Engineering Institute of Technology.

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Phase 1: Foundation (Laying the Groundwork): DEng Program: **From Concept to Research Problem – Defining an Engineering Challenge**

5 February 2026

Presenter: Emeritus Professor Akhtar Kalam

EIT EMERITUS PROFESSOR

About EIT

We are dedicated to ensuring that you receive a world-class education and gain skills that you can immediately implement in the workforce.

Engineering Specialists

EIT is one of the only institutes in the world specializing in Engineering. We deliver professional certificates, diplomas, advanced diplomas, undergraduate and graduate certificates, graduate diplomas, bachelor's and master's degrees, and a Doctorate of Engineering.

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Our programs are designed by industry experts, ensuring you graduate with cutting-edge skills that are valued by employers. Our program content remains current with rapidly changing technology and industry developments.

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Our vocational programs and higher education degrees are registered and accredited by the Australian Government. We have programs that are also recognized under three international engineering accords.

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Our lecturers are highly experienced engineers and subject specialists with applied knowledge. The technologies employed by EIT, both online and on-campus, enable us to source our lecturers from a large, global pool of expertise.

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We deliver our programs via a unique delivery methodology that makes use of live and interactive webinars, an international pool of expert lecturers, dedicated learning support officers, and state-of-the-art such as hands-on workshops, remote laboratories, and simulation software.

Introduction – Presenter

Emeritus Professor Akhtar Kalam

Emeritus Professor at Victoria University and EIT.
Academic Director and Chair of the Academic Board - Texila College Australia.
Director of Al-Kalam Educational Solutions.
Editor-in-Chief of AJEEE
Distinguished Professor/Adjunct Faculty in Australia, India, Malaysia and Oman.
He has published over 610 publications in his area of expertise and has written over 29 books.
Supervised 51 postgraduate research students to graduation, including 39 PhD's and 12 MEngs. Currently, 10 postgraduate research students (four PhD students at VU and six DEng students at EIT) are being supervised.
Public, University, and Motivational Lecturer.
Consultant for the electricity supply industries in Australia and overseas.
Assisted in change management plans for Universities and the higher education sector.

Education

The University of Bath, Bath, UK, D.Eng., Electrical Engineering
The University of Oklahoma, Norman, USA, MS, Electrical Engineering
Aligarh Muslim University, Aligarh, India, BSc. Eng., Electrical Engineering
St Xavier's College, Calcutta, India, Applied Science

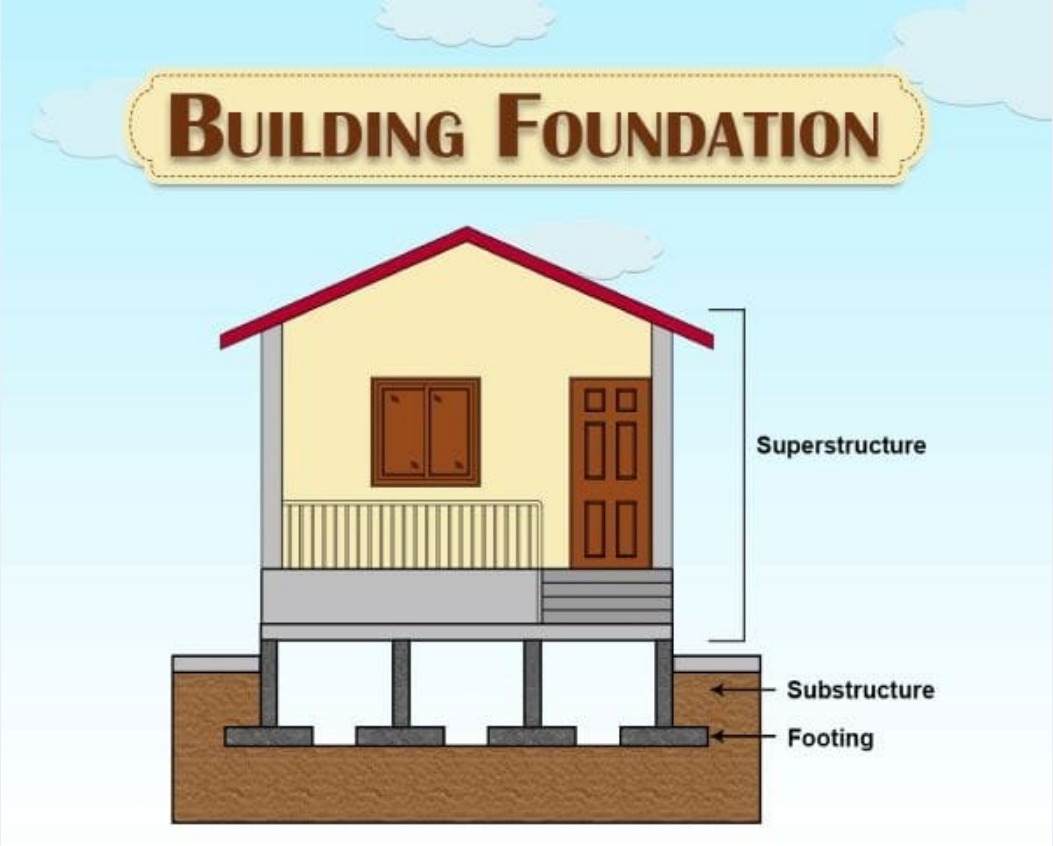
Professional Society Activities

Australian Institute of Energy – Fellow
Engineers Australia – Fellow
The Institution of Engineers and Technology, UK – Fellow.
The Institution of Electrical and Electronic Engineers, USA –Life Senior Member.

"My vision is to provide exciting higher education science and engineering courses, research, consultancy and collaborate in development work of the industry and communities within Australia and beyond."

