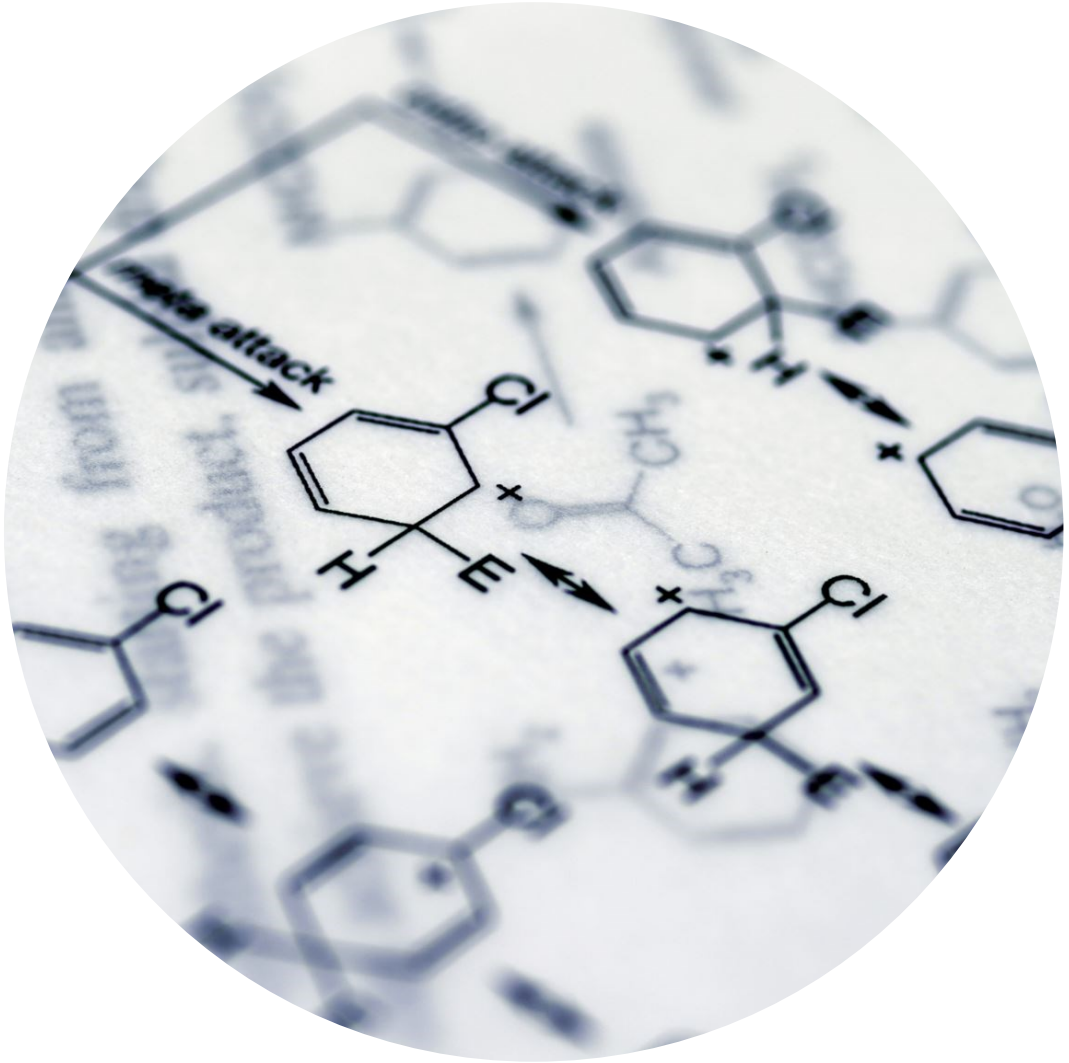
Research Planning

Part 1: Introduction



Research Plans

The research plan is a ***roadmap*** for the research. It will help you to accomplish the **research objectives**, and it will help the supervisor/advisor to facilitate the research process. The research plan can be organized in several ways, but it should include at least the following:

- Topic of research
- Background information
- Description of the research problems
- Objectives of the specific study
- Research methods & materials
- Research Plan / Experiment Cycles

} Flexible structure

- Implementation: Timeline and milestones
- Follow up or evaluation – especially important for large / complex projects

Research Plans

- You must be able to implement the plan . .
  - *in a finite amount of time*
  - *with finite resources*
  - *with defined specific expectations (of outcomes)*
- Your Plan must address
  - *How you plan to test your hypotheses*
  - *How you will analyze and interpret the results of the tests*

Components of a Research Plan

- Topic of Research – already discussed: this includes the research goal(s)
- Background – this includes the critical review of the literature
- Description of the research problem
  - this includes the identification of the need area, or problem to be solved –sometimes called the 'technology gap analysis', long-term outcomes
  - medium-term objective(s)
  - Identifying the driving hypotheses
  - Plan for testing them
- Research Objectives
  - What do you hope to accomplish at the end of the project?
  - Ideally, presented in the context of longer term objectives

Research Methods & Materials

- Sometimes called the "Experimental Plan"
- This includes descriptions of
  - _____
  - The experimental modeling or design approach (plus experimental and/or theoretical or empirical background for the approach),
  - Description of the necessary facilities / apparatus / materials (including methods of obtaining access to rare, expensive, or highly-controlled items)
  - _____
    [Whenever possible, run experiments in parallel!]
  - _____

Research Plan

- Details matter!
  - All important parameters must be controlled (or accounted for)
  - Measurements must be within the capabilities of your facilities
  - _____
  - _____
  - _____

The Experimental Cycle

Major types of errors from experiments

- Type I: conclude that a variable **has** an effect (or a **particular** effect) on the experimental outcome (when it does not)

- Type II: conclude that a variable has **no** effect (or **does not** have a **particular** effect) on an experimental outcome (when it does)

Both can usually be avoided by good experimental design and research planning.

Implementation/Planning Tools

- MANY, many good tools available. Some of these are described in Chapter 6 of Fogler & LeBlanc (see recommended text books)
- Time and resource allocation
  - Task Trees
  - Gantt Charts
  - Deployment Charts
  - Critical Path Management
- More about this in Part 2

The End