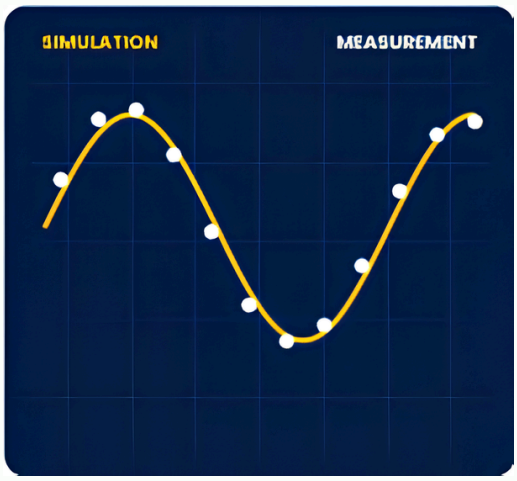
INTRODUCTION:



- Every engineering doctorate reaches the same early fork: do you build and measure, model and simulate, or combine both? Your answer shapes your evidence, your timeline and the questions your examiners will ask.
- Electrical engineering candidates in Australia often face this choice while preparing for confirmation of candidature. This fact sheet gives you a quick, practical way to decide before you start writing your methodology chapter.

The Three Options at a Glance

1. Experiment: Build It and Measure It

- Overview: You build a prototype, set up a test bench or collect field data, then measure what happens. Typical examples include power electronics rigs, antenna measurements and sensor trials.
- Strength: Real-world credibility. A measured result is very hard to argue with.
- Watch out: Cost, lab access, noise and time. Equipment delays are a classic cause of slipped timelines.

2. Simulation: Model It and Test It

- Overview: You model the system in software and test it across many conditions. Think grid stability studies, RF and circuit models, or control algorithms.
- Strength: Speed, repeatability, and the freedom to sweep parameters you could never afford to build.
- Watch out: Results are only as good as the model. Without validation, examiners will question it.

3. Mixed Methods: Do Both and Cross-Check

- Overview: You use a model and a physical test together. A common route is to simulate a converter design, then validate it on a prototype.
- Strength: Cross-checked results that are the hardest to challenge. never afford to build.

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- Watch out: •A heavier workload and a longer timeline, so plan for both.

A Quick Note on Terms

Experiment and simulation are both quantitative. Qualitative methods such as interviews play only a small part in most electrical engineering topics, so qualitative vs quantitative rarely settles this choice.

Five Questions to Settle It

- What is your question really asking? "Does it work?" points to an experiment. "How does it behave across conditions?" points to simulation.
- What can you actually access? Check lab time, equipment, software licences and computing power before you commit.
- Can you trust your model? With no validated model for your system, simulation alone is hard to defend.
- What will your examiners expect? Applied work usually needs some physical evidence behind it.
- How long do you have? Build-and-test delays are the most common reason timelines slip.

If you have both a trustworthy model and access to a prototype, mixed methods research is probably your route.

What Matters for an Australian HDR

- Confirmation of candidature: Most universities expect a clear, feasible method early, so your panel will test this choice sooner than you might expect.
- Ethics and safety: Work with human participants needs ethics approval under the National Statement on Ethical Conduct in Human Research. Lab work needs risk assessments and safety sign-off. Pure simulation often avoids ethics review, but data management still applies.
- Facilities: University labs, shared research infrastructure and industry partners are all options. Book early, because access is often the bottleneck.
- Examiners: Theses are usually marked by external examiners, often overseas. They look for a justified choice, not just a described one.

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Mistakes to Avoid

- Picking the method your lab already uses, then never explaining why it suits your question.
- Running simulations without validating them against measured data or a published benchmark.
- Choosing mixed methods to look thorough when the two parts never feed into each other.

Using This Fact Sheet

Read the three options first, then work through the five questions with your supervisor. If your answers split between two options, treat that as a sign to look closely at mixed methods.

Conclusion

Choosing between experiment, simulation and mixed methods is not about picking the most impressive option. It is about matching the method to your question, your resources and your timeline, then being able to explain why. Once you have decided, your next step is the Engineering PhD Research Methodology Chapter Template for Australian HDR Candidates.

An Engineering PhD Research Methodology Chapter Template for Australian HDR Candidates. Once you've chosen your method, this ready-to-fill template walks you through every section of the chapter. After posting internal link template to this title

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Reference:

National Health and Medical Research Council, Australian Research Council and Universities Australia. (2023). National Statement on Ethical Conduct in Human Research 2023. Canberra: NHMRC. https://www.nhmrc.gov.au/about-us/publications/national-statement-ethical-conduct-human-research-2023

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