

Critical thinking and AI – Does it matter?

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Critical thinking and AI – Does it matter?

Welcome to Safety and Reliability Journal 43.2. In the comments for Journal 43.1 I wrote about AI and mentioned how design and creativity involve critical thinking, and, depending on how you use AI, this can be diminished.

I'd like to explore this a little deeper here, both in the context of AI but also in professional development and membership.

I am involved in the process that allows SaRS Members to apply for registration with the Engineering Council. Typically, I have an initial conversation with the potential applicant who is eager to know what they must do, over and above a membership application, to reach the Incorporated or Chartered Engineer level. In every case it comes down to evidencing and applying knowledge and competence, and critical thinking.

What is critical thinking?

In general, critical thinking is the process of analysing, synthesising, and evaluating information to reach an informed conclusion. It involves questioning assumptions, identifying biases, examining evidence, and assessing the validity of arguments.

Like many other aspects of life, critical thinking is something we need to do to problem solve. As we learn as children, we go through various levels of cognitive development. Jean Piaget, a Swiss psychologist, introduced a theory of learning that is used in child pedagogy. Piaget proposed four stages of cognitive development as follows:

- **Sensorimotor Stage at 0–2 years:** In this stage, children use their senses to learn all about the world. They develop object permanence and learn that objects still exist even when they cannot be detected by the senses.
- **Preoperational Stage at 2–7 years:** During this stage, children start to use language to explore and understand their worlds. They start to think symbolically but can't yet perform operations, to do mentally what they previously could only do physically.
- **Concrete Operational Stage at 7–11 years:** In this stage, children begin to think logically about concrete events. They gain a better understanding of how to hold a conservation and begin to be able to see things from others' point of view. They start to have

internalised mental actions about the operations they will perform.

- **Formal Operational Stage at 12 years onwards:** Young people in this stage develop the ