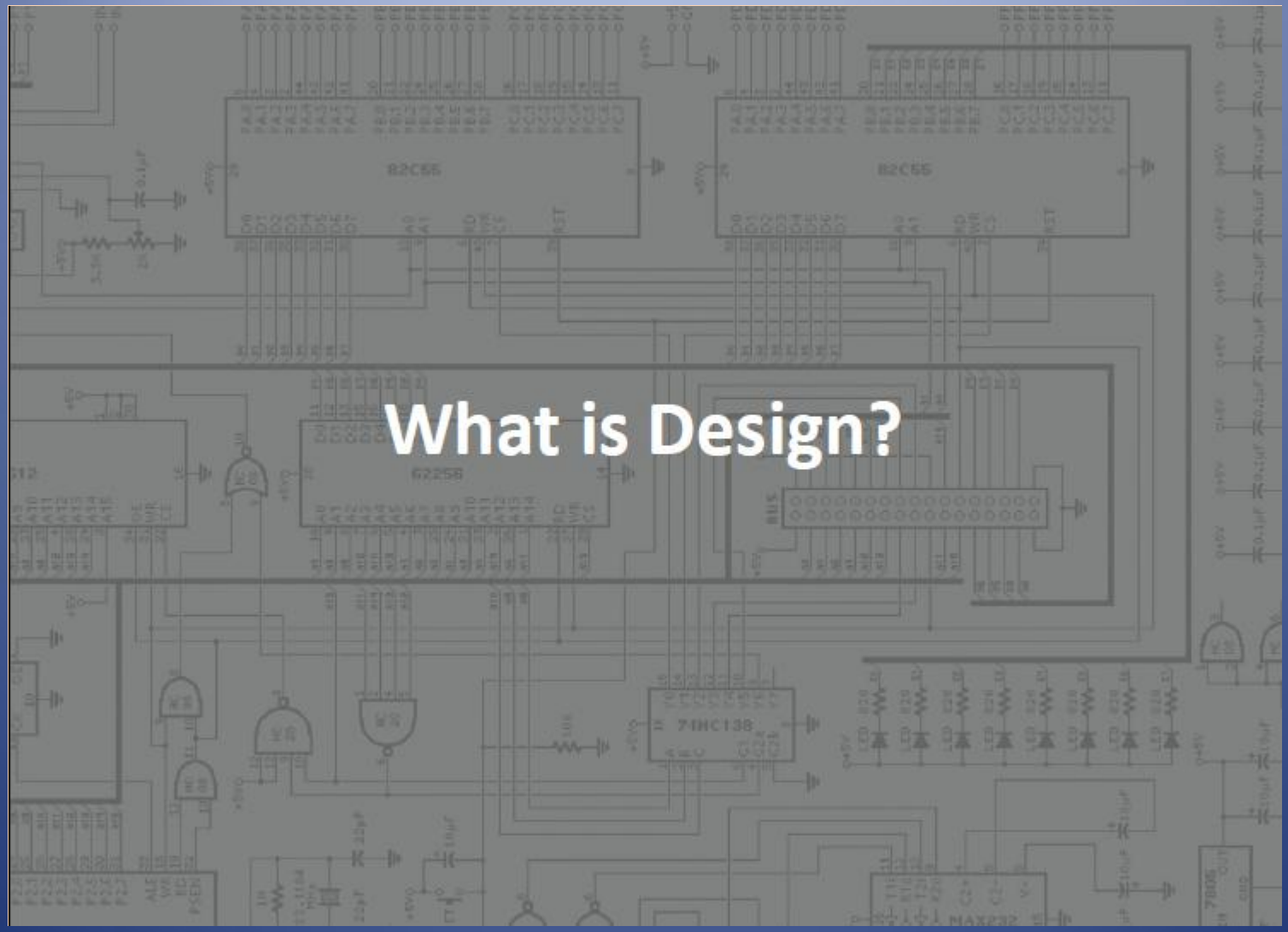