Why the Foundation Stage Matters

- Sets direction for the entire DEng
- Determines feasibility and impact
- Prevents years of misaligned research

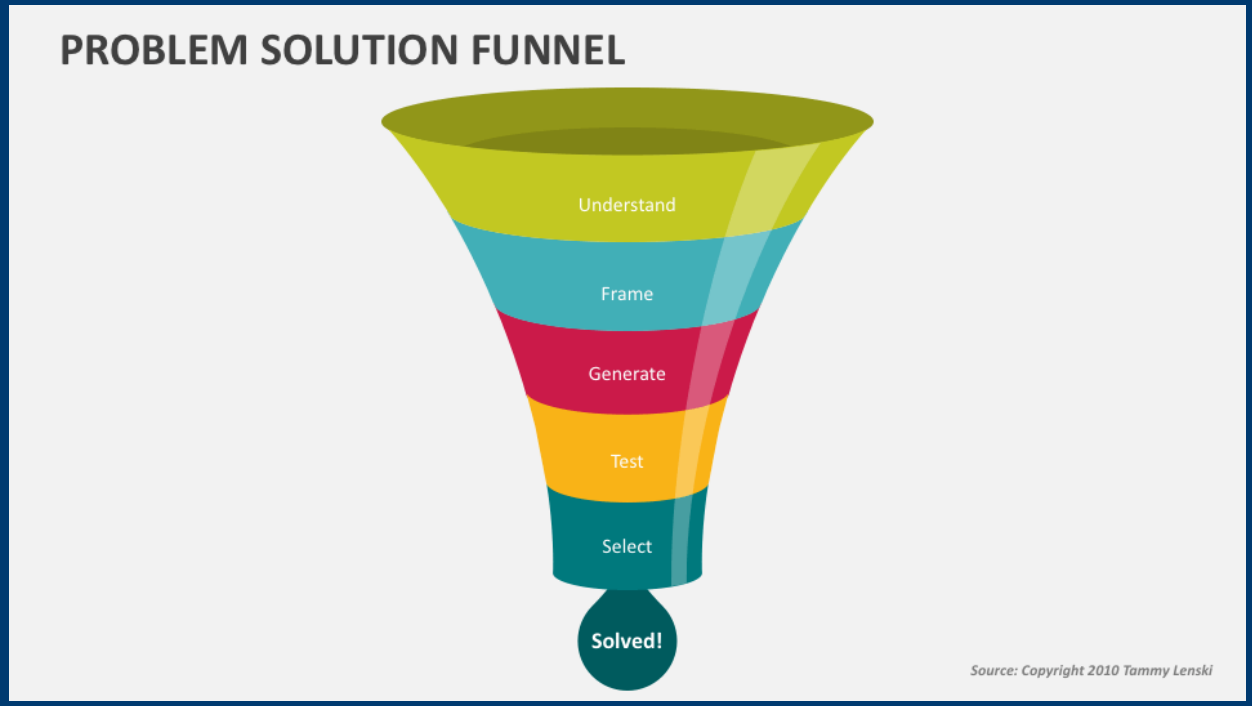


What Is a Doctoral Engineering Challenge?

- Complex, real-world engineering problem
- Requires original contribution
- Cannot be solved by routine methods

From Idea to Research Problem

- Initial interest or observation
- Technical gap identification
- Formal research problem definition

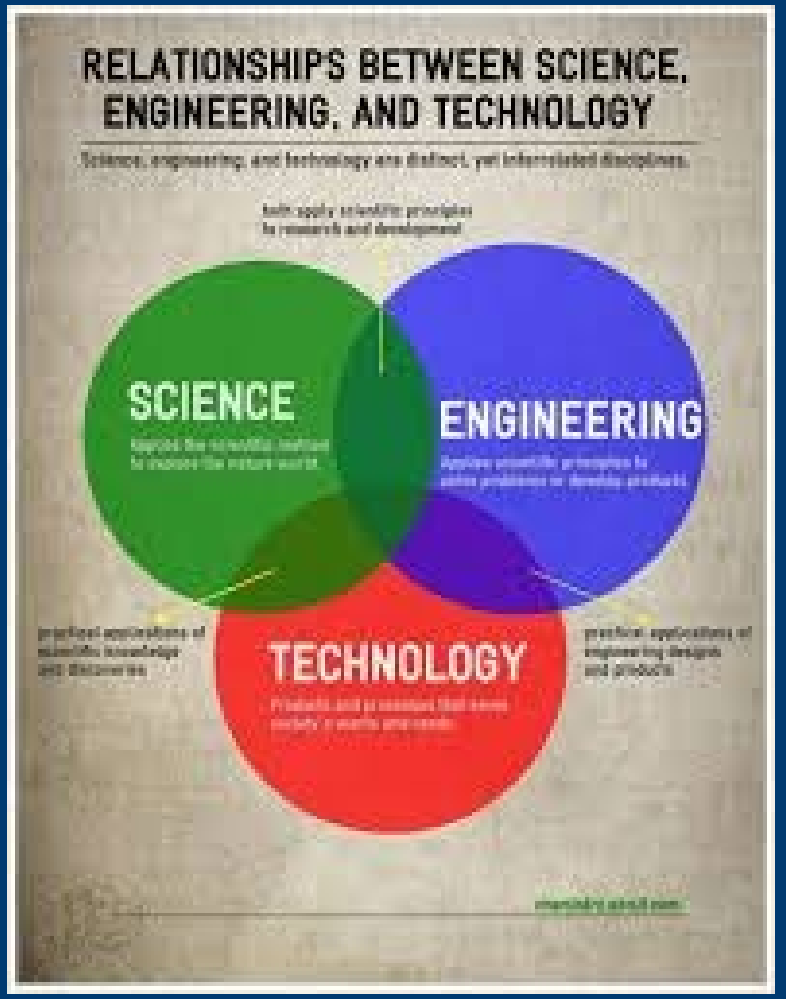


Sources of Doctoral Research Ideas

- Industry challenges
- Literature gaps
- Government and societal needs
- Supervisor research programs

