UNDERSTANDING THE BOUNDS OF YOUR COMPETENCE

The Chartered Professional Engineer mark relies heavily upon an engineer understanding and staying within their bounds of competence. However, how do you know what you don't know?

BACKGROUND

Competence refers to the knowledge, skills and attributes required for a person to undertake their work successfully. Different activities, roles and projects require different competencies. Knowing (or recognising) the bounds of your or another person's competence can result in the performance or success of an activity or task.

Our work is growing increasingly complex, multi-disciplinary, and specialised, as are other disciplines. We need to be able to learn new skills, change how we do things and solve problems for which we didn't initially train.

When we say that an engineer is competent, we're inferring from the information we have about an engineer's current or past performance to an expectation of future performance. That inference relates to a range of possible future scenarios.

WHY KNOWING YOUR BOUNDARIES OF COMPETENCE IS IMPORTANT

We have the competence required to do our work most of the time. But we need to know our bounds of competence to recognise if we are operating outside these boundaries. If we work outside the bounds of our competence, we may be breaching our obligations under the **Code of Ethical Conduct**.

Other professions already demonstrate this behaviour well, which helps build trust and confidence in their profession. For example: when meeting with a General Practitioner (GP) about a specific health issue, we trust them to either:

- identify the patient's needs and be able to help directly, or

- learn or research quickly to find options and get back to us, or

- triage and refer to a relevant specialist (who has the required expertise).

We don't expect doctors to know and be able to do everything. But we expect them to work within the bounds of their competence, as part of a system and wider team, and communicate what they can and cannot do with others (patients, colleagues, and the general public).

THE IMPACT OF COMPETENCY SELF-AWARENESS

People have four layers of competence awareness regarding their competence.

Layers	Description
1 Unconsciously incompetent	People don't know what they don't know. Research has shown (i.e. the Dunning-Kruger effect)[1] that some people have a cognitive bias where they overestimate their ability.
2 Consciously incompetent	People know what they don't know, what the boundaries of their competence are and potential danger spots.
3 Consciously competent	People know their competence, strengths and areas they need to use others' expertise in their work.
4 Unconsciously competent	These are our experts. They are often highly competent and specialised. You see them presenting to others, leading professional changes, solving tricky issues, and conducting peer reviews. They are often called on in emergencies (where they can be trusted to advise quickly and accurately).

EXAMPLE: LENORA

Lenora had developed a reputation as an engineer with expertise in small, straightforward projects.

- What happens when a lead engineer approaches her to work on a project with hazards outside her normal work?
  - How could the bounds of her competence impact on the project outcome?
  - What if she didn't recognise the bounds of her competence, and neither did the lead engineer?

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[1] Kruger, J., & Dunning, D. (1999). Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology, 77*(6), 1121–1134.

Unconsciously incompetent response

What if Lenora says 'yes'? She could 'give it a go' and was ready to start.

There may be a gap between the competencies required to do the job to the required standard and her competencies.

Outcome: Increased danger and risk to the project.

Danger: Unconscious incompetence

☐ Current competence
■ Job required
▨ Unknown
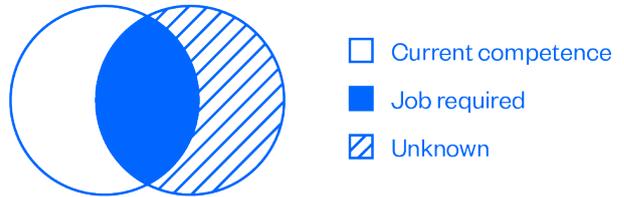
Consciously incompetent response

Lenora says she would like to participate in the larger project but is upfront about the gap in her competence with the lead engineer.

Together they discuss and plan how to use this project to build her competence (with the oversight and mentoring from the lead engineer, who has proven expertise and a successful track record of leading complex projects).

Outcome: Managed risk and Lenora has a development opportunity to build her competencies (with support).

Conscious incompetence

☐ Current competence
■ Job requires
▨ Additional knowledge required
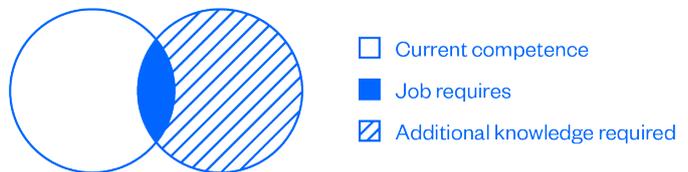
Consciously competent response

Since graduation, Lenora has identified and developed her competencies and has always planned to transition to larger projects based on the competencies required for larger projects.

She has been building her knowledge and skills around larger projects by completing additional study, shadowing experts, and completing research.

She shares her career goals, competency strengths and development areas with the lead engineer.

Conscious competence

☐ Current competence
■ Job required

Outcome: Minimal risk and Lenora has a development opportunity to apply her existing and new competencies in larger projects. Lenora is also open to support and open feedback from the lead engineer.
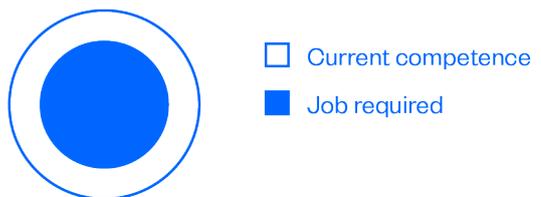
HOW DO YOU KNOW YOUR AREAS OF COMPETENCE?