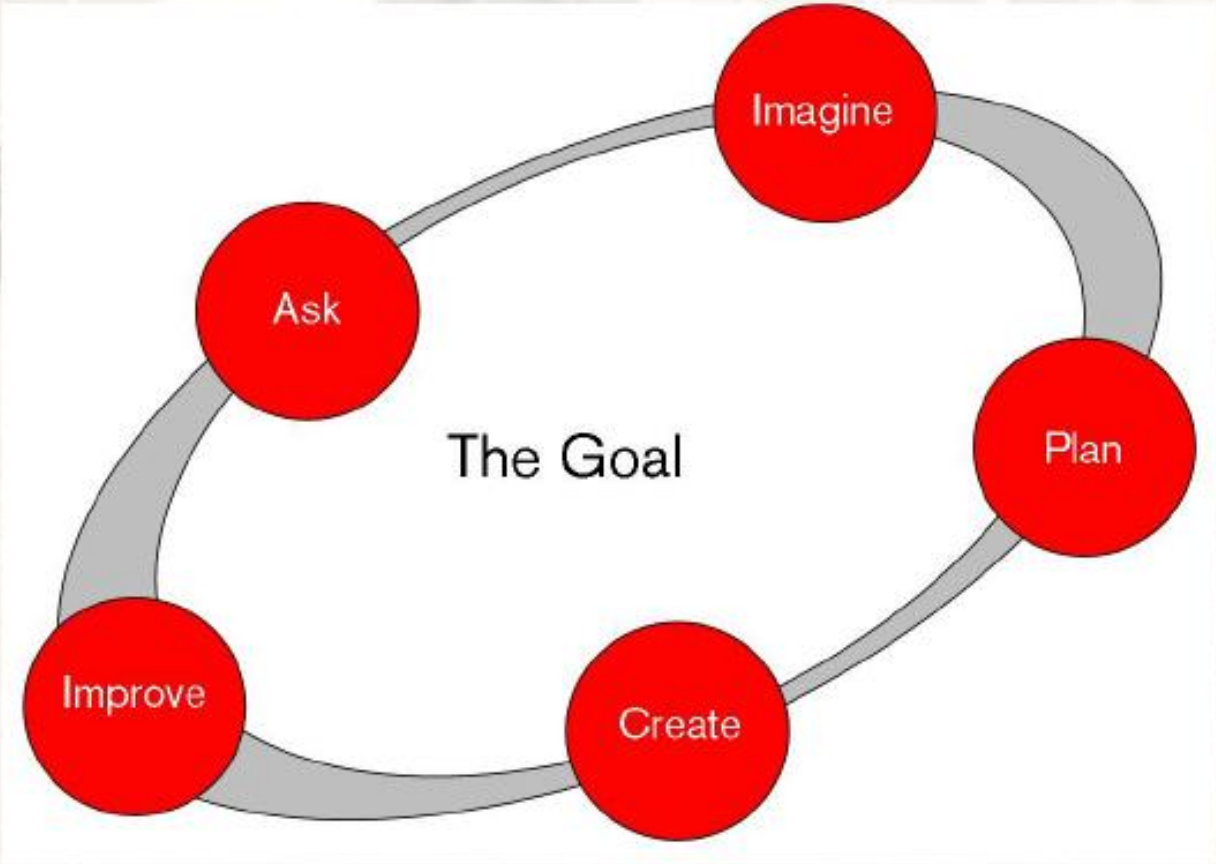