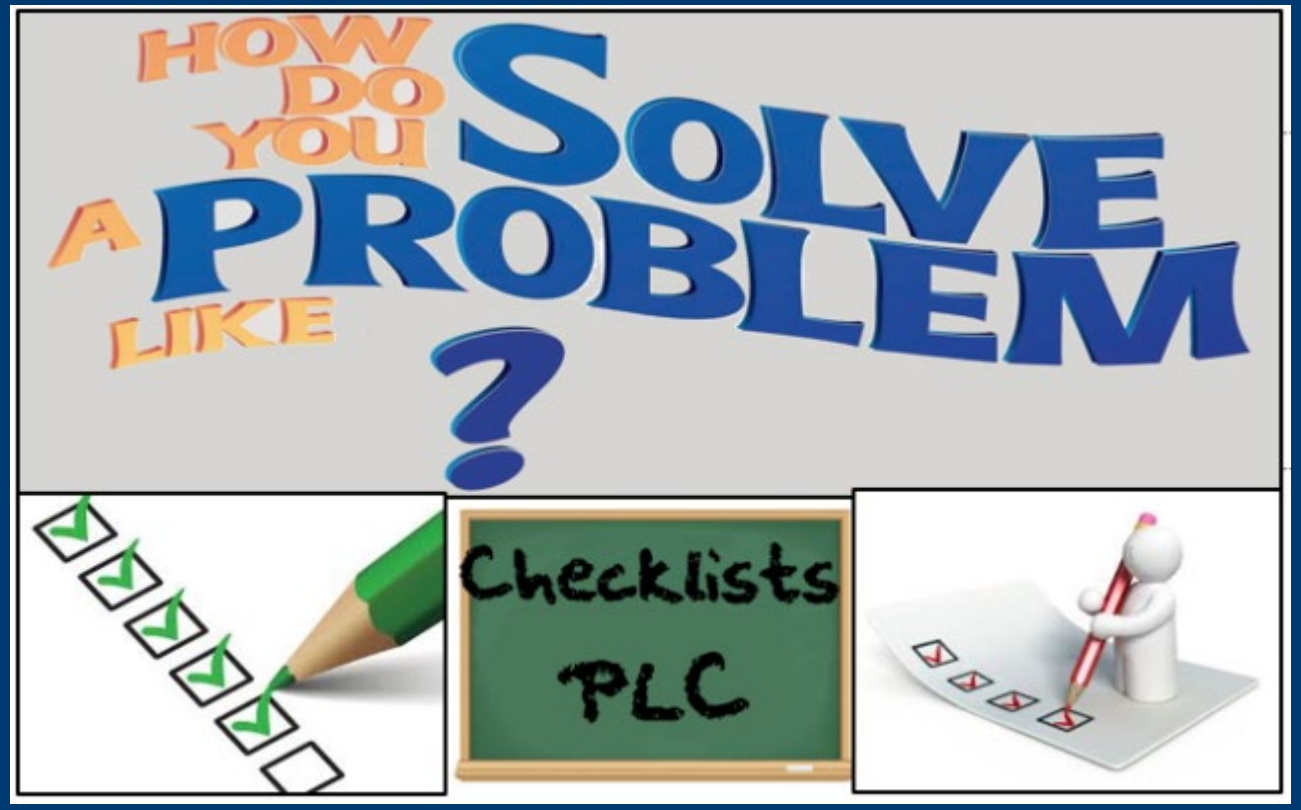
Engineering vs Scientific Research Problems

- Engineering: solution-oriented
- Science: explanation-oriented
- PhD engineering blends both



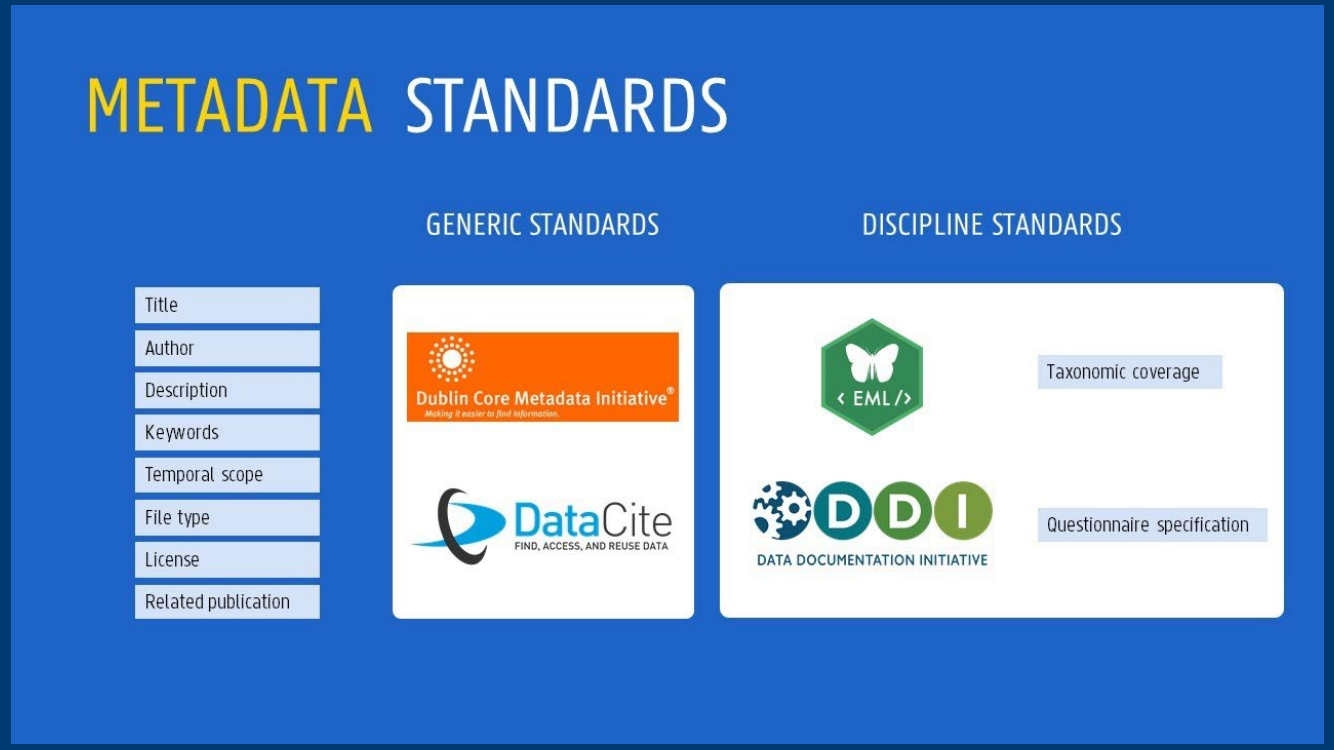
Characteristics of a Strong Engineering Problem

- Novel
- Significant
- Feasible within time/resources
- Measurable outcomes



Understanding the State of the Art

- Systematic literature review
- Standards and codes
- Existing technologies and patents

