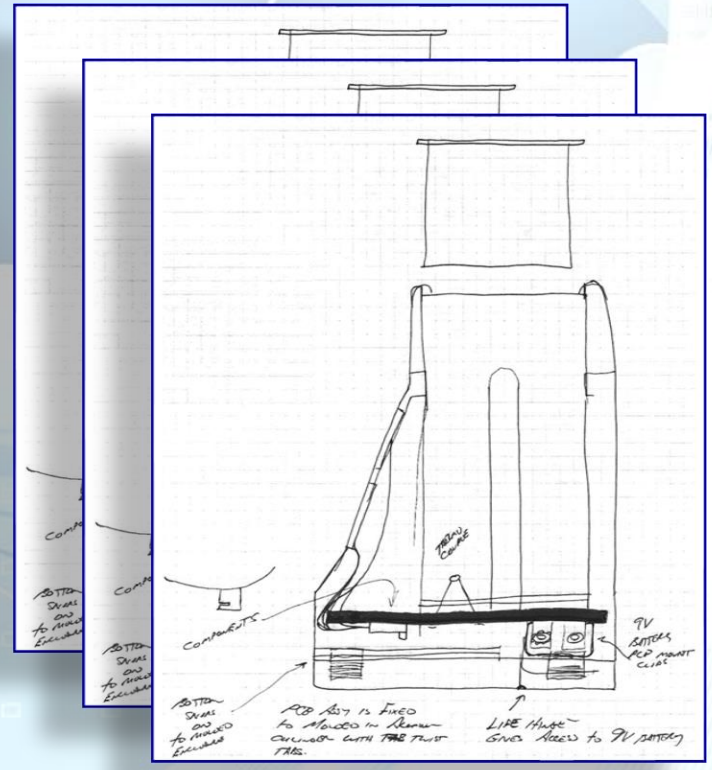
Interactively Generate & Define Multiple New Concepts

