Engineering Institute of Technology.

Phase 3: Completion and Impact (Delivering and Beyond) Communicating Engineering Research: Resilience, Reflection, and the Doctoral Mindset

Watch Webinar Recording Here

5 November 2026

Presenter: Emeritus Professor Akhtar Kalam

EIT EMERITUS PROFESSOR



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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 56 postgraduate research students to graduation, including 38 PhD's, 5 DEng and 13 MEngs. Currently, 7 postgraduate research students (4 PhD students at VU and 3 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."

Agenda

1	The Doctorate as a journey
2	What does “impact” mean?
3	Communicating complex engineering research
4	Resilience
5	Reflection
6	The Doctoral mindset
7	Completing the doctorate
8	Beyond the thesis
9	Building your researcher identity
10	The call to the next generation
11	Final message and conclusion



SECTION 1 — THE DOCTORATE AS A JOURNEY

Resilience, Reflection, and the Doctoral Mindset

- From research problem → knowledge → engineering solution
- From thesis completion → professional impact
- Developing the researcher, not only the research



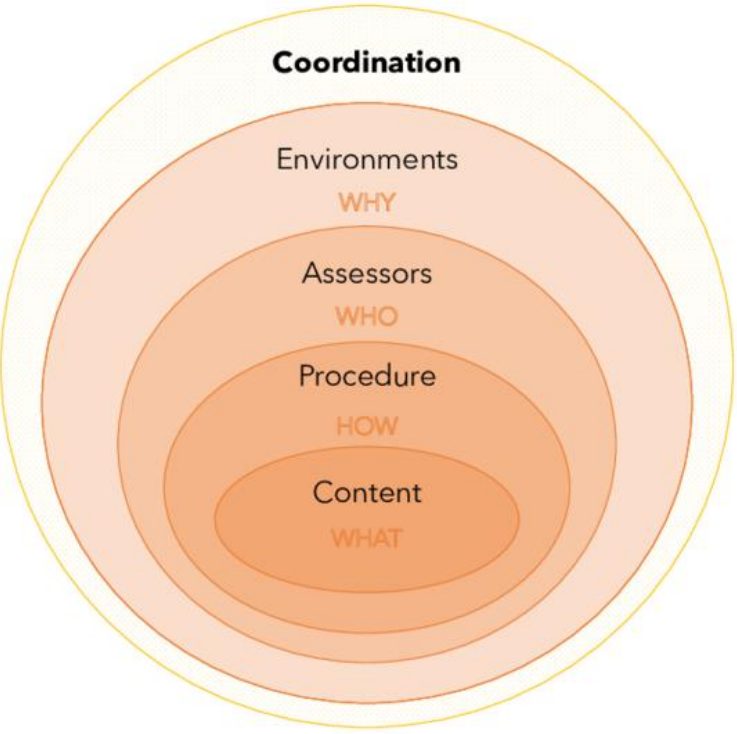
The Central Question - What does it really mean to complete a doctorate?

Completion is more than:

- Submitting a thesis
- Passing the examination
- Receiving the degree

True completion involves:

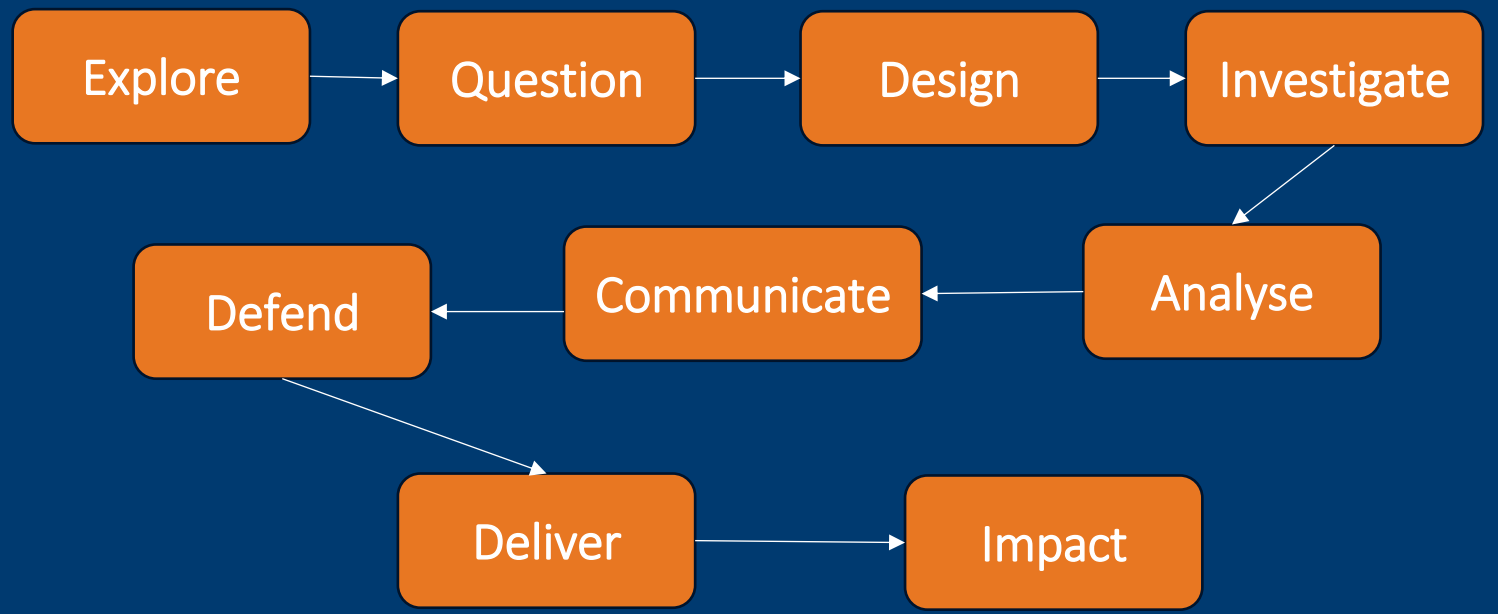
- Knowledge contribution
- Research independence
- Communication capability
- Professional identity
- Potential for impact





The Doctoral Journey

Engineering Institute of Technology.

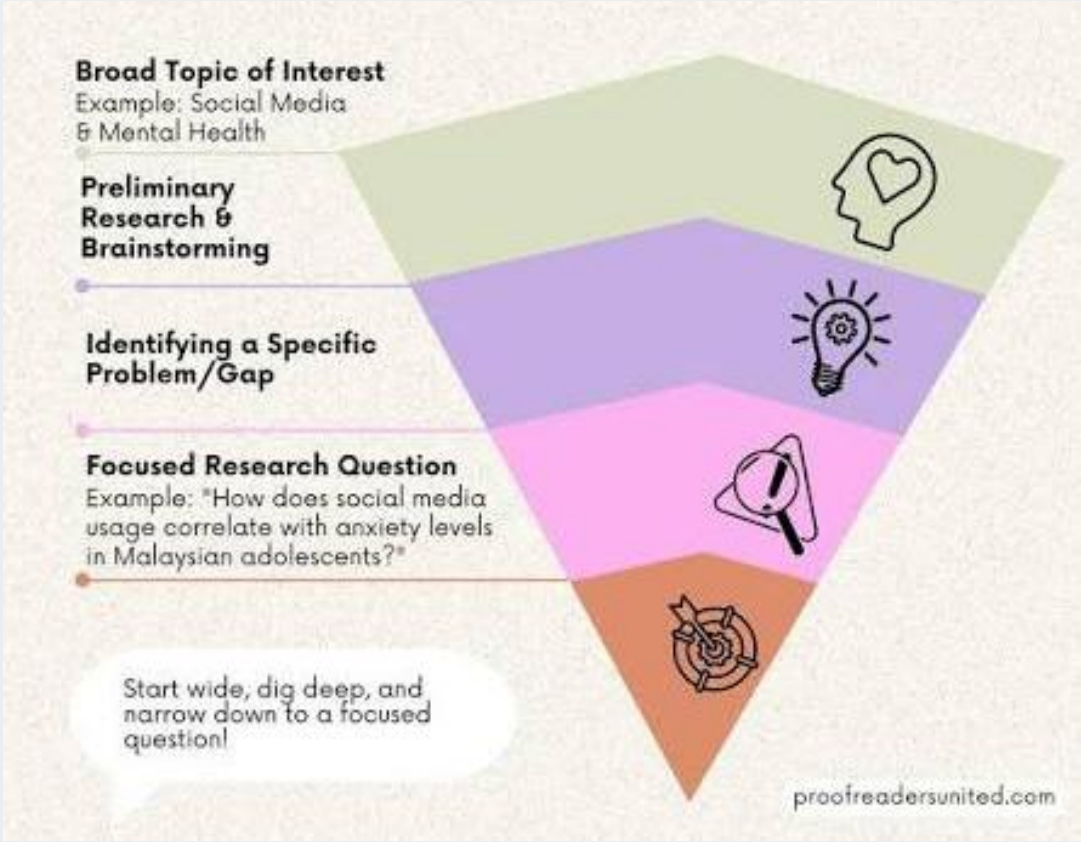


Engineering Research Is About Problems

Great engineering research begins with a significant problem.