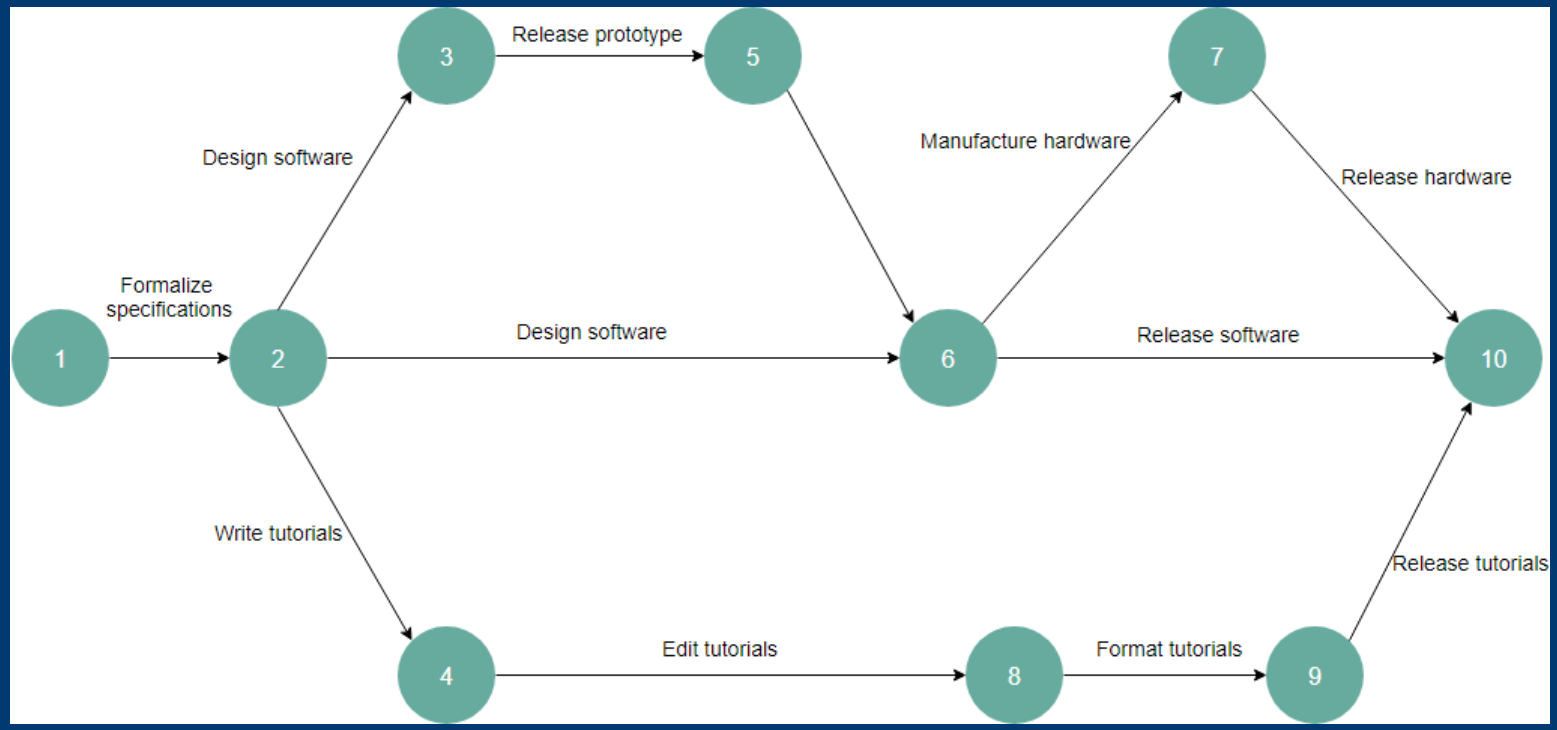


Identifying the Research Gap

- What is known?
- What is partially solved?
- What remains unsolved?

Translating Gaps into Problems

- Gap → challenge
- Challenge → researchable question



Engineering Constraints to Consider

- Cost
- Safety
- Sustainability
- Standards compliance

Defining the Problem Statement

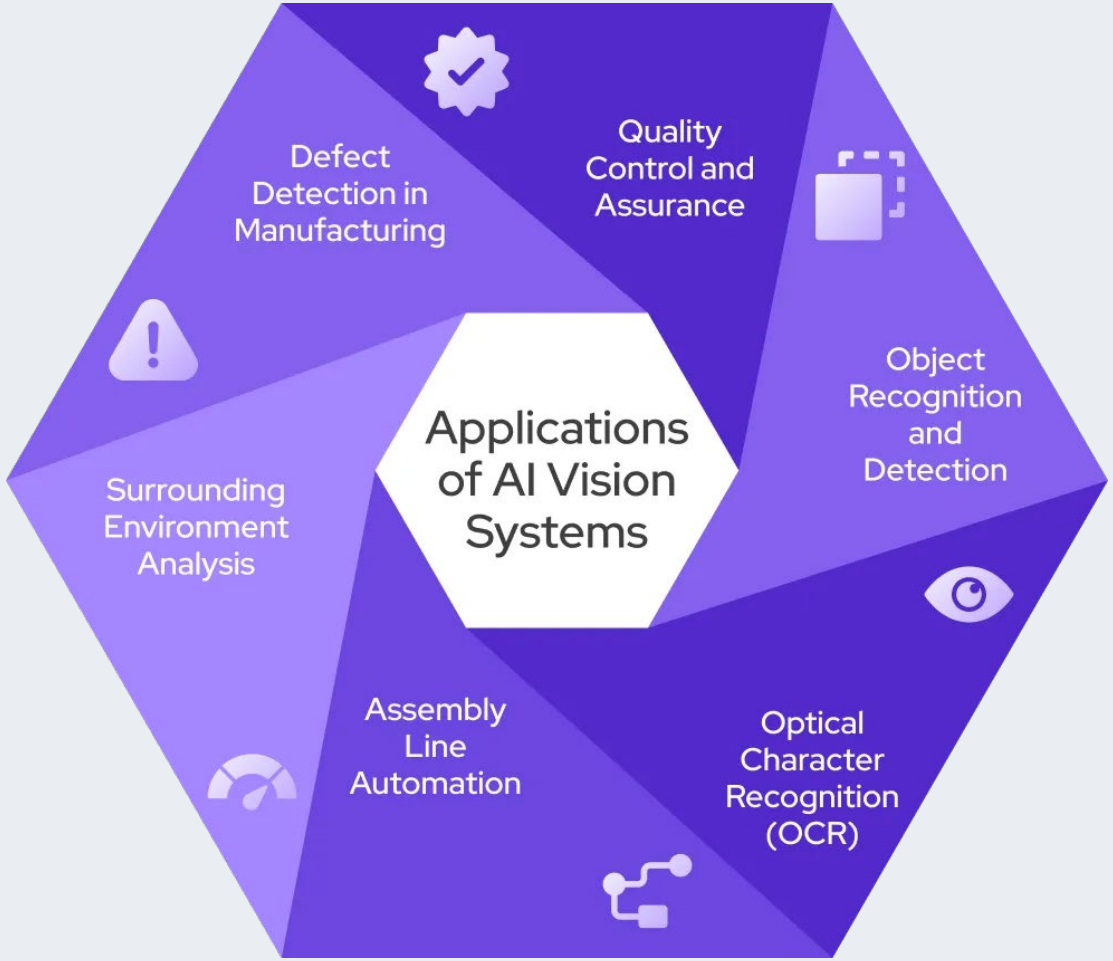
- Clear and concise
- Technically precise
- Outcome-focused