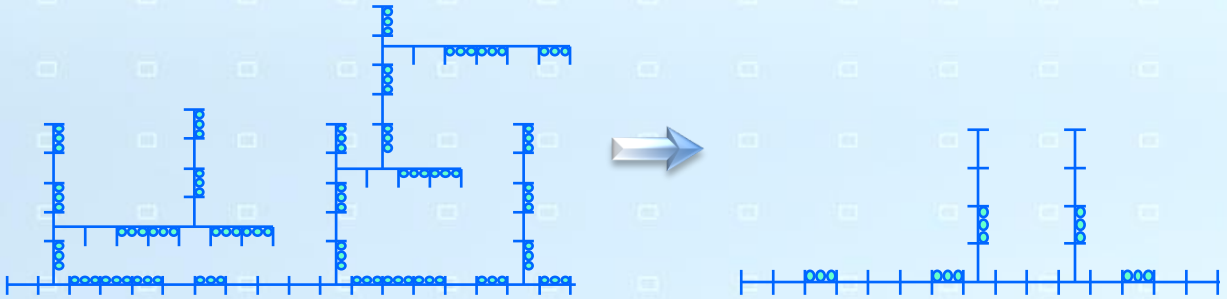
Simplify the Product Structure

Focus on Simplification Principles & Value-Added Components

Consider Alternate Materials, Processes, Configurations

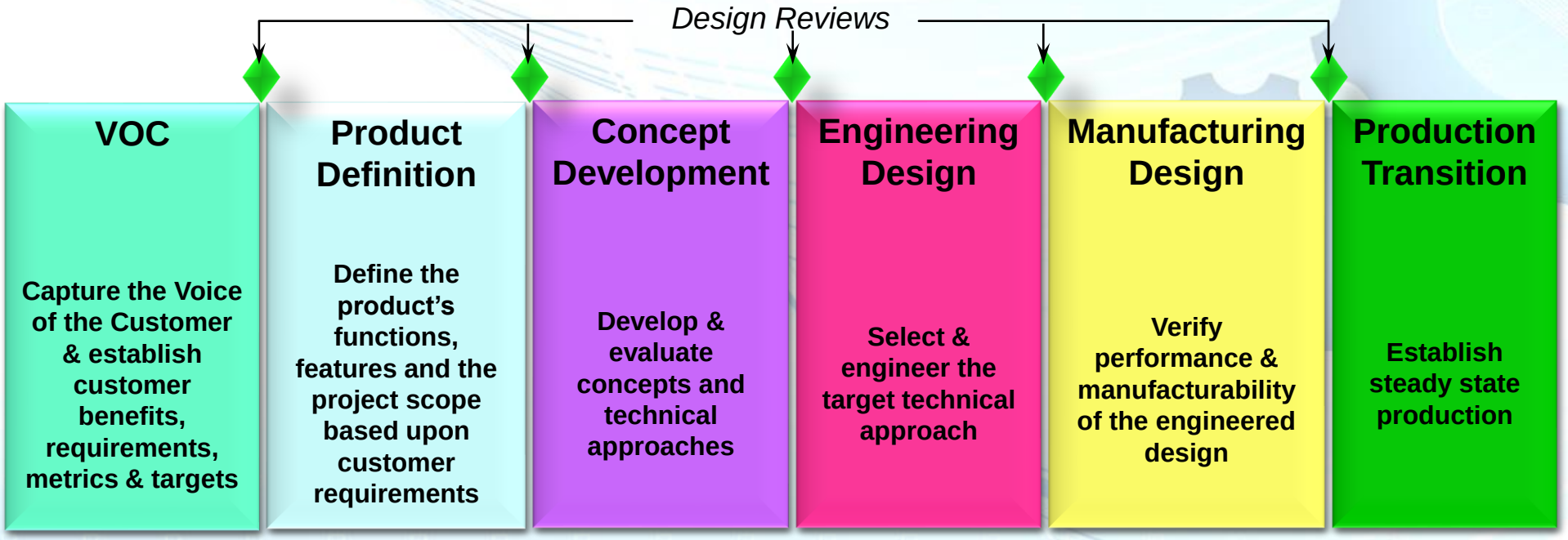
Interrogate Assumptions – Identify Possibilities





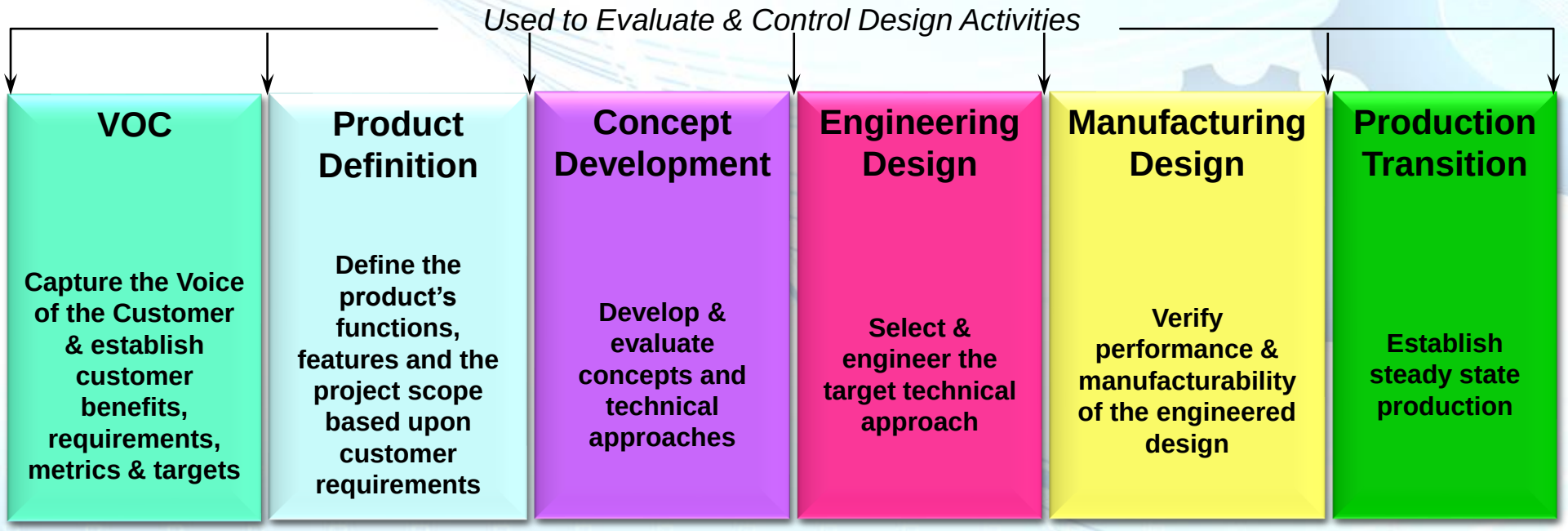
Simpler Product Structures Result in Simpler Processes

Product Development Phases



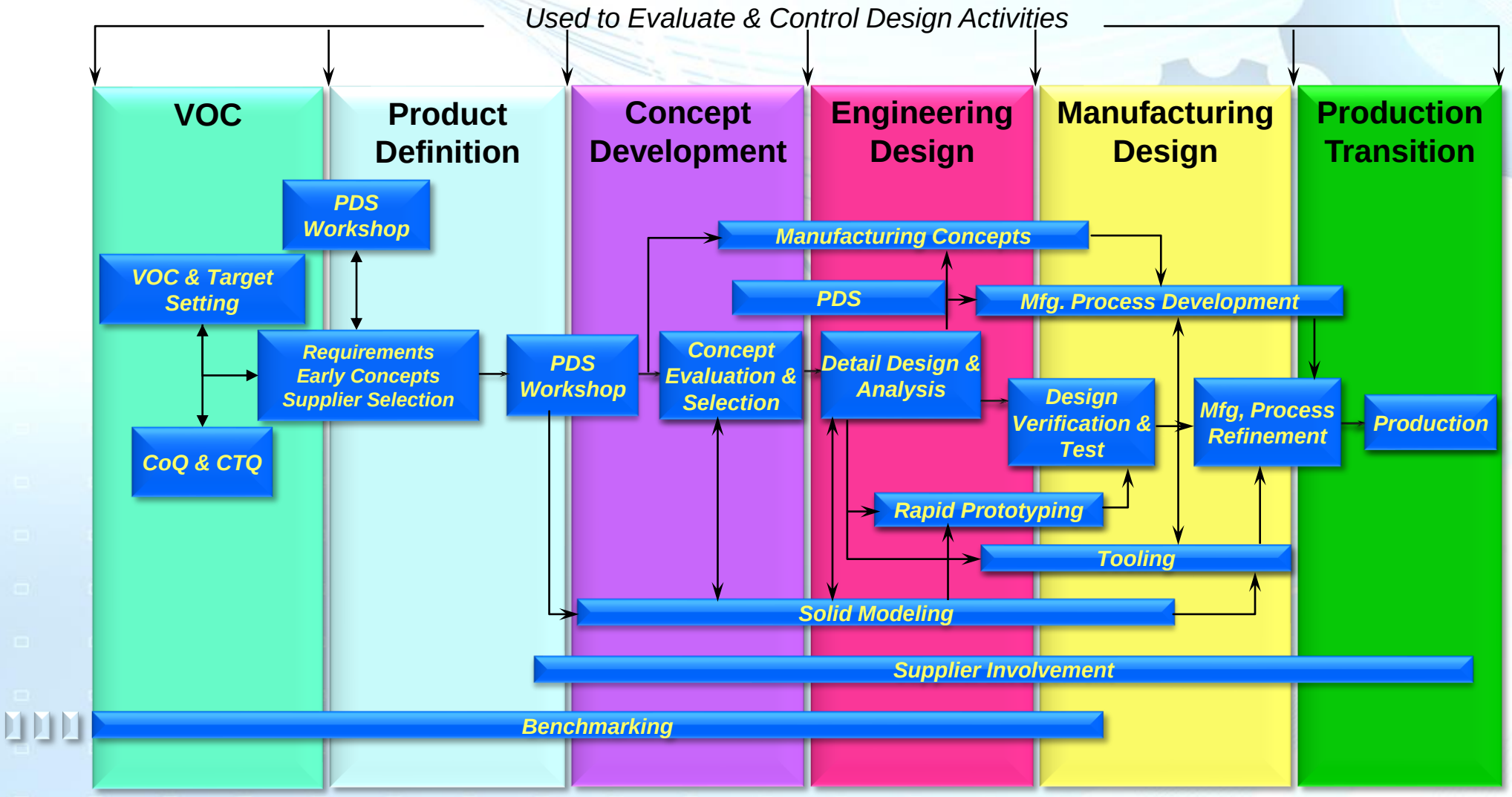
- Typical product development programs progress through several stages or phases from initial requirements through to production
- While the specifics and criterion of each phase may differ between companies and industries, they generally follow an overall track similar to the one above
- Design reviews or phase gate reviews occur between phases to inform others, evaluate the design against requirements, identify potential issues, and function as decision milestones for continuance

Proactive Design Simplification & NPD Phases

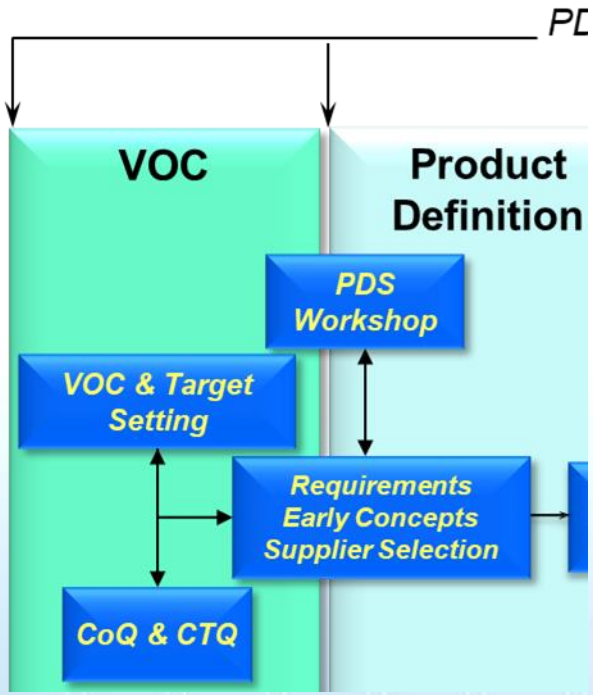


- Applies to all phases throughout New Product Development
- Provides design direction, defining the design, parts, & processes which determine NPD activities
- Fully integrated, Proactive Design Simplification forms the framework to define, evaluate & control design activities improving communications and decision making
- Evolves from Proactive Design Focus to Responsive Problem-Solving
  From Cost Avoidance to Cost Reduction

Product Development Process

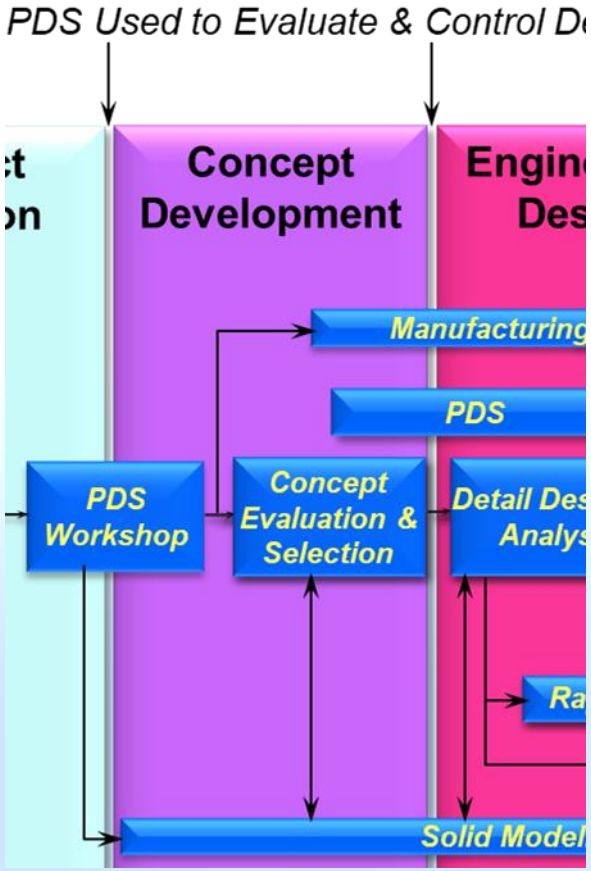


Integrated Proactive Design Simplification



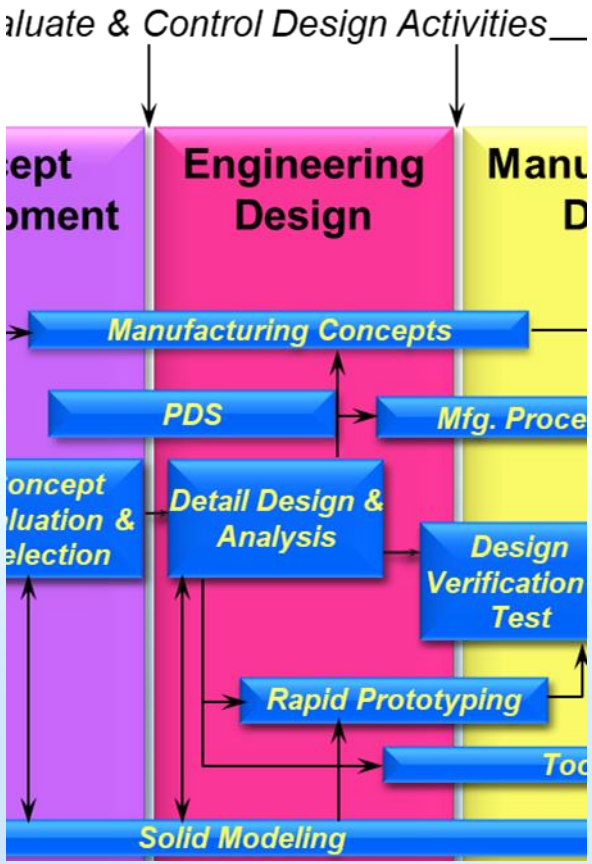
- Early DFMA application define high-level concept alternatives
- Provide early perspectives on costs, quality, manufacturing.
- High level systems view of the product and coarse models versus details of individual items.
- Early concepts can feed VOC and requirements activities to gain feedback on concepts, requirements, customer benefits, and potential business cases.
- Competitive Benchmarking with DFMA analytics provides competitive information for VOC and Product Definition

