

Project Design

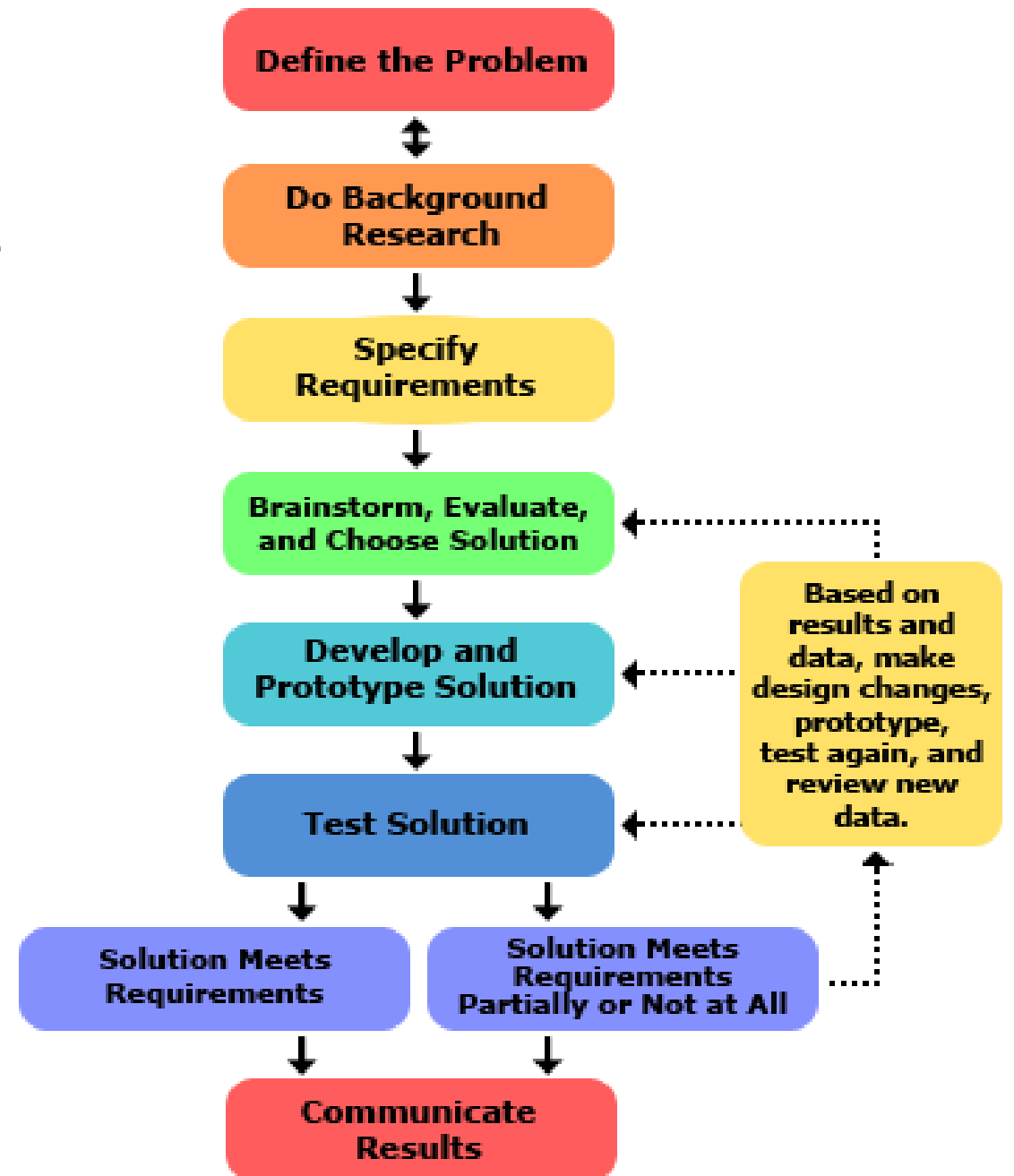
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The Engineering Design Process

- Engineers and designers use the engineering design process to solve a problem by creating new products, systems, or environments.



Define the problem

The engineering design process starts when you ask the following questions about problems that you observe:

- What is the problem or need?
- Who has the problem or need?
- Why is it important to solve?
- [Who] need(s) [what] because [why].

Do Background Research:

- Learn from the experiences of others — this can help you find out about existing solutions to similar problems, and avoid mistakes that were made in the past.
- So, for an engineering design project, do background research in two major areas:
 - Users or customers
 - Existing solutions

Specify Requirements:

- Design requirements state the important characteristics that your solution must meet to succeed.
- One of the best ways to identify the design requirements for your solution is to analyze the concrete example of a similar, existing product, noting each of its key features.

Brainstorm Solutions:

- There are always many good possibilities for solving design problems. If you focus on just one before looking at the alternatives, it is almost certain that you are overlooking a better solution. Good designers try to generate as many possible solutions as they can.

Remember: As a trained problem solver, the engineer has three basic responsibilities:

- 1) determine all possible solution options
- 2) choose the best option, and
- 3) implement the solution.

Because this is nearly impossible, we need a plan to do the best we can..

Choose the Best Solution:

- Look at whether each possible solution meets your design requirements. Some solutions probably meet more requirements than others. Reject solutions that do not meet the requirements

Test and Redesign:

- The design process involves multiple iterations and redesigns of your final solution. You will likely test your solution, find new problems, make changes, and test new solutions before settling on a final design.

Communicate Results:

- To complete your project, communicate your results to others in a final report and/or a display board.
- Professional engineers always do the same, thoroughly documenting their solutions so that they can be manufactured and supported.

Document the Solution

- All ideas and decisions should have been documented along the way. Now it is time to polish the drawings and collect everything in a design report.

The Report

- The "Introduction" of a design report identifies the design problem, the objectives of the design, the assumptions for the design, the design alternatives, and the selection of the design being reported.
- Also included for transition is a mapping of the entire report. Note that in longer reports, the selection of design is often a separate section.

Example

Introduction

This report presents a design of a temperature measurement and display system that incorporated the Motorola 68HC11 microcontroller, simply referred to here as the HC11. This design made use of the HC11's analog-to-digital (A/D) converter and the serial subsystems.

As shown in Figure 1, the design included a temperature sensor connected to one of the HC11's A/D input pins on Port E, and light emitting diodes...

Discussion

- The discussion presents the design itself, the theory behind the design, the problems encountered (or anticipated) in producing the design, how those problems were (or could be) overcome, and the results of any tests on the design.
- Note that this part usually consists of two, three, or four main headings. In regards to the actual names of these headings, pay close attention to what your instructor requests. Also consider what would be a logical division for your particular design.

Conclusion

- The "Conclusions" section summarizes the design and testing work completed and assesses how well the design meets the objectives presented in the "Introduction."
- Note that if the design does not meet the objectives, you should analyze why the design did not succeed and what could be modified to make the design a success.