research design

DTL SU @ AU

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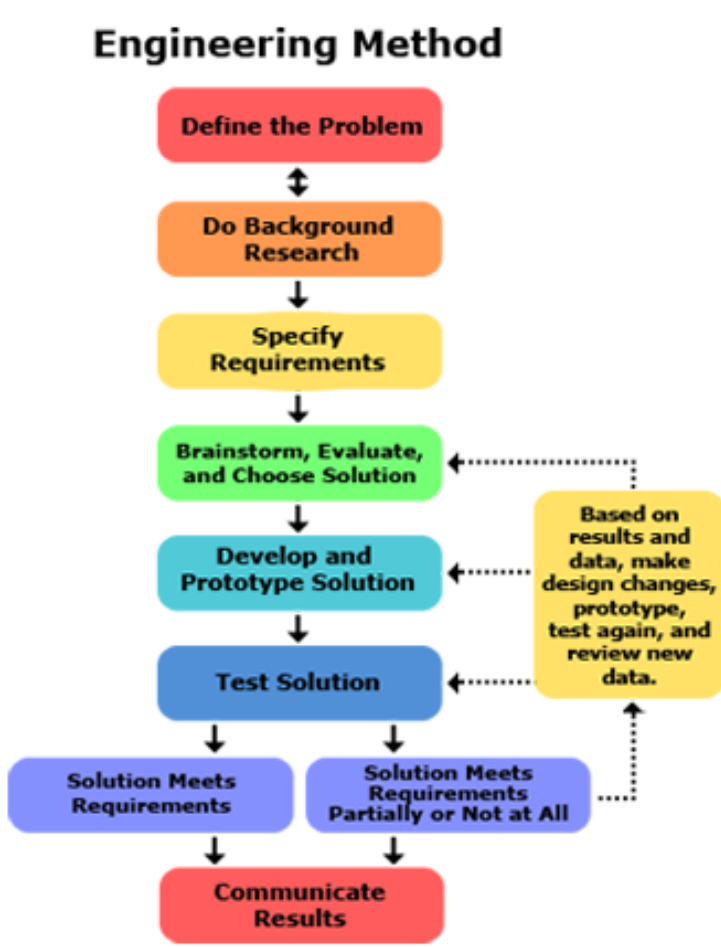
DAI|IMC|AARHUS UNIVERSITY

Outline

- General article structure
- Synopsis structure
- Questions


Scientific Method
Ask a Question
Do Background Research
Construct a Hypothesis
Test with an Experiment
Procedure Working?
No
Yes
Troubleshoot procedure. Carefully check all steps and set-up.
Analyze Data and Draw Conclusions
Results Align with Hypothesis
Results Align Partially or Not at All with Hypothesis
Communicate Results
Experimental data becomes background research for new/future project. Ask new question, form new hypothesis, experiment again!


Engineering Method
Define the Problem
Do Background Research
Specify Requirements
Brainstorm, Evaluate, and Choose Solution
Develop and Prototype Solution
Test Solution
Based on results and data, make design changes, prototype, test again, and review new data.
Solution Meets Requirements
Solution Meets Requirements Partially or Not at All
Communicate Results

General structure

Five components

- *I*ntroduction
- *M*ethods
- *R*esults
- *A*nd
- *D*iscussion

Introduction

Summation of Design ($\sim$) elevator pitch

- Motivation and relevance
- Theoretical background
- Research question
- Hypothesis (theoretical)

Methods

Procedure

- Data
- Design specifics (descriptive, exploratory, hypothesis testing)
- Preprocessing
- Analysis

Results

Findings

- Preamble
- Results
- Summary (pointing towards the discussion)

for each experiment REPEAT Methods and Results

General Discussion

Inference from results and contextualization

- Inference to specific theory
- Inference to more general framework
- Perspective
- Suggest new experiments

Synopsis structure part 1

Outline problem

- IMRAD introduction
- Thorough description and motivation of research question/problem
- Outline competing positions (existing research)
- Include a bit of general discussion

QUALIFY YOUR CHOICES

Synopsis structure part 2

Method and Results

- Method section
- Operationalization
- Data (what, how, and why)
- Suggest design (e.g., descriptive, exploratory, causal)
- Specify pipeline
- Show prototype (results from sample, simulated or hard-coded data)
- Visualization if needed

```
"qualify your choices".upper()
```

```
1 if questions:
2     try:
3         answer()
4     except RunTimeError:
5         pass
6     else:
7         print "thank you"
```