Integrated Proactive Design Simplification



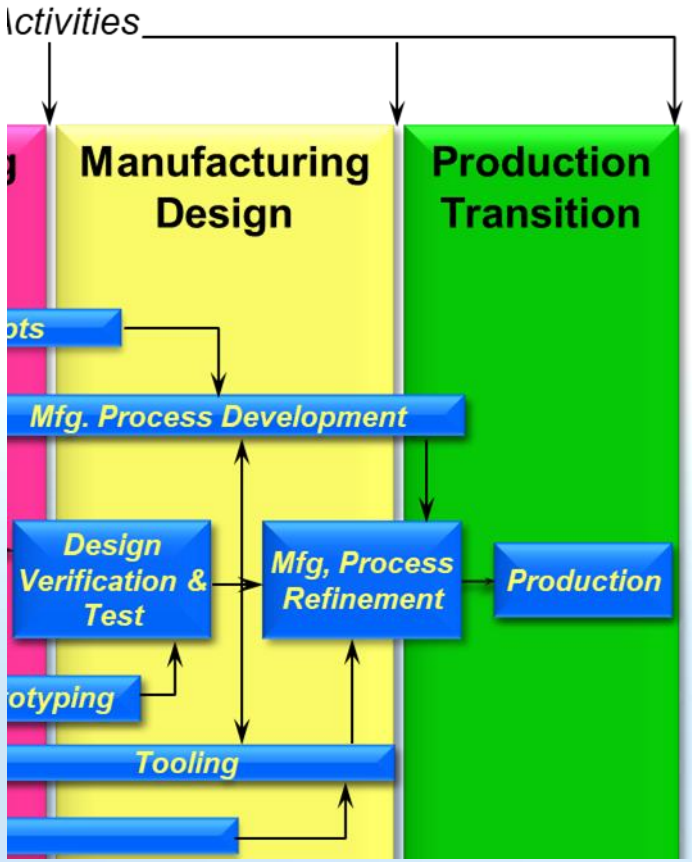
- DFMA efforts in Concept Development phase, generate and define multiple design concepts with more detail and information.
- Concepts form the basis for the final product. System and subsystems and components are defined identifying potential technologies, materials, & processes.
- Part cost estimates produced within DFMA models providing BOM information and target alignment
- Predictive cost of quality metrics can be estimated through CoQ methods
- Cross-functional, interdisciplinary teams are critical
- Comparison of analytical results and metrics describing each design alternative are part of concept selection.

Integrated Proactive Design Simplification



- During the Detail Engineering Design Phase, DFMA efforts are more focused and detailed, identifying specific technologies, materials, & processes.
- Modeling their impact on complexity, costs, quality, and manufacturability keeps the team focused and on track.
- DFMA efforts collaboratively find solutions as new issues arise preventing the tendency to add complexity in late development stages.
- Manufacturing and production processes evolve as an integral part of the DFMA process.
- Each refinement of the product concepts and their DFMA models also refines manufacturing process definition.
- Models and information are utilized for process development, tool & equipment identification, personnel and space requirements.

Integrated Proactive Design Simplification



- Continued DFMA application ensures quality, cost and value are not compromised, maintaining consistency against the goals, metrics and targets.
- Modeling process details and changes evaluates impact of different scenarios.
- Models are more focused, with significant detail. Evaluating process changes as well as design changes improves decision making.
- DFMA evolves toward problem solving in late stages, identifying solutions for the product and process.
- DFMA is invaluable for Continuous Improvement and sustaining engineering activities post launch.
- Applies to design and development of production equipment, fixtures, and tools, with reduced complexity, ease of build, improved cost and maintainability

Integrated Proactive Design Simplification – Summary

- Proactive Design Simplification / DFMA
  - Forward-looking process for defining new product designs
  - Grounded in the principles of DFMA
  - Proactively leads the design to reduce design complexity
  - Yields significant benefits for cost, quality, producibility, & profitability
- Integrated into NPD – product definition through launch
  - Provides design direction reducing complexity that drive NPD Activities
  - Becomes the way products are developed
  - Provides better & more consistent results across projects
- Cross-Functional, Interdisciplinary Teams are key
  - Collaboratively define creative, innovative solutions
  - Emphasize design simplification, manufacturability, assemblability, and cost avoidance
- Reduced design complexity reduces process complexity and TTM
- Quantified data supports intelligent decision making

The greatest danger for most of us is not that our aim is too high, and we miss it, but that it is too low, and we reach it.

Michelangelo

PROACTIVE DESIGN SIMPLIFICATION / DFMA

The Power
Is In
The Process©