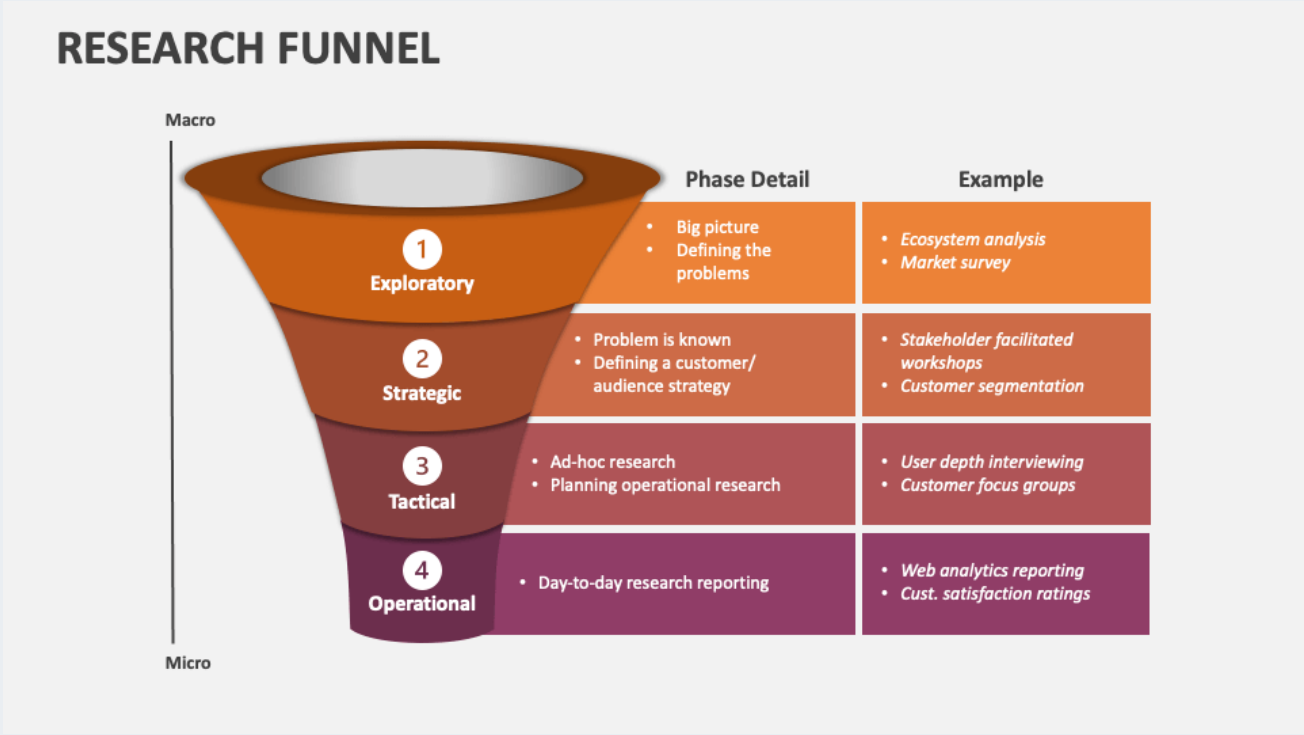
Ask:

- What problem exists?
- Why does it matter?
- Who experiences the problem?
- Why have existing approaches not solved it?
- What new knowledge is required?



From Engineering Problem to Research Question





The Difference Between Engineering and Engineering Research

Engineering Practice	Engineering Research
Solves a problem	Creates new knowledge
Uses established methods	Questions or extends methods
Delivers a solution	Demonstrates contribution
Optimises performance	Explains why/how improvement occurs
Focuses on implementation	Focuses on transferable knowledge



SECTION 2 — WHAT DOES “IMPACT” MEAN?

The Thesis Is Not the Finish Line

Thesis

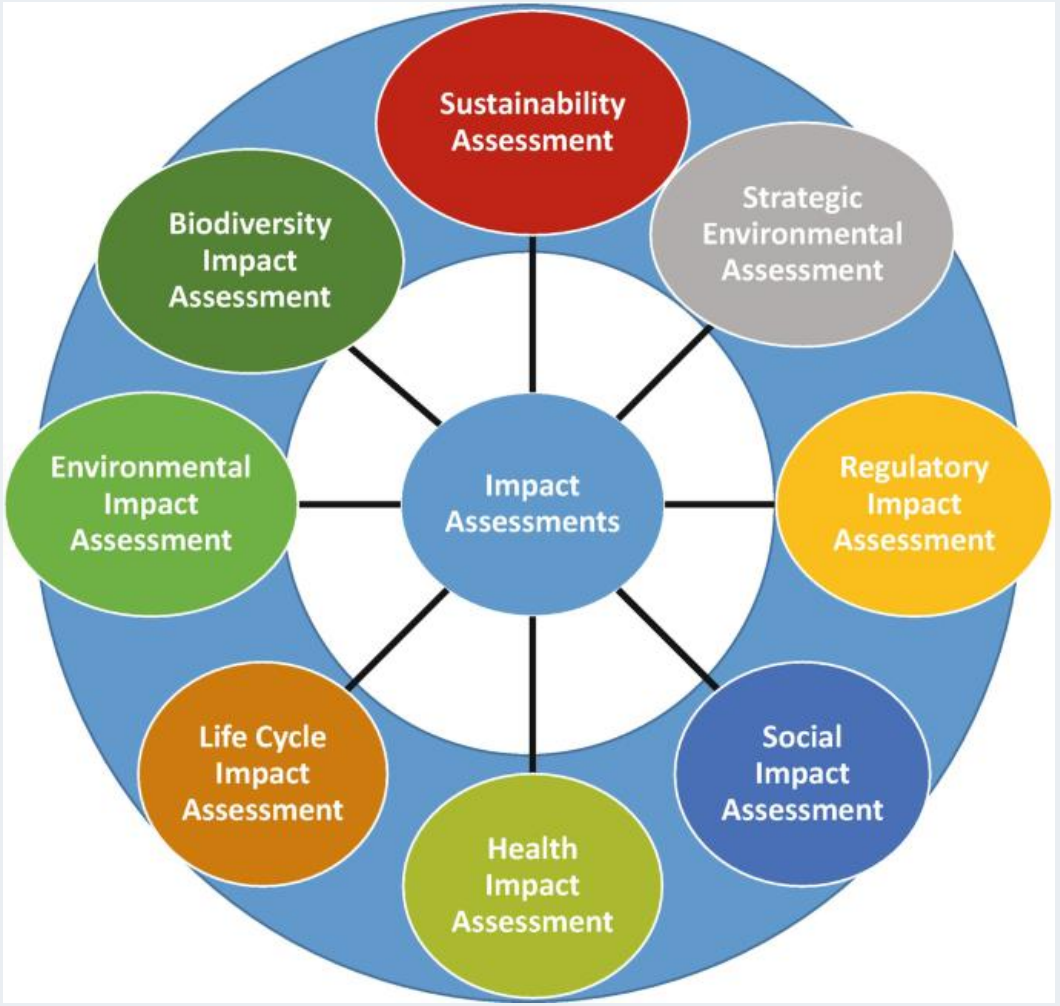
→ Examination
→ Publications
→ Technology / Method
→ Industry adoption
→ Policy / Standards
→ Education
→ Societal benefit



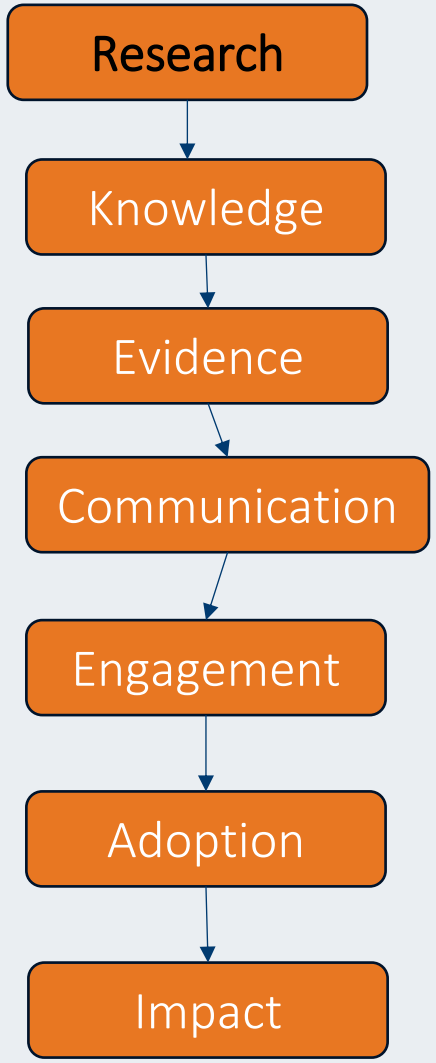
What Is Research Impact?