Example: Power Engineering PhD Problem

- Renewable integration instability
- Grid resilience under uncertainty

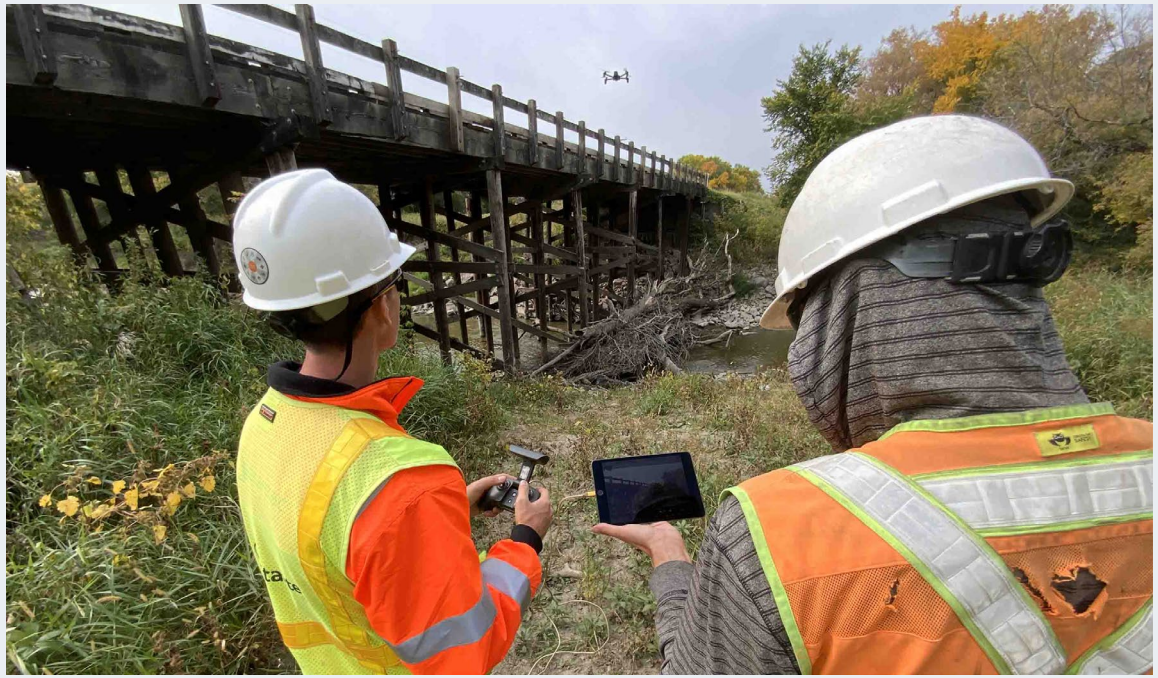
Example: AI in Engineering Systems

- Data reliability issues
- Explainability and safety



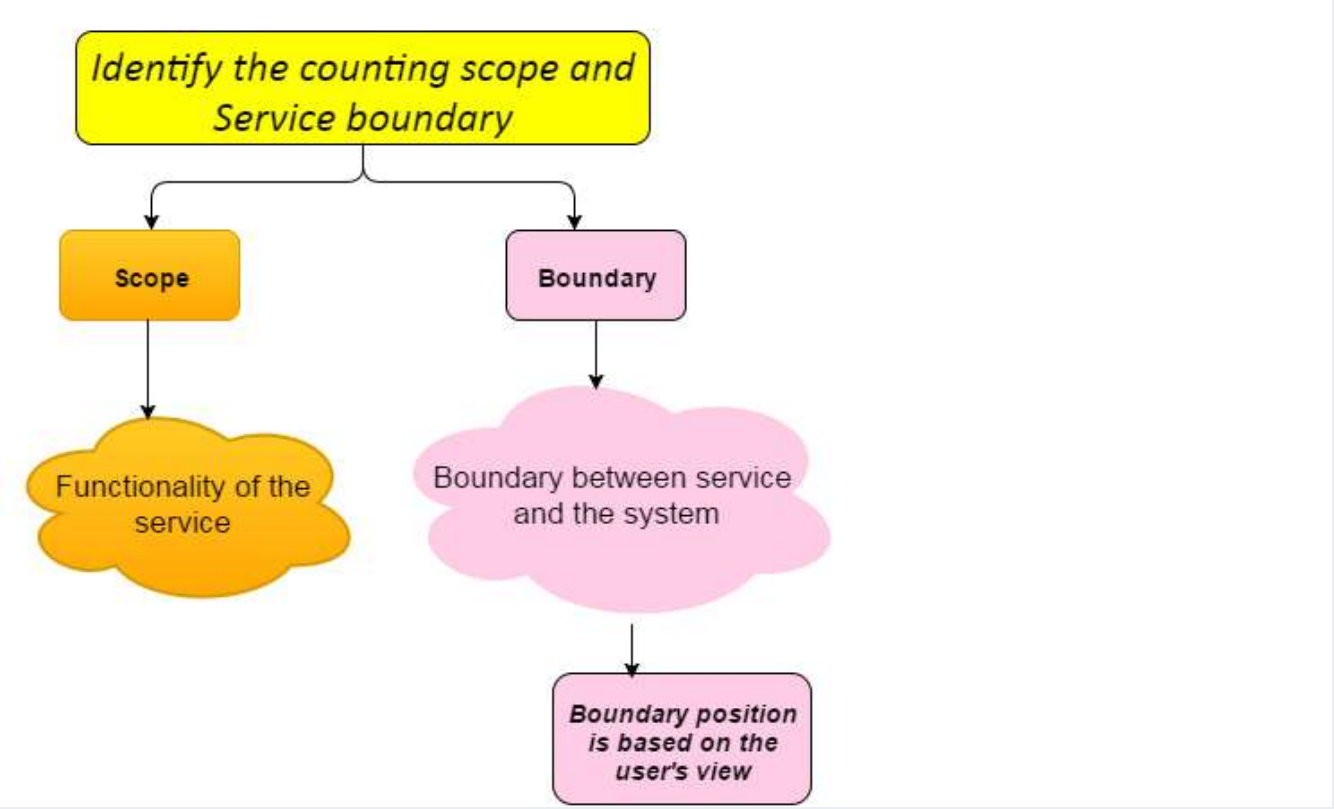
Example: Civil Infrastructure Research

- Aging structures
- Predictive maintenance challenges



Scope Definition

- What is included?
- What is excluded?
- Why boundaries matter?