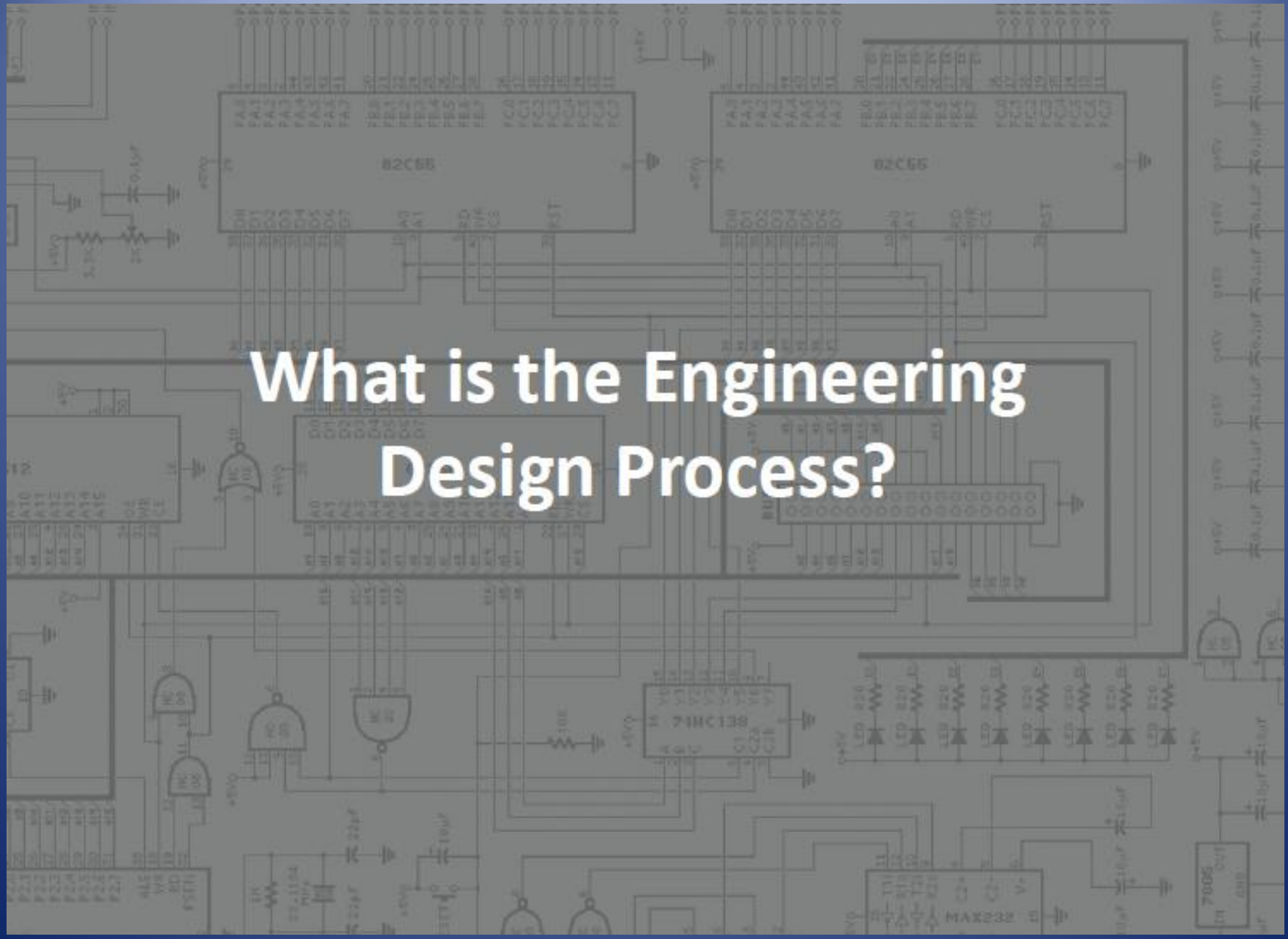

