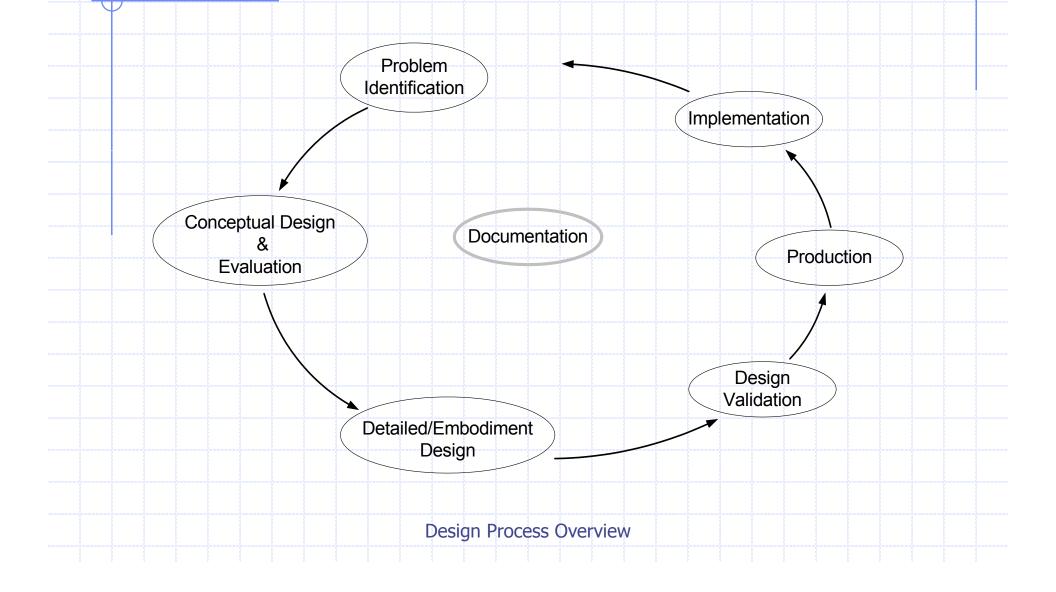
Design Process Overview

Professor Frank J. Fronczak Mechanical Engineering Department & Biomedical Engineering Department University of Wisconsin-Madison

Design Process - Idealized



Problem Identification

- Problem Statement
 - Concise statement of the needs
- **Design Specification**
 - Detailed transformation into engineering specifications

Problem Identification

Detailed/Embodiment

Documentatio

Conceptual Design

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Evaluation

Implementation

Design Validation

Production



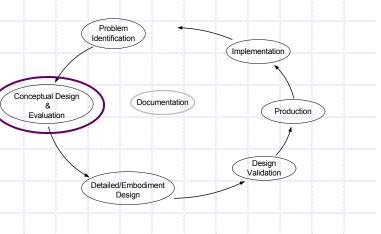
Concept Generation

Generate Multiple Potential Solutions

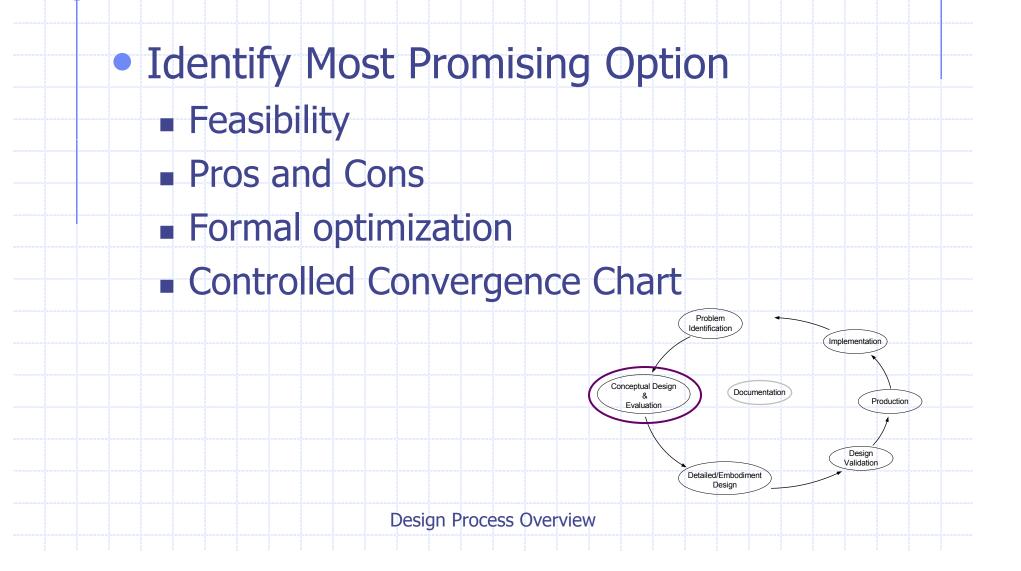
Functional decomposition

Physical >> Abstract

- Energy
- Material
- Information
- Brainstorming
 - Osborne's Checklist
- Morphological Chart



Concept Evaluation

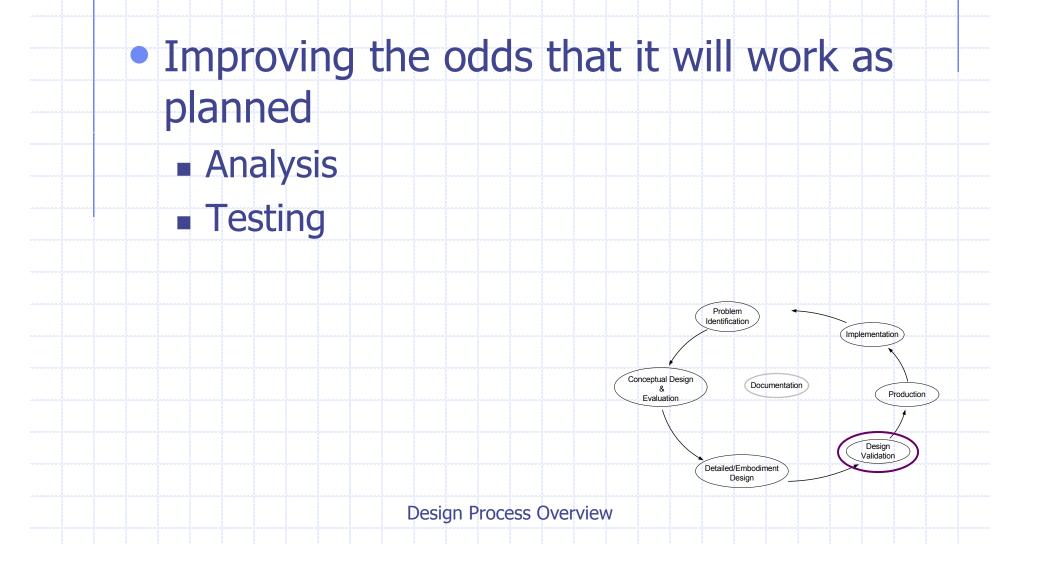




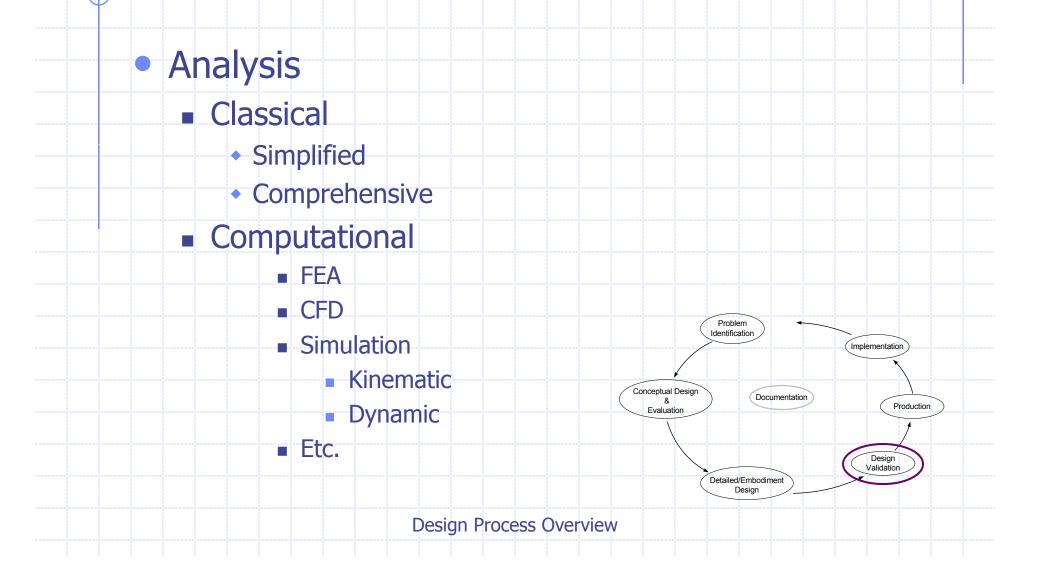
- Working out the details
 - Design for DFX
 - Safety
 - Manufacturability
 - Assembly
 - Environment
 - Effective material usage strength, stiffness
 - Ergonomics
 - Etc.

Problem ldentification (Implementation R Evaluation Documentation Production Production Production Design Validation Design Process Overview

Design Validation

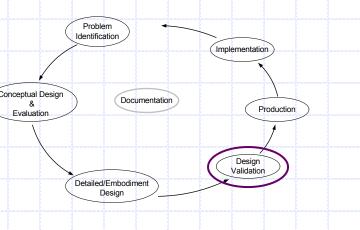


Design Validation - Analysis

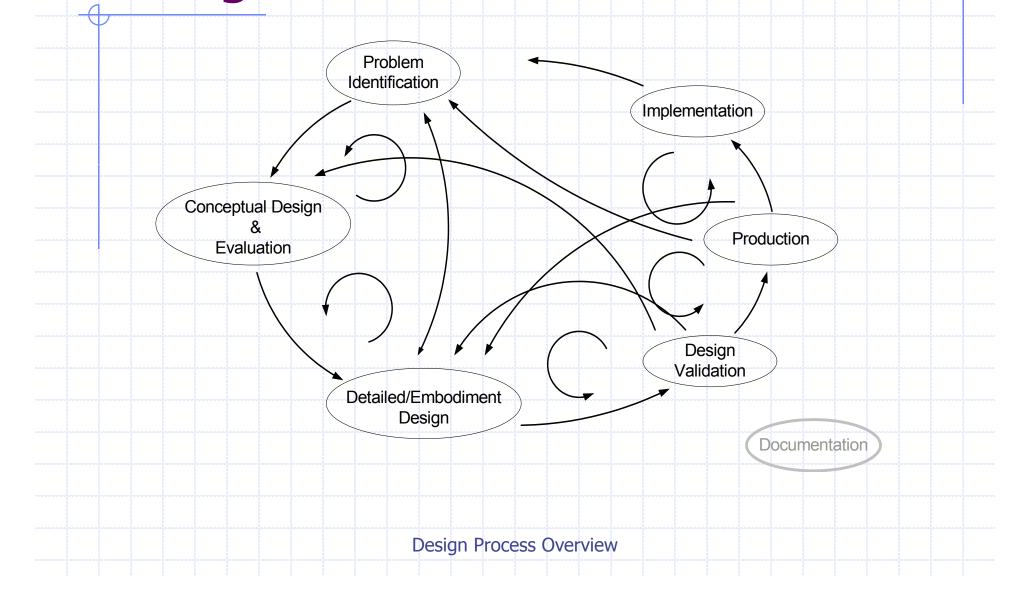


Design Validation - Testing

 Mock-ups Spatial/layout issues Proof-of-concept devices Independent functional issues Prototypes Operational issues Conceptual Design ጲ Evaluation



Design Process - Actual



What it Takes

- Knowledge
 - Engineering, math, and science principles
 - Technology
- Skill
 - Ability to utilize knowledge
- Attitude
 - Explorer
 - Persistence

Selected References

- The Mechanical Design Process, David Ullman
- Engineering Design Methods Strategies for Product Design, Nigel Cross
- Engineering Design A Project Based Introduction, Clive Dym and Patrick Little
- Engineering Design A Materials and Processing Approach, George Dieter
- Engineering Design A Systematic Approach, Pahl and Beitz