There are different ways that engineers identify their competence and assess their limits and the limits of others in their team.

Using a competence framework or model

Many disciplines and organisations use competency frameworks and models. Competency models are explicit about the specific knowledge, skills, and behaviours people must demonstrate for a particular role and what level you are (entry, competent or expert) within each competency. Using this system means the frameworks and models identify what is required for a person to perform in a particular role. The system can underpin high-performing teams.

Example - Water New Zealand's competency framework

For many years the three waters sector (drinking, waste and stormwater) had minimal means of assessing and measuring worker competency.

With 67 water suppliers and a vast range of roles and occupations, along with little formalised training or career progression, it had become virtually impossible for both workers and their managers to feel confident that they had the right skills for the job.

The lack of formalised training was a considerable risk, both from a public health and environmental point of view. No one wants to inadvertently make a community sick through a drinking water treatment failure or pollute the environment because of an avoidable wastewater overflow.

That's why Water New Zealand, with the backing of its members, embarked on the development of a competency framework.

It's still a "work in progress". But, two years down the track, four roles have been brought into the framework - Drinking Water Treatment Operator, Wastewater Treatment Operator, Drinking Water Distribution Operator and Wastewater Network Operator. Water New Zealand will integrate other roles into the framework over the coming months and years.

The next role to be made available is the Small Water Supplier, which is currently in the final stages of development.

The benefit of the framework is that it is formatted in a straightforward, user-friendly approach that can help employees and their managers find out what skills are required to undertake the job competently.

The format helps easily identify knowledge gaps and allows workers to see what level of skills they need to develop their careers.

Without a framework, it's difficult for people to see an obvious career pathway, making recruiting and retaining staff harder. In a highly competitive market, a sector must be professional and offer good career prospects.

See more at the **Water New Zealand website**.

Caption: This is an abbreviated snapshot of the *at a glance* document accompanying the competency framework for each of the abovementioned roles. The full document sets out what an individual needs to be able to do and needs to know at each stage as they progress through their career.

Example - NASA

Another example of a **competency framework model is by NASA**. Using the competency framework, an engineer may review the competencies required to be part of a multi-disciplinary team on a complex project with safety-critical aspects. In conversation with the lead engineer, they may plan to build competency in the following areas:

- technical knowledge of complex projects, situational awareness, and systems thinking
- behaviours of teamwork and communication
- the attributes of care and open communication in a large team

Once engineers understand the gaps in their knowledge, they can work to upskill in those areas.

Working outside a formal competence framework or model

Engineers working outside any formal competency framework or model can develop their own processes and approaches to knowing and working within their competence.

Here is a high-level process to follow.

1. Reflect on the type of work you do. What changes and innovations can you see in the profession? What do you want to do in the future?

2. List the competencies relevant to this – present and future. Ideas where you can find these are:

- Review publicly available competency frameworks or Bodies of Knowledge and Skills (BoKS) similar to your discipline or role. For example:

    Engineering New Zealand CPEng assessment guidance

    SFPE BoKS

    NZGS BoKS

    SESOC BoKS

    US **National Society of Professional Engineers BoKS**

    US **National Society of Professional Engineers Article "Are You a Competent Engineer?"**

- Look at contracts, procurement documents, legislation, rules, materials, reviews and recommendations.

- Ask people you see as experts in the discipline.

- NB: don't just think of your technical areas. For example, if you lead a firm or team, check out the attributes of a modern leader.

- Assess where you think you are for each competency – entry-level, competent or expert? Think of the mistakes you have made and lessons learnt. Ask for open and honest feedback from those who know your work.

3. If you are undertaking a different project or work you haven't undertaken recently, ask yourself –

- If I were standing in front of a disciplinary tribunal, could I explain my decision to work on this without seeking help?

- If I were on the tribunal faced with the case, what would I think of the explanation given?

    The answer will often guide you to your level of competence.

4. Plan how you will develop your competency gaps. For example:

- Researching a topic
- Learning from an expert (e.g. a mentoring programme from Engineering New Zealand or Water New Zealand)
- Attending a course
- Join a **special interest group** or local **Engineering New Zealand branch** so that you can build your networks and talk about how others approach similar problems
- Practice activities and tasks, such as shadowing an expert and getting your work reviewed.

5. Keep evidence of your ongoing learning and achievement. Have regular check-ins with others to get feedback on how you are progressing.

You can build processes like this into your professional development – say on a three-monthly cycle – so it becomes part of keeping up with what is happening around you.

SUMMARY

The increased specialisation of engineers and expectations on us to work to the highest standards and outcomes means that we know and work within our bounds of competence.

We need to understand and be able to communicate to others what knowledge, skills, and attributes we bring to an organisation/role/project, what we are working on developing, and how we contribute to an activity's overall performance and success.

Once we have identified gaps in our knowledge, we need to develop plans to address those gaps. There are several ways to do that, and a mixture of methods can work best.

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