



PREPARE RESEARCH PROPOSAL

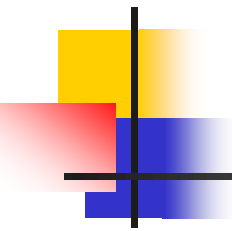
INFO7016 Postgraduate Project A

School of Computer, Data and Mathematical Sciences



Definition of Research

- Scholarly or scientific investigation or inquiry aimed at the discovery and interpretation of facts, or
- the revision of accepted theories in the light of new facts, or
- the practical application of such new or revised theories or laws



Primary Purpose of Research

(From Wikipedia)

- Discovering, interpreting, and the development of methods and systems for the advancement of human knowledge on a wide variety of scientific and social matters of our world.



Scientific Research

(From Wikipedia)

- Provides scientific information and theories for the explanation of the nature and the properties of the world around us
- Follows a certain structural process in which scientific methods are applied
- The process must be objective to reduce biased interpretations of the results
- The outcome must be independently verifiable



Scientific Method

- Is based on gathering observable, empirical and measurable evidence subject to specific principles of reasoning
- Consists of the collection of data through observation and experimentation, and the formulation and testing of hypotheses



The Linear Process of Scientific Research

- Formation of the topic and theory
- Establishment of Hypothesis
- Conceptual definitions
- Gathering of data
- Analysis of data
- Test, revising of hypothesis
- Conclusion, iteration if necessary



The Non-linear Theory of Research

- Half form theory
- Preliminary experiments
- Refined theory (mistakes)
- Form hypothesis
- Discuss with colleagues (go drink, cry, etc)
- Back to beginning
- Form new theory



The Non-linear Theory of Research (continued)

- Eliminate errors from experiments
- Test hypothesis
- Pressure to write out results
- Reform the entire process into a scientifically acceptable form (linear model)
- Pretend to be a “proper scientist”



Prepare a Proposal

Where	Develop a question, conduct preliminary literature review and identify the problem
What	Define objective and scope
How	Develop methodology
When	Draft a plan

More details below in regards to “Choosing a Topic”, “Conducting Literature Review”, “Defining Research Objectives”, “Expected Outcomes”, and “Planning” ...



Choosing a Topic

- The topic should interest you and professional and general communities
- You have done preliminary literature study relevant to the topic
- The topic is original
- The outcome of the research will contribute to the science and engineering literature



Choosing a Topic

(continued)

- Your personal strengths and weaknesses should be taken into account
- Topics arising from your workplace activities are often suitable
- You should recognise the limitations imposed by time and research facilities
- Do not knowingly choose a topic addressed previously unless you have something new to add



Literature Review

- The first stage of a research project
- “If I can see a long way it’s because I stand on the shoulders of giants”



Literature Review

(continued)

- General background review leading to the research problem
 - What is our current understanding of the topic
- Specific review in relation to the identified problem
 - Has any research been done to address the problem?
 - How was it done?
 - What were the findings or conclusions?
 - What is in dispute
 - What can I use to
 - support my concept
 - justify my approach
 - compare with my results
 - backup my analysis and conclusion



Literature Review (continued)

- Types of literature source
 - Books
 - Learned journal papers
 - Conference papers
 - Popular magazine (unrefereed)
 - Internet



Literature Review

(continued)

Tips

- Always go to the source of information
- Seek out review articles
- Relevance – choose the relevant articles
- Summary
 - What have other people done
 - How was it done (optional)
 - What were the findings or conclusions



Literature Review (continued)

Golden Principles

- Be critical
 - question the findings
 - Identify the limitations
 - search for gaps
 - search for supports (evidence)
- Be humble
 - draw appropriate review conclusion
 - Know the limit of your own knowledge



Define Research Objectives

- When you have done some literature review
- When you have identified a problem
- When you know where you are
- When you have a clear idea of what you are going to do



Define Research Objectives (continued)

Tips

- Have a focus
- Have a defined scope
- Ensure that the objectives are achievable
- Think of outcomes



Research Methodology

- How is your objective going to be achieved?
- How are you going to collect information, conduct analysis and draw conclusion?
- Term of reference
 - Identify the parameters to be investigated
 - Establish the criteria



Research Methodology

(continued)

- Types of Research Methods
 - Survey
 - Case Study
 - Computer simulation
 - Laboratory experimentation



Research Methodology

(continued)

Survey

- Review of published material
- Selecting variables and hypotheses
- Developing indicators
- Ethics approval
- Pilot studies
- Specification of a sample population
- Sampling and statistical significance
- Data reduction
- Data analysis



Research Methodology

(continued)

Case Study

- Review of published material
- Selecting variables and hypotheses
- Developing indicators
- Selecting cases
- Data analysis
 - What can be generalised?
 - What is specific?
 - What can be compared (multiple cases)?
- May be supplementary to survey



Research Methodology

(continued)

Computer Simulations

- Identify and isolate key parameters
- Identify the range of variation
- Scaling
- Systematic testing
- Random testing
- Data processing
- Result analysis
- Limitations, verification and validation



Research Methodology

(continued)

Experiments

- Identify and isolate key parameters
- Identify the range of variation
- Scaling
- Systematic testing
- Random testing
- Data processing and error analysis
- Result analysis



Various Methods of Analysis (lateral thinking)

- Generation of alternatives
- Challenging assumptions
- Innovation
- Suspend judgment
- Dominant ideas and crucial factors
- Analogies



Expected Outcomes

- Describe the deliverables;
- Must be related to the objectives.



Planning

- Timing
- Sequencing
- Resource



Golden Rule of Research

- Focus!
- Focus!
- Focus!



Additional Readings

- How to Write a Project Proposal at <https://www.projectmanager.com/blog/how-to-create-a-project-proposal>
- The Project Proposal Toolkit at <https://project-proposal.casual.pm/>