Research impact may include:

- Scientific impact
- Engineering impact
- Industrial impact
- Economic impact
- Environmental impact
- Social impact
- Policy impact
- Educational impact



From Knowledge to Impact





The Engineer Who Can Explain

A doctoral engineer should be able to explain the research to:

- A supervisor
- A researcher
- An engineer
- An industry executive
- A policymaker
- A journalist
- A community member



SECTION 3 — COMMUNICATING COMPLEX ENGINEERING RESEARCH

The Communication Challenge

The researcher knows:

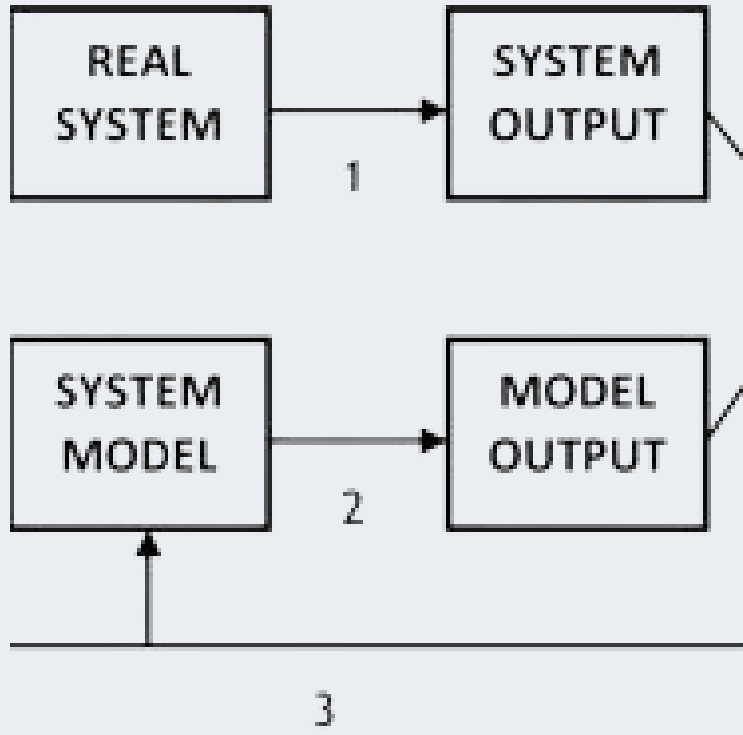
→100% of the technical detail.

The audience may need:

→10% of the detail to understand the decision.

Key principle

Complexity ≠ communication quality



The “So What?” Test

After every major research finding, ask:

“So what?”

- What does this change?
- Who benefits?
- What decision could change?
- What engineering practice could improve?
- What new research become possible?



The One-Sentence **Research Message**

Every doctoral researcher should be able to complete:

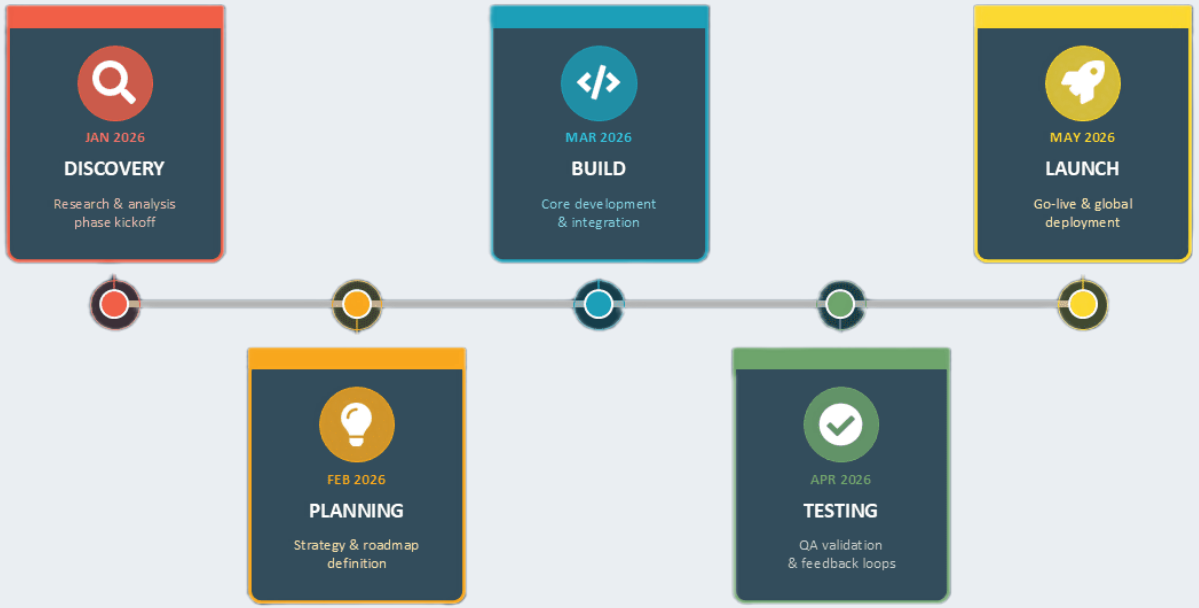
"My research demonstrates that _____, which matters because _____."



The Three-Minute Thesis

A strong short presentation answers:

1. What is the problem?
2. Why does it matter?
3. What did you do?
4. What did you discover?
5. Why does it matter?



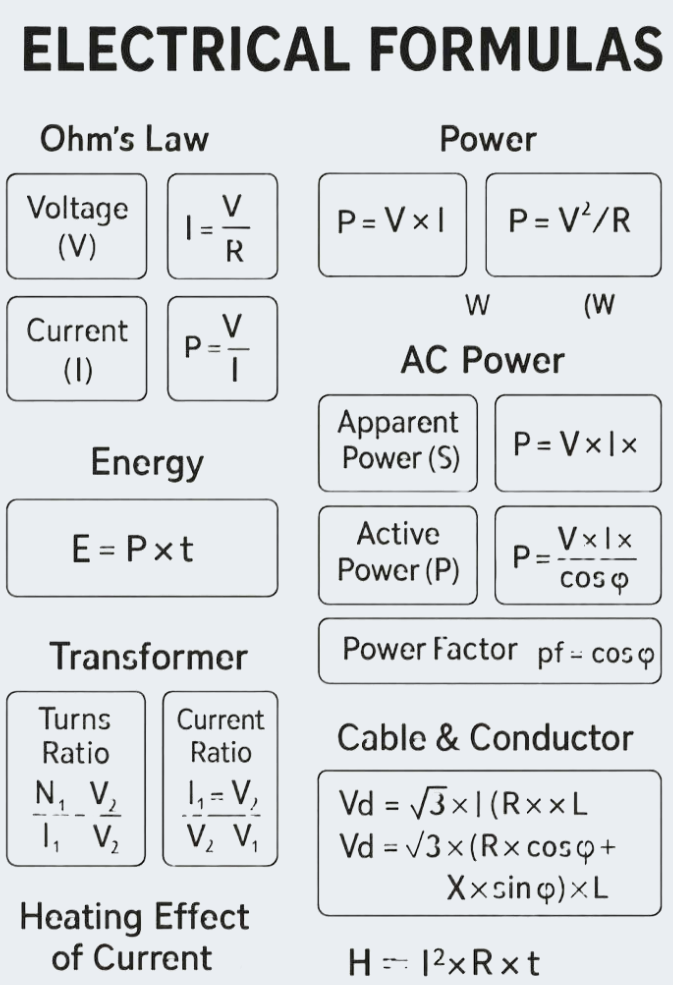
Explaining an Equation

Do not merely show:

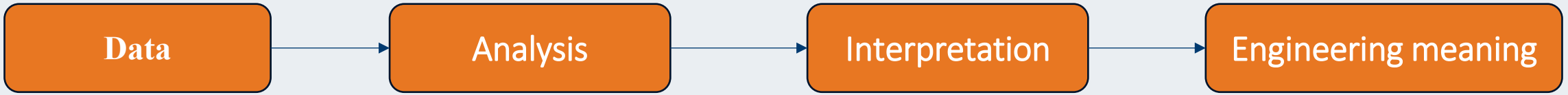
$T = f(R, X, s)$

Explain:

- What the variables represent
- Why the relationship matters
- What changes when a variable changes
- What engineering decision follows



Data Does Not Speak for Itself



Avoid:

- Unexplained graphs
- Excessive decimal places
- Unnecessary datasets
- Charts without conclusions

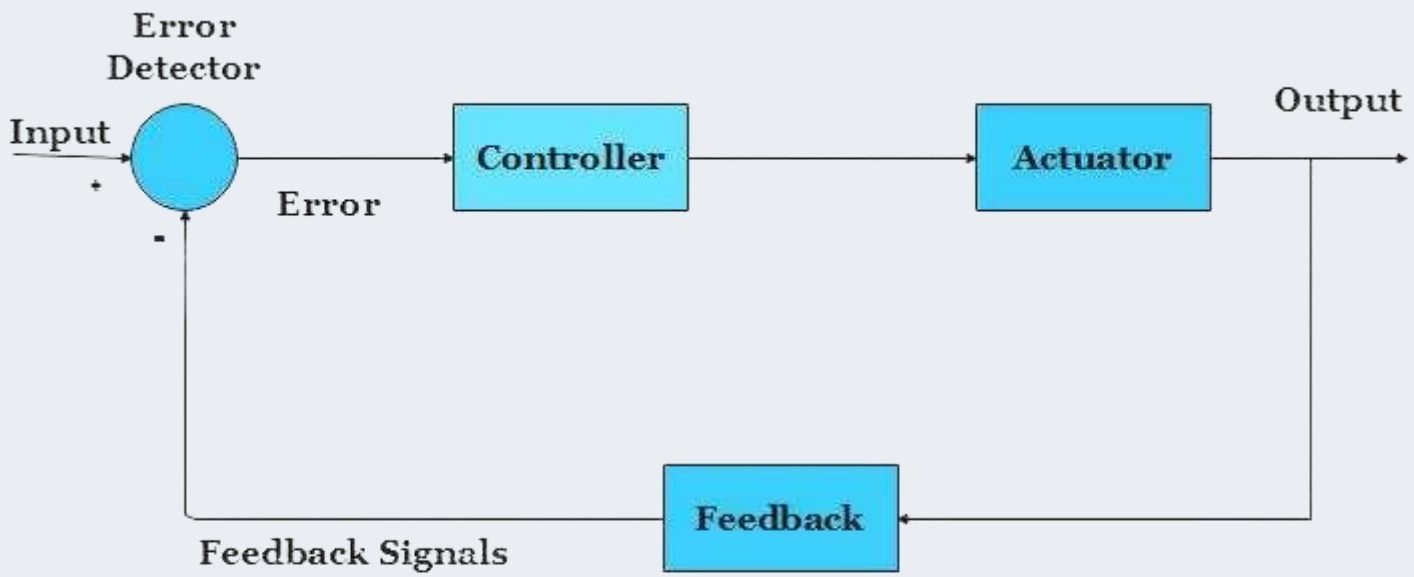
Visualising Engineering Research

Good research visuals should:

- Clarify
- Compare
- Explain
- Emphasise
- Reveal relationships

Avoid visuals that merely:

- Decorate
- Fill space
- Repeat the text



Block Diagram for Process Control System

SECTION 4 — RESILIENCE

Research Does Not Go to Plan

Expect:

- Failed experiments
- Negative results
- Rejected papers
- Broken prototypes
- Unavailable data
- Conflicting results
- Reviewer criticism
- Methodological setbacks



Failure Is Data

Failure → Diagnosis → Learning → Adjustment → Improved research

Ask:

- What failed?
- Why?
- What assumption was wrong?
- What does this tell us?
- What should change?

Resilience Is Not Stubbornness

Resilience means:

Persisting toward the objective

while being willing to:

- Change methods
- Revise assumptions
- Seek advice
- Accept criticism
- Abandon weak approaches



The Rejected Paper

A rejection is not necessarily:

“Your research is worthless.”

It may mean:

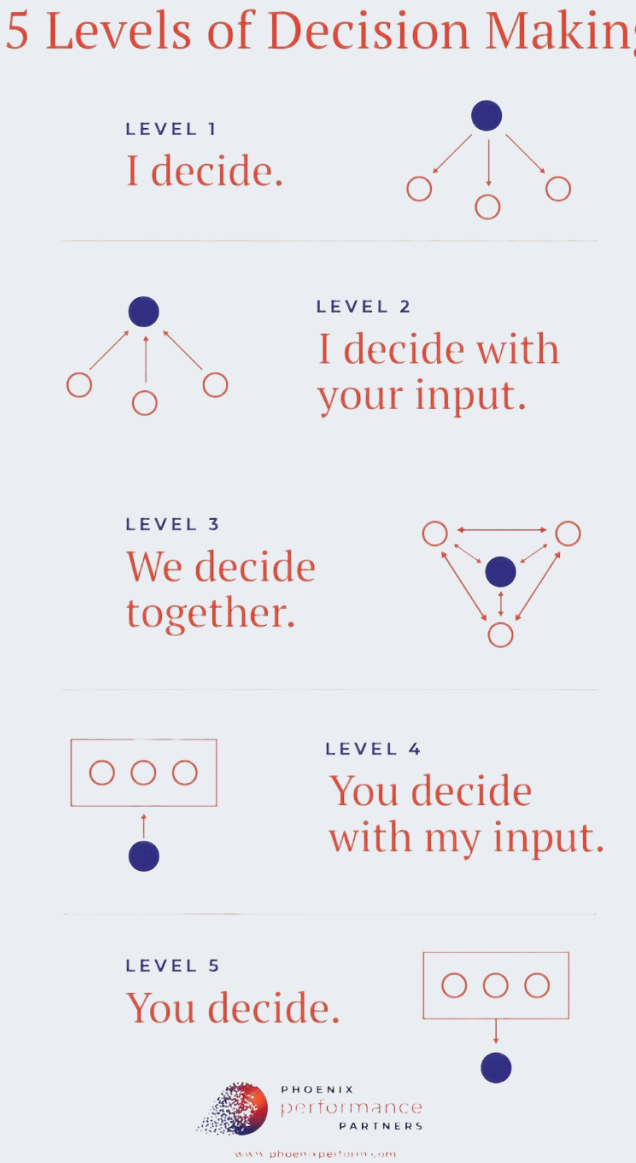
“The contribution is not yet sufficiently demonstrated.”



When the Experiment Fails

Use the **5 Whys approach**

1. Why did it fail?
2. Why did that condition occur?
3. Why was it not detected?
4. Why did the design permit it?
5. What must change?



Managing the Emotional Side of Research

Doctoral research can involve:

- Uncertainty
- Isolation
- Self-doubt
- Comparison
- Frustration
- Fatigue

Develop:

- Perspective
- Support networks
- Healthy routines
- Reflection
- Professional boundaries

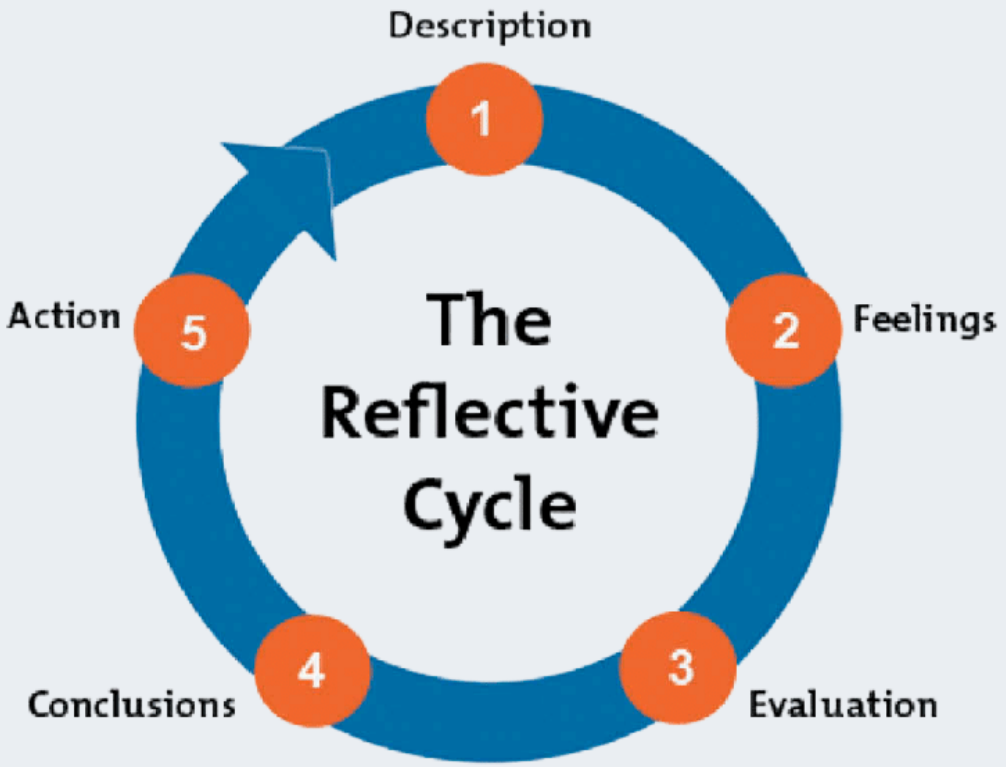


SECTION 5 — REFLECTION

Reflection Is a Research Skill

Reflection asks:

- What did I learn?
- What surprised me?
- What assumptions changed?
- What would I do differently?
- What remains uncertain?

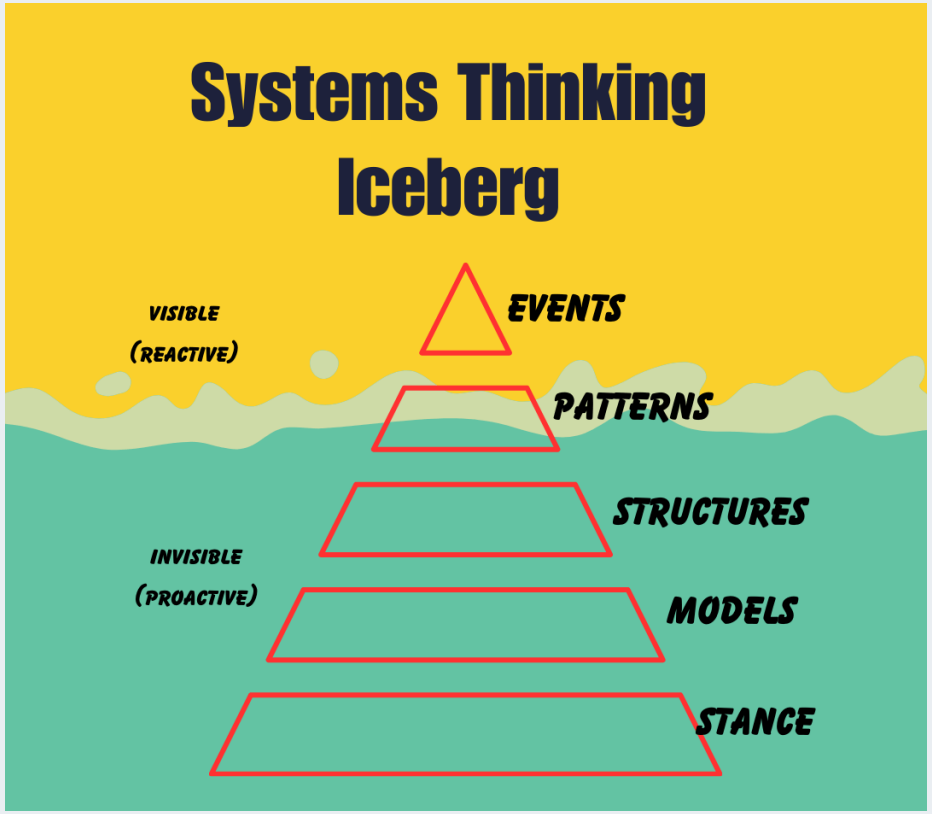


The Researcher's Assumptions

Every researcher carries assumptions about:

- The problem
- The data
- The model
- The method
- The stakeholders
- The expected outcome

Doctoral maturity = recognising and testing assumptions



The Research Diary

Record:

- Decisions
- Unexpected results
- Method changes
- Failed approaches
- Questions
- Ideas
- Literature insights
- Lessons learned



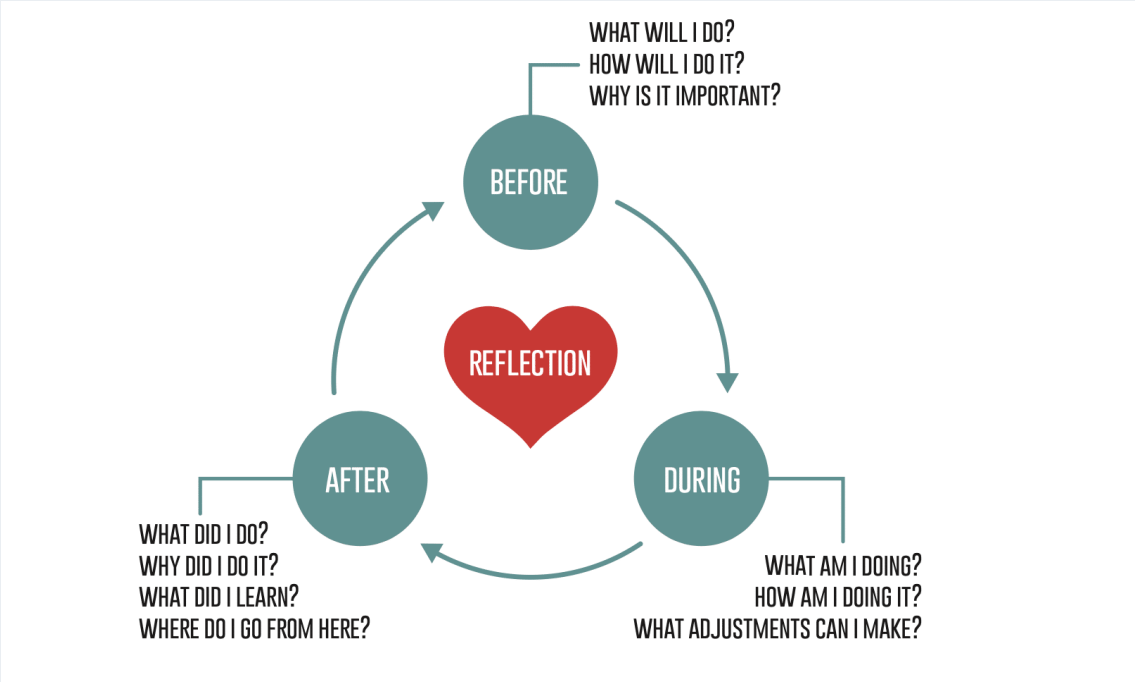
From “I Did” to “I Learned”

Weak reflection:

“I conducted three experiments.”

Stronger reflection:

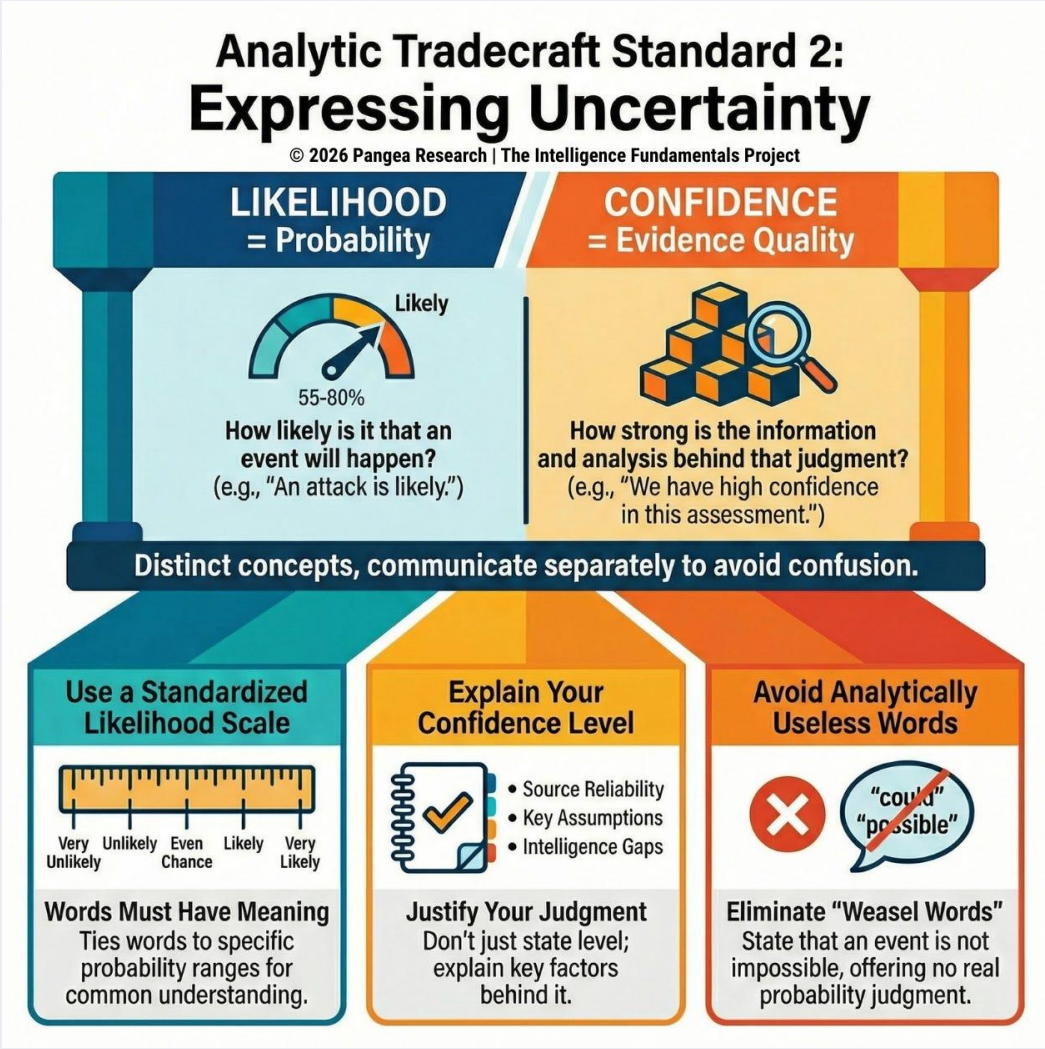
“The first experiments demonstrated that the original assumption was invalid, leading to a revised experimental design.”



Intellectual Humility

A strong researcher can say:

- “The evidence suggests…”
- “Within these limitations…”
- “We cannot yet conclude…”
- “An alternative explanation is…”
- “Further investigation is required…”



SECTION 6 — THE DOCTORAL MINDSET

From Student to Researcher

Student Mindset	Doctoral Mindset
“What is the correct answer?”	“What evidence supports the answer?”
“What does my supervisor want?”	“What does the research require?”
“How do I complete this task?”	“What knowledge will this create?”
“I need certainty.”	“I can manage uncertainty.”

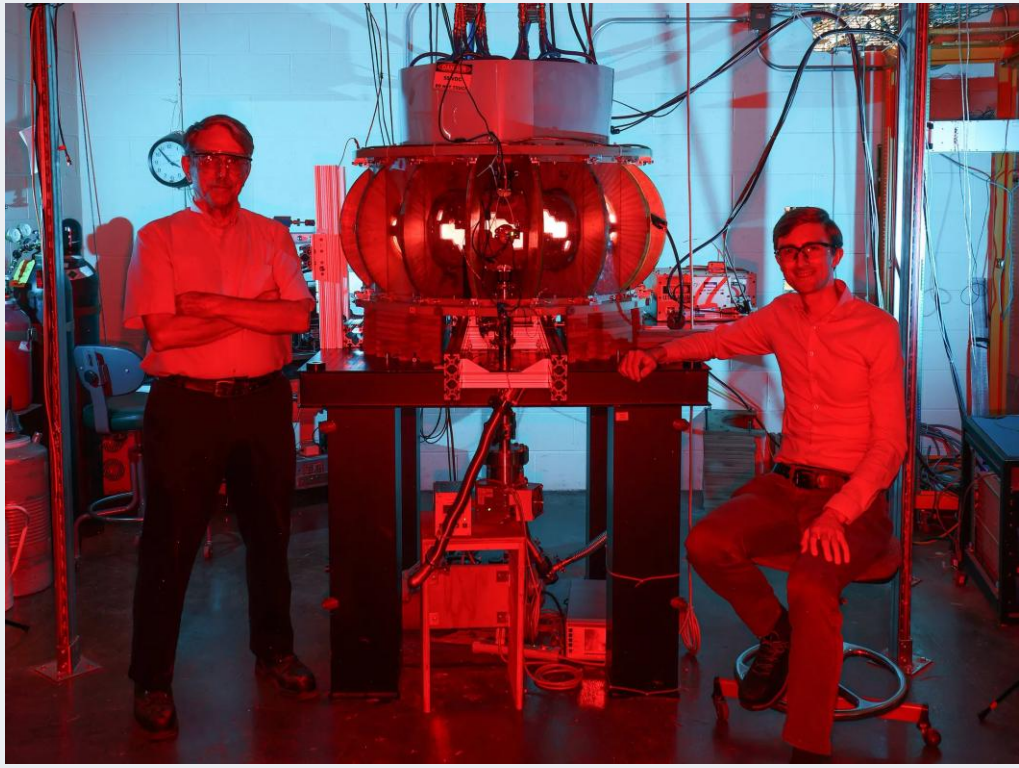


The Doctoral Researcher as an Independent Thinker

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Independence means:

- Asking difficult questions
- Challenging assumptions
- Defending methodological choices
- Evaluating evidence
- Making justified decisions
- Taking responsibility for the research



Curiosity + Discipline

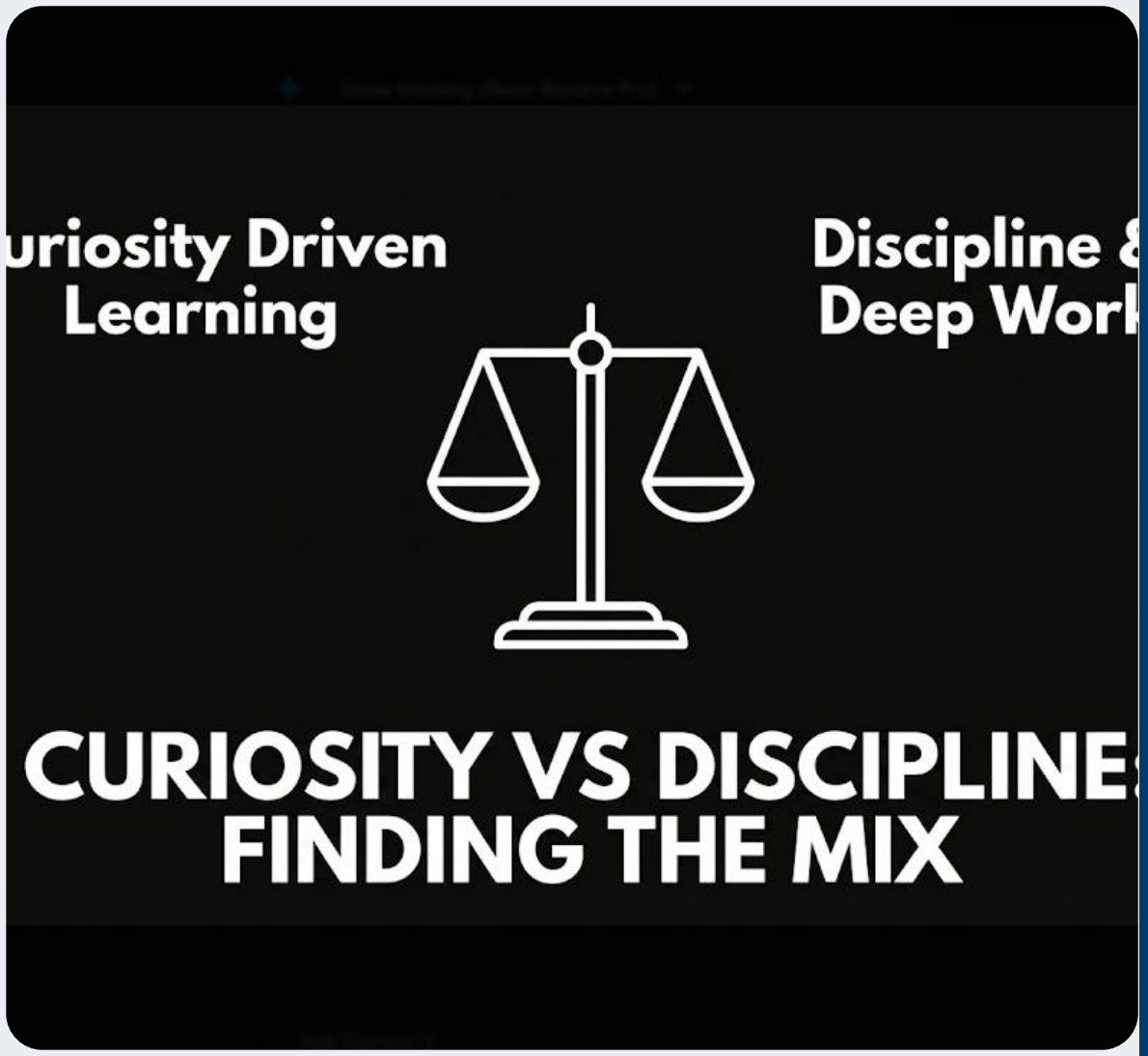
Doctoral research requires both:

CURIOSITY

“What if…?

DISCIPLINE

“How can I demonstrate it?”



The Researcher Must Become Comfortable With Uncertainty

Research often begins with:

“We don't know.”

The doctoral contribution may become:

“We now know more about why, how, when and under what conditions.”



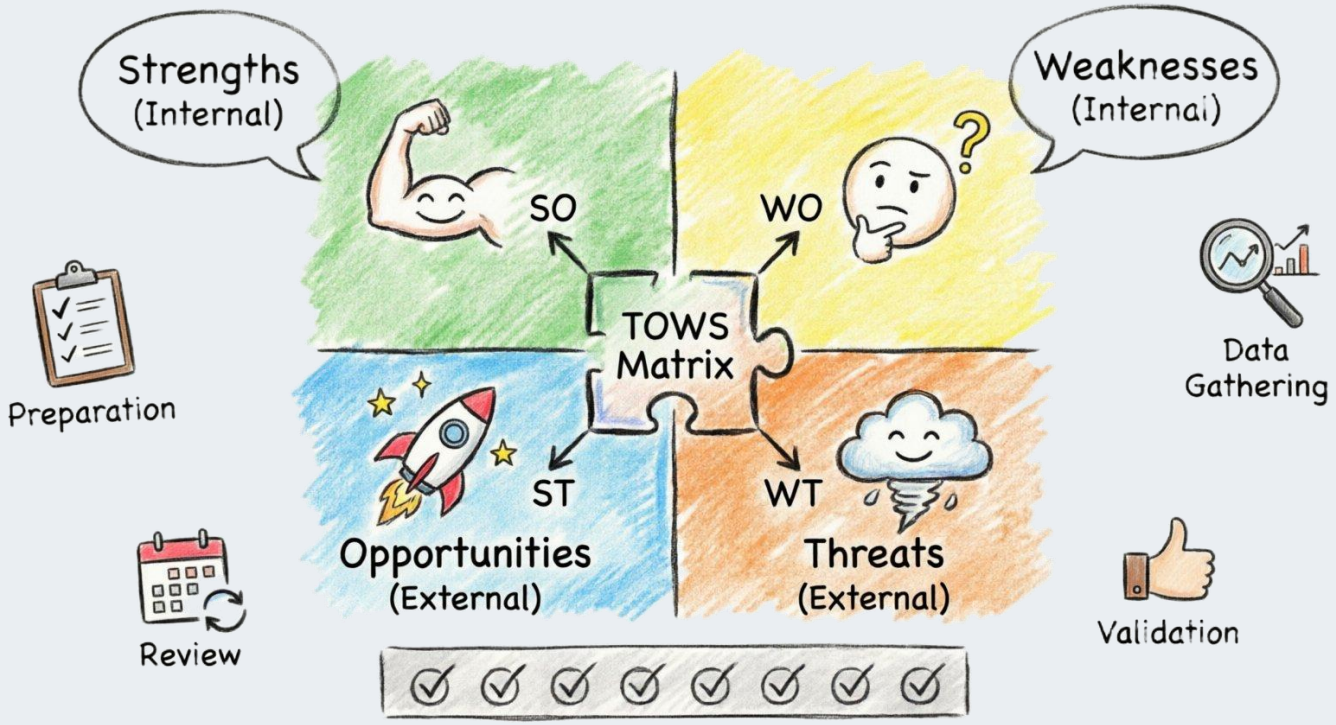
Critical Thinking

Do not ask only:

“Is this result interesting?”

Ask:

- Is it valid?
- Is it reliable?
- Is it reproducible?
- Is it novel?
- Is it generalisable?
- What are the limitations?
- What alternative explanations exist?



SECTION 7 — COMPLETING THE DOCTORATE

The Final 20% Is Different

Early PhD:

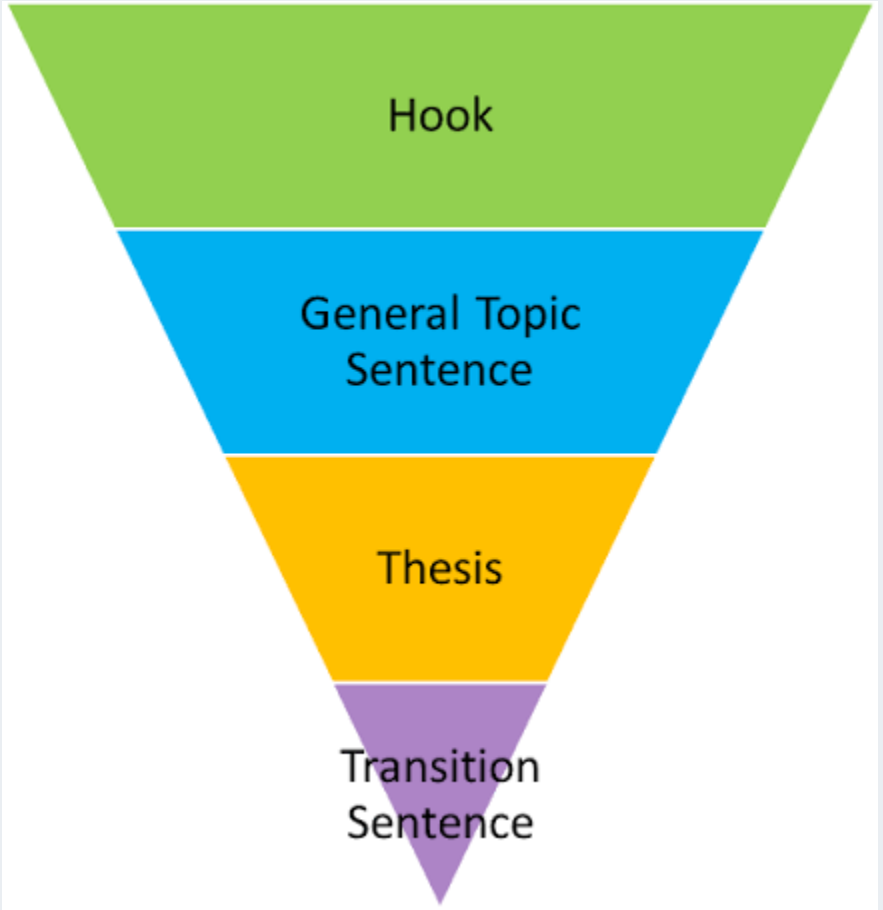
Discovery

Late PhD:

Convergence

Final stage:

Completion + Communication + Defence



Know When to Stop

Ask:

- Have the objectives been answered?
- Is the contribution defensible?
- Is sufficient evidence available?
- Are limitations understood?
- Can the thesis tell a coherent story?



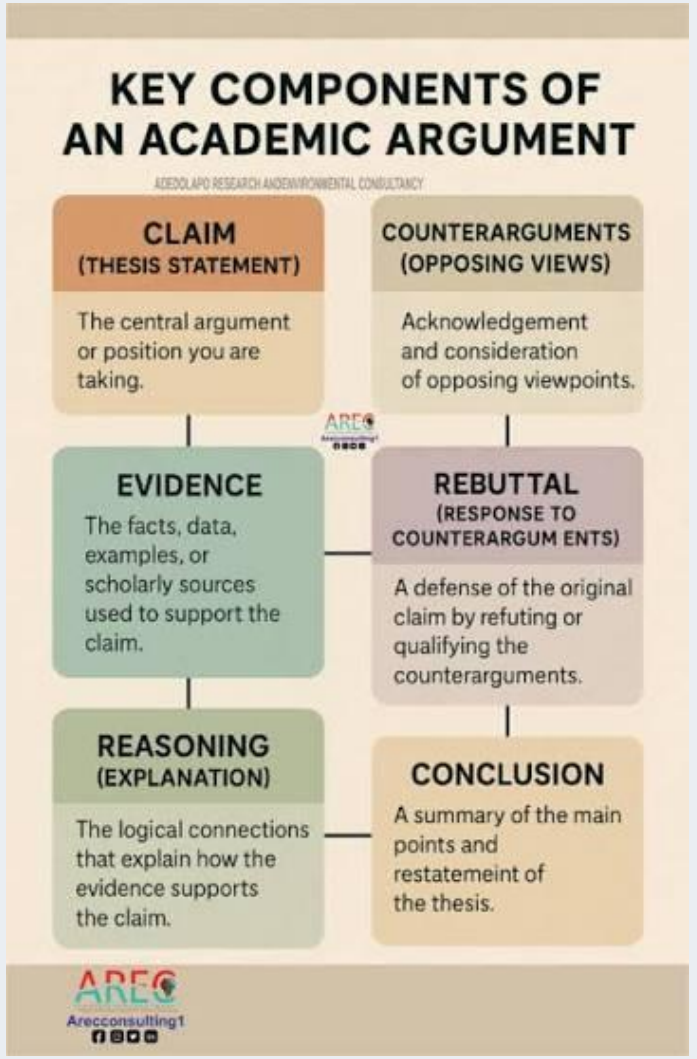
The Thesis as an Argument

A strong thesis is not:

A collection of chapters.

It is:

A coherent argument supported by evidence.



The Thesis Examination

Examiners are essentially asking:

- What is your contribution?
- Why is it novel?
- Is the methodology appropriate?
- Do the results support the claims?
- What are the limitations?
- What should happen next?



Defending Without Becoming Defensive

When challenged:

1. Listen carefully
2. Clarify the question
3. Identify the evidence
4. Explain your reasoning
5. Acknowledge limitations
6. Respond respectfully



SECTION 8 — BEYOND THE THESIS

Your Research Has Multiple Lives

One doctoral project can become:

- Journal papers
- Conference papers
- Patents
- Software
- Datasets
- Prototypes
- Standards
- Industry reports
- Policy recommendations
- New research projects



Communicating With Industry

Industry asks:

- What problem does it solve?
- Does it work?
- Under what conditions?
- What does it cost?
- What are the risks?
- Can it scale?
- Can we integrate it?



From Prototype to Deployment

Technology Readiness Journey

Concept
- → Laboratory
- → Prototype
- → Validation
- → Demonstration
- → Pilot
- → Deployment
- → Scale



Communicating Research to Society

Engineering affects:

- Energy
- Transport
- Water
- Buildings
- Communications
- Health
- Environment
- Public safety

Therefore: **Engineering researchers have a responsibility to communicate.**

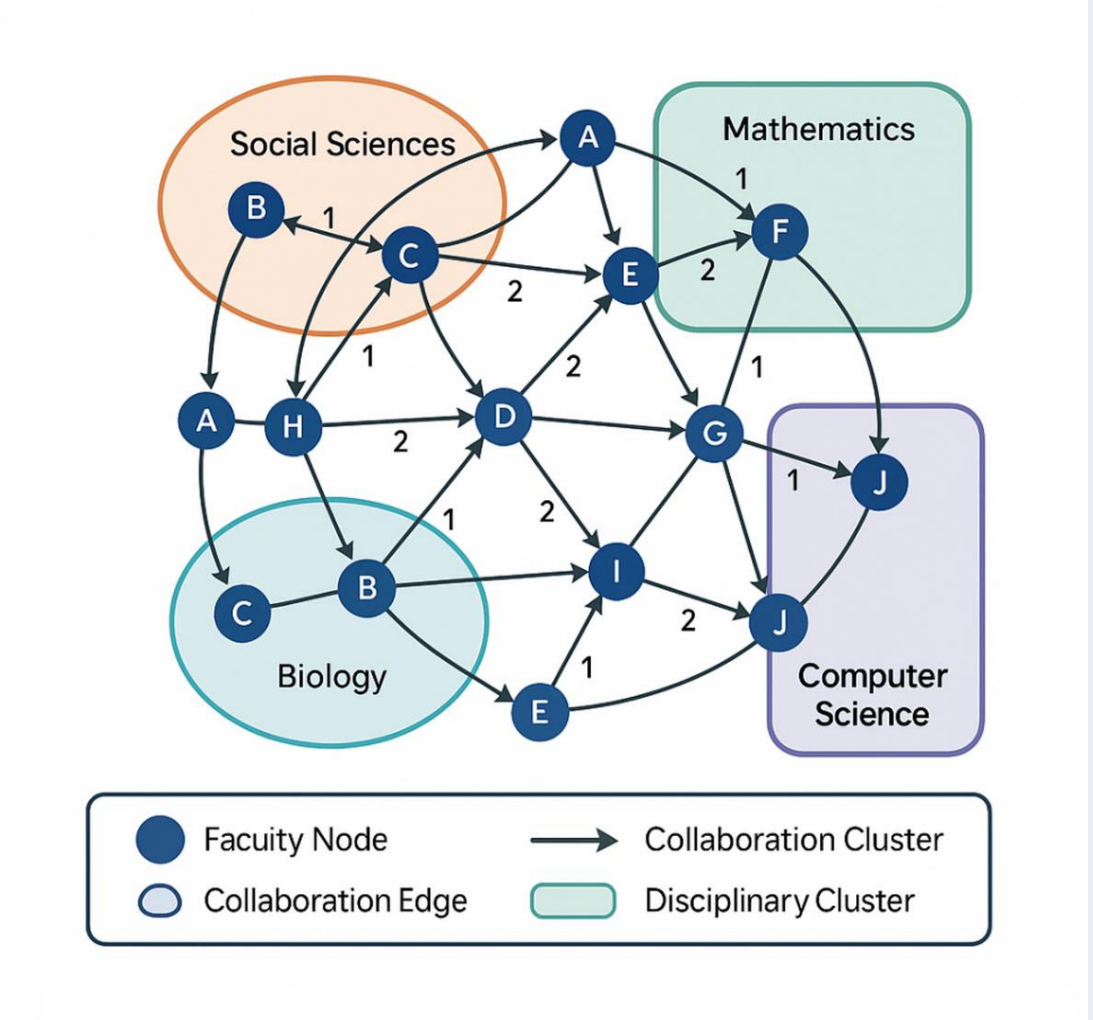


SECTION 9 — BUILDING YOUR RESEARCHER IDENTITY

Your Doctoral Researcher Profile

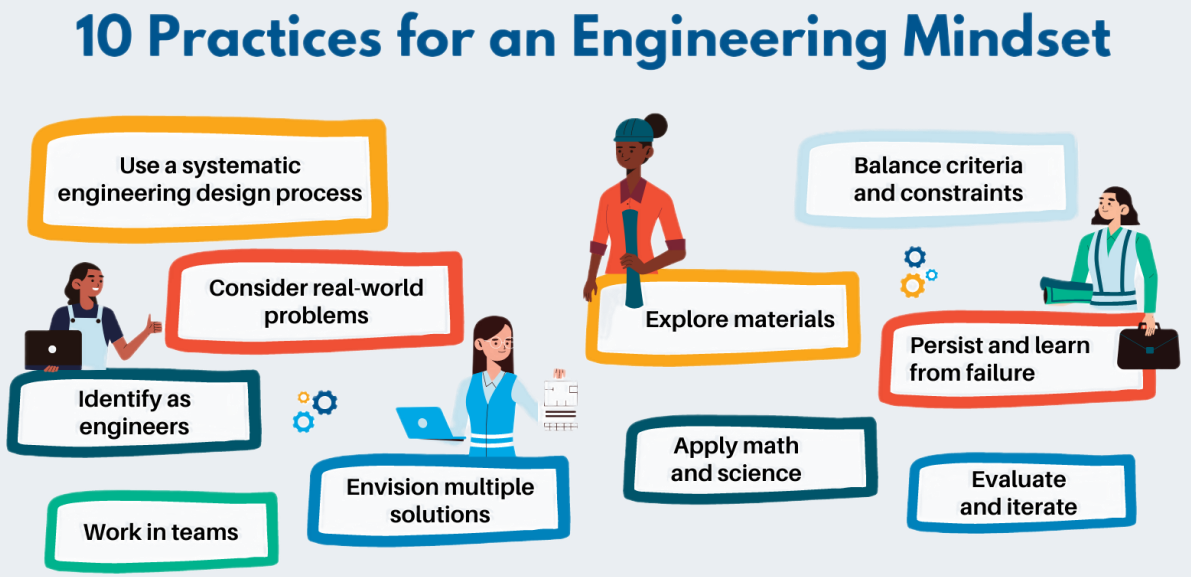
By graduation, aim to have:

- A clear research identity
- Publications
- Conference experience
- Research collaborations
- Industry engagement
- Teaching/mentoring experience
- A professional network
- A credible research narrative



The Doctoral Mindset: 10 Principles

1. Be curious
2. Be rigorous
3. Question assumptions
4. Accept uncertainty
5. Learn from failure
6. Communicate clearly
7. Reflect continuously
8. Seek feedback
9. Think independently
10. Create impact

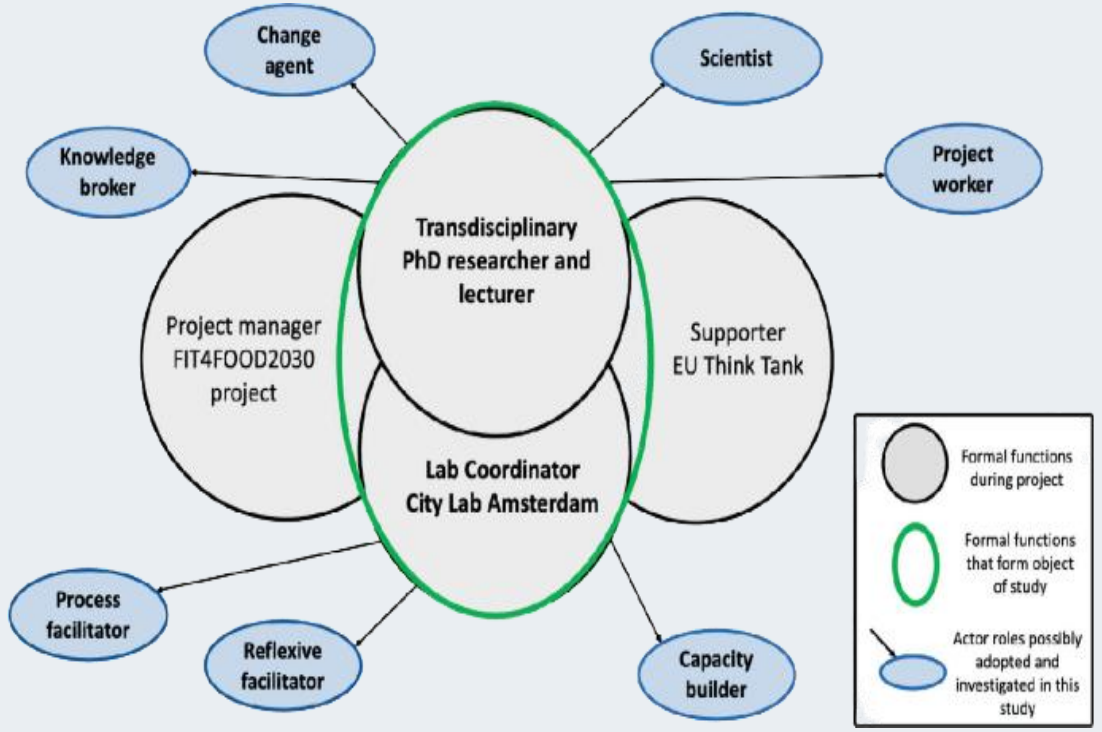


SECTION 10 — THE CALL TO THE NEXT GENERATION

THE CALL TO THE NEXT GENERATION

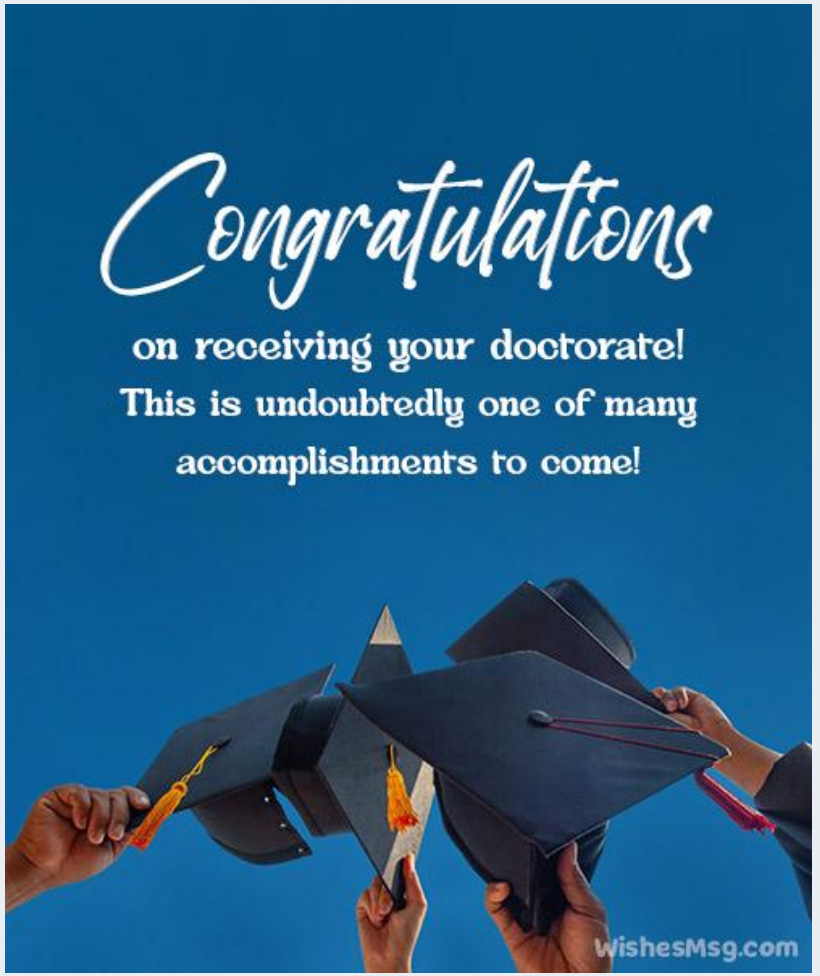
At the end of your doctorate, ask:

- What did I discover?
- What did I contribute?
- Who benefited?
- What changed because of my research?
- What will I do next?
- Don't just complete the PhD.
- Build something that continues beyond it.



Final message

- Complete the research.
- Communicate the contribution.
- Reflect on the journey.
- Build resilience.
- Create impact.
- And then keep going.



CLOSING DISCUSSION

Suggested final discussion questions

1. What would make you proud to say, “My doctorate made a difference”?
2. What engineering problem would you be willing to spend 3–4 years investigating?
3. How would you explain your proposed research to a non-engineer?
4. What would you do if your first major experiment failed?
5. What kind of researcher do you want to become?
6. What could your research contribute beyond a thesis?

Thank You!

Q&A



Upcoming courses

Courses	Start Date
Doctor of Engineering (online) 36 months	8 February 2027
On-Campus – Doctor of Engineering 36 months Perth/Melbourne	15 February 2027

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

Upcoming Doctoral Webinars

All upcoming Doctoral Webinars:
www.eit.edu.au/news-events/events/

3 December: Building Your Research Identity: Patents, Publications, and Professional Pathways

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