Research Objectives

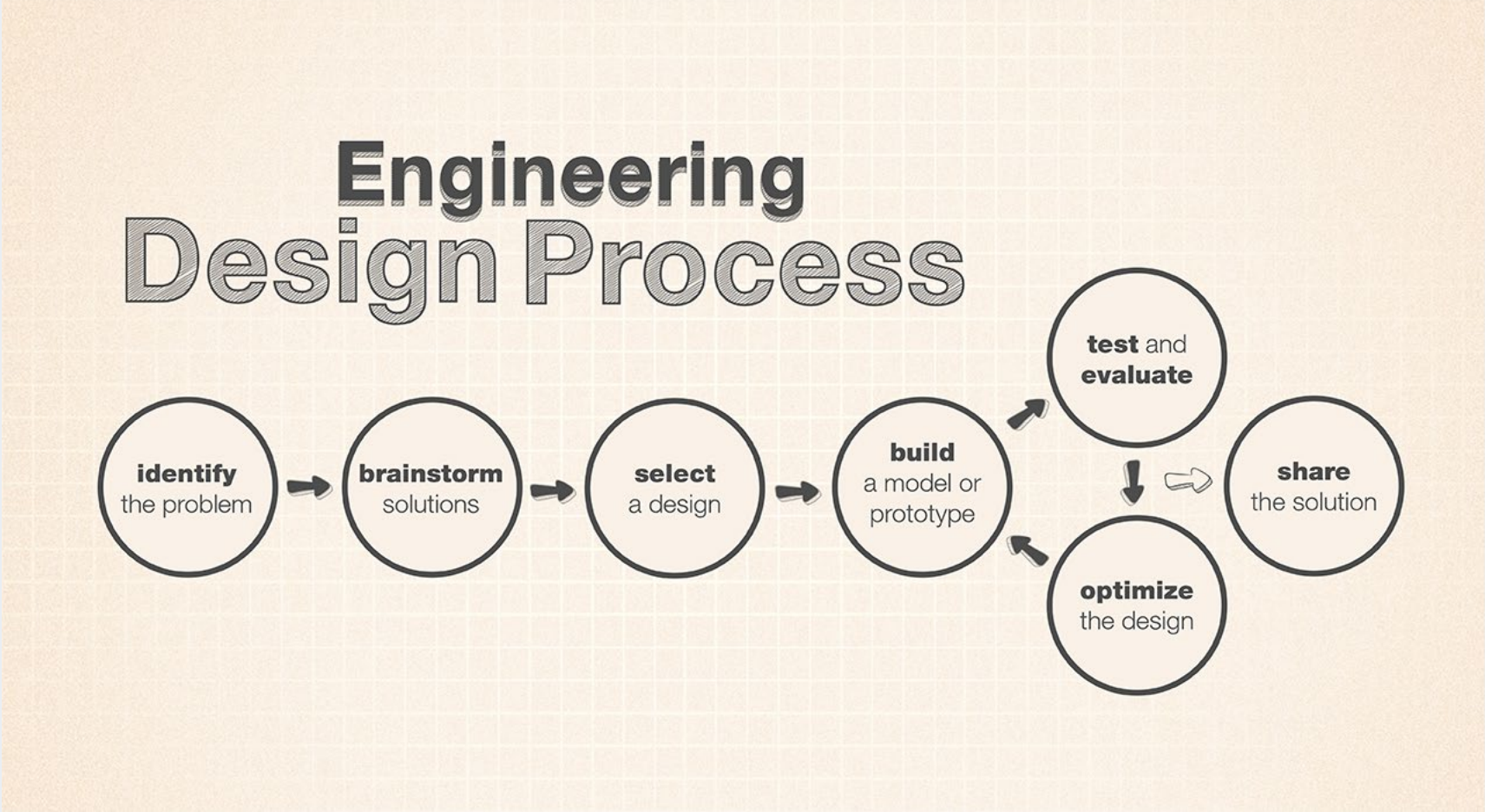
- Primary objective
- Supporting objectives

Research Questions vs Hypotheses

- Exploratory vs predictive
- Engineering-specific framing

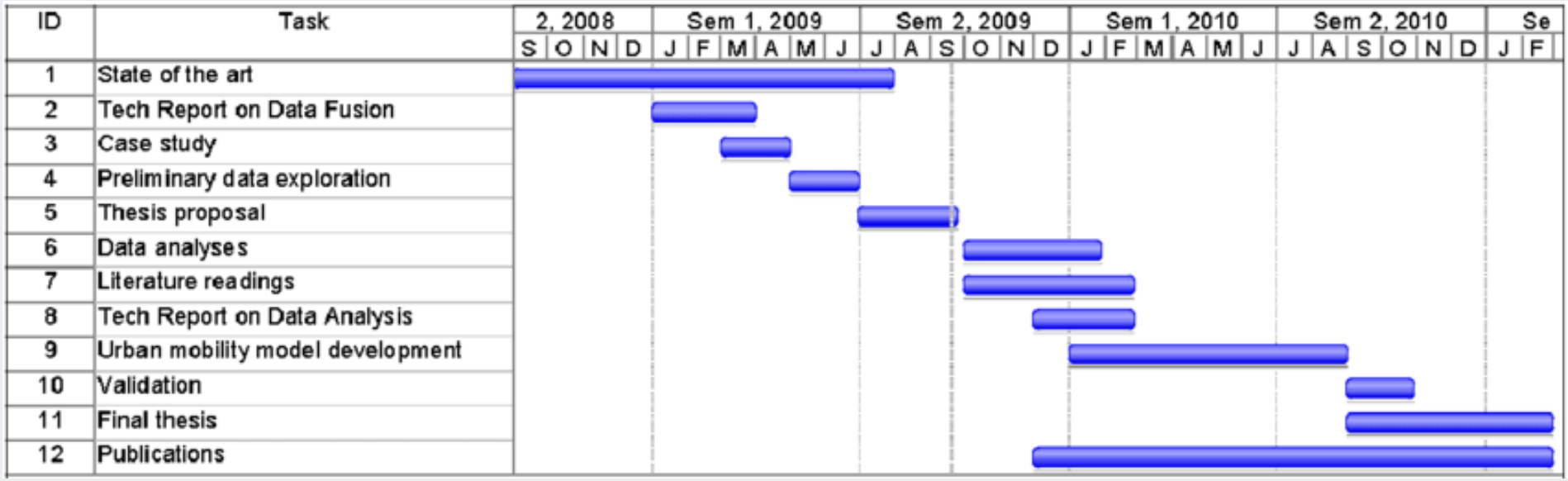
Methodological Alignment

- Modelling
- Simulation
- Experimentation
- Field validation



Feasibility Check

- Timeframe (3 years)
- Resources
- Data availability



ID	Task
1	State of the art
2	Tech Report on Data Fusion
3	Case study
4	Preliminary data exploration
5	Thesis proposal
6	Data analyses
7	Literature readings
8	Tech Report on Data Analysis
9	Urban mobility model development
10	Validation
11	Final thesis
12	Publications