What is Design?

The Engineering Design Process is an algorithm for creation and invention.

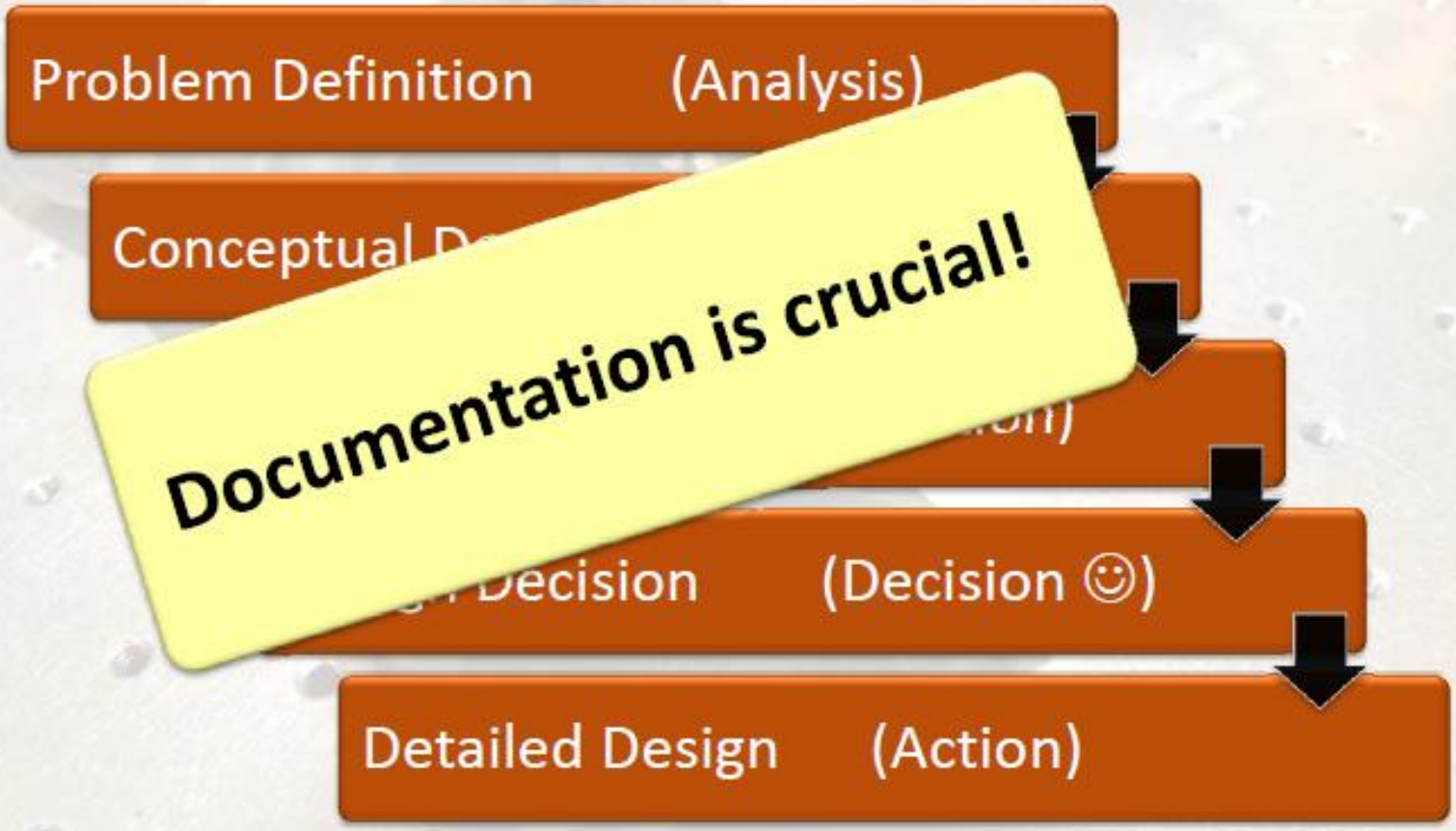



What is the Engineering Design Process?

Problem-solving isn't necessarily design, but it provides a good starting point.

Engineering Design,
Alan Wilcox – Figure 1.3

The Engineering Design Process mirrors standard steps in problem-solving.



Define the problem in detail without implying a particular solution.

Problem Definition

- Establish requirements
- Identify constraints
- Establish functions
- Establish requirements

negotiable objectives
or functions

doing")

- often the result of guidelines and standards

Objectives, constraints, functions and requirements may be broad-based.

- **Some items are absolute – others may be negotiable**
  - **Functionality (inputs, outputs, operating modes)**
  - **Performance (speed, resolution)**
  - **Cost**
  - **Ease of use**
  - **Reliability, durability, security**
  - **Physical (size, weight, temperature)**
  - **Power (voltage levels, battery life)**
  - **Conformance to applicable standards**
  - **Compatibility with existing product(s)**

Both functional and non-functional requirements may be placed on a design.

- **Functional requirements:**
  - support a given load
  - respond to voice commands
  - (output based on input)
- **Non-functional requirements (usually form-focused):**
  - size, weight, color, etc.
  - power consumption
  - reliability
  - durability
  - etc.

Design involves creativity within boundaries. Consider *any* viable solution concept.

Conceptual Design

- **Generate design alternatives**
- **Generate design alternatives**

- must live within the design space
- let the creativity flow
- don't marry the first idea
- beware of "you/we can't…" and "you/we have to…"

Nail down enough design details that a decision can be made.

Preliminary Design

- "Flesh out" leading conceptual designs
- Model, analyze, test, and evaluate conceptual designs

- proof-of-concept
- simulation results
- mathematical models

The “optimal” design solution may or may not be obvious.

Design Decision

- **Select the optimal design based on the findings from the previous stage**

Time to go from idea to reality.

Detailed Design

- Refine and optimize choices made in preliminary design
- Articulate and dime
- Fabricate p ype and move toward production

There is a huge gulf between a great idea and a working prototype!

The Engineering Design Process is generally iterative, not linear.