Role of the Supervisor

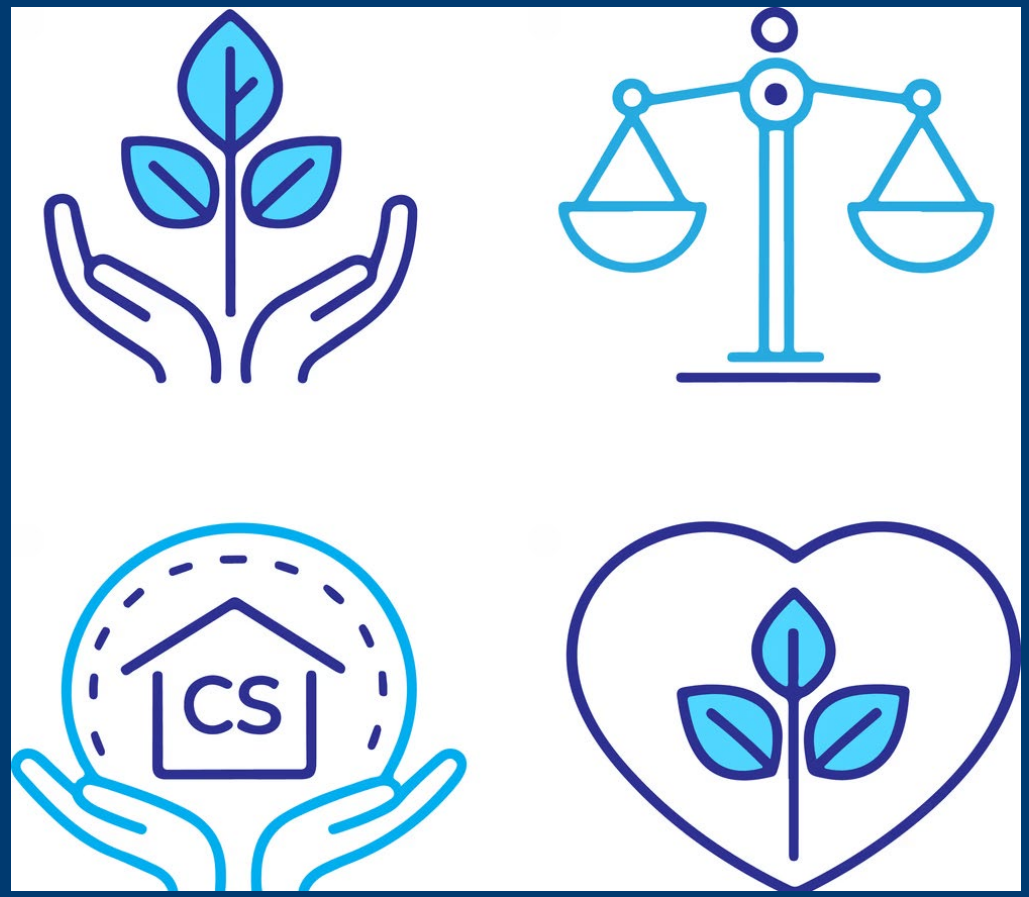
- Refining scope
- Ensuring novelty
- Aligning with expertise

Common Mistakes to Avoid

- Too broad
- Incremental only
- Poorly justified

Ethical and Societal Considerations

- Safety
- Environmental impact
- Responsible innovation



Aligning with Doctoral Outcomes

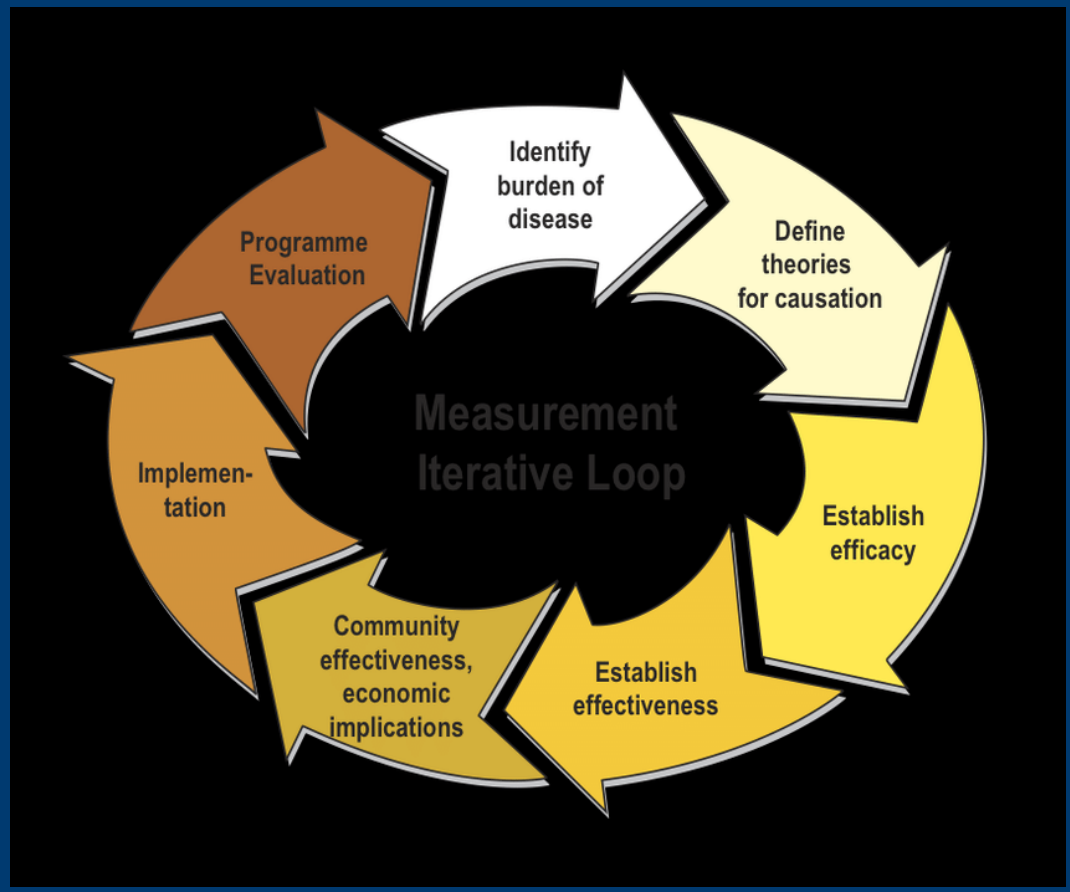
- Original contribution
- Peer-reviewed publications
- Industry or societal impact

Testing the Research Problem

- Can it be defended?
- Can it be examined?
- Can it be published?

Iteration Is Normal

- Problem evolves
- Refinement over first year

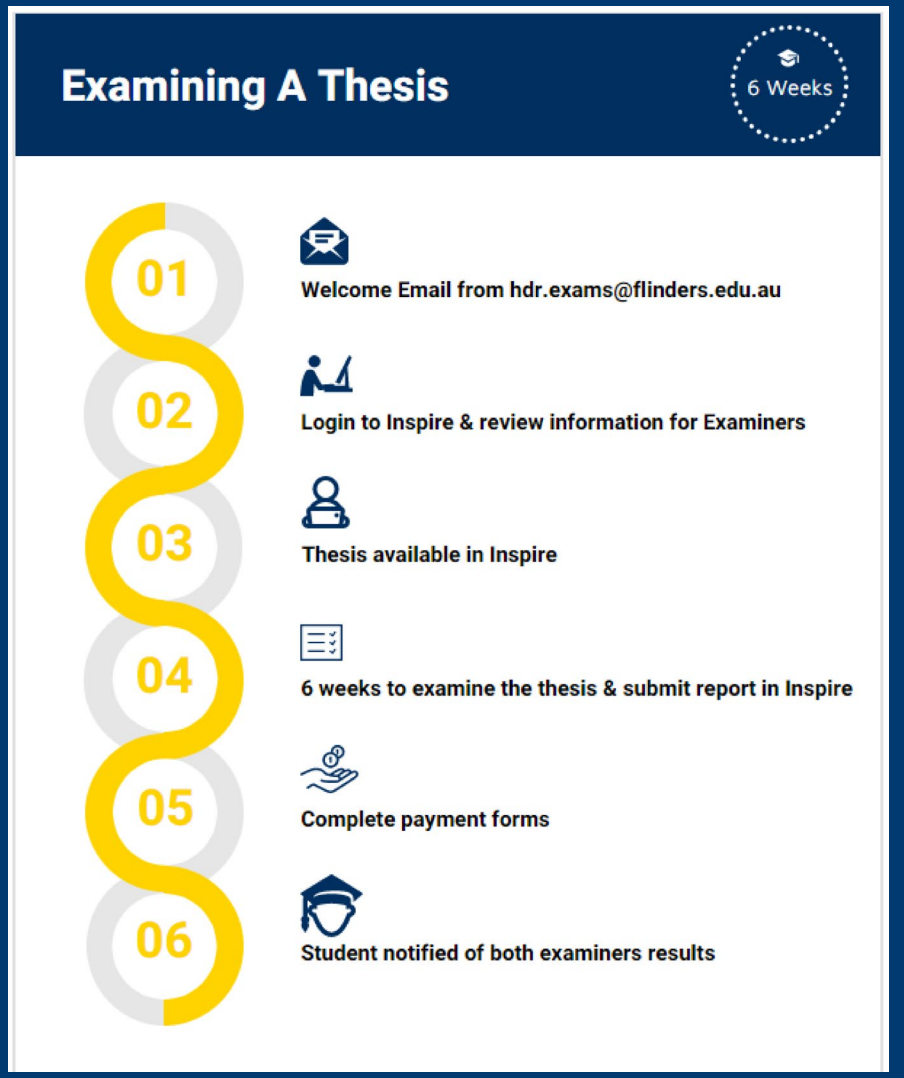


Proposal as a Foundation Document

- Problem statement
- Objectives
- Methodology

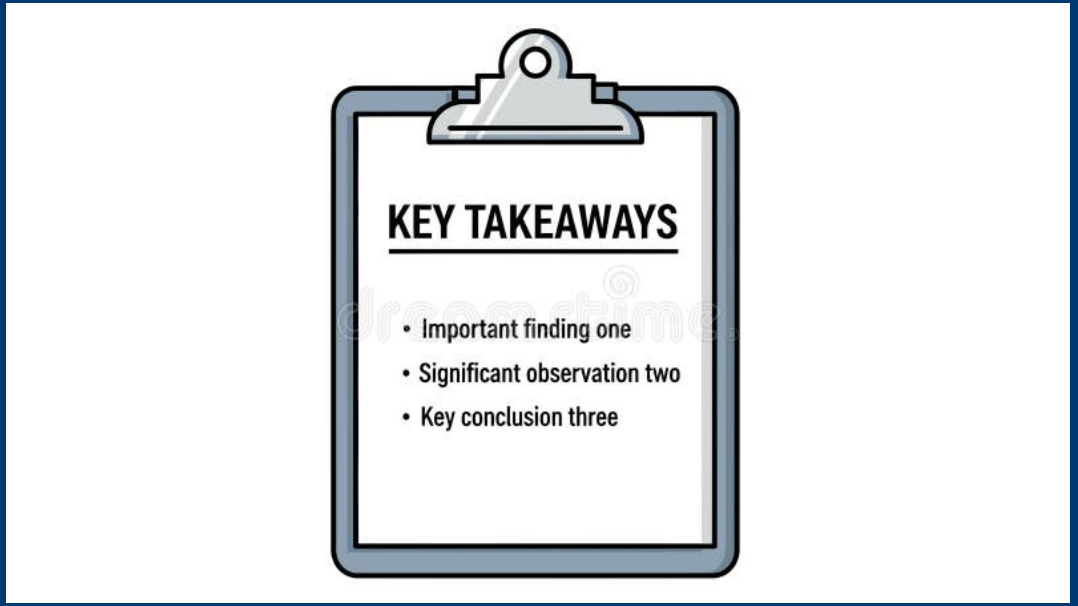
Examiner Perspective

- Is it engineering?
- Is it novel?
- Is it rigorous?



Key Takeaways

- Strong foundation = successful PhD
- Problem definition is critical



Final Advice to Prospective Students

- Be curious
- Be critical
- Be patient

Thank You!

Upcoming courses

Courses	Start Date
Doctor of Engineering (online) 36 months	20/07/2026
On-Campus – Doctor of Engineering 36 months Perth/Melbourne	27/07/2026

Find MORE courses here: https://www.eit.edu.au/schedule/

Upcoming Doctoral Webinars

All upcoming Doctoral Webinars:
https://www.eit.edu.au/event/doctoral-research-toolbox-chat-with-emeritus-professor-akhtar-kalam/

5 March – The Art of the Engineering Literature Review

Phase 2: Research Practice (Designing and Executing Research)
2 April – Designing Rigorous Engineering Research: Methods, Models, and Validation
7 May – Tools of the Trade: Simulation, Experimentation, and Data Analytics
4 June – Research Integrity, Safety, and Ethics in Engineering
2 July – Supervisory and Industry Collaboration: Working as a Research Engineer
6 August – Managing the DEng: Planning, Time, and Resources

Phase 3: Completion & Impact (Delivering and Beyond)
3 September – Communicating Engineering Research: Writing and Presenting Effectively
1 October – From Lab to Field: Translating Research into Real-World Engineering Applications
5 November – Resilience, Reflection, and the Doctoral Mindset
3 December – Building Your Research Identity: Patents, Publications, and Professional Pathways

Q&A

Survey

Thank you for participating.

Kindly fill out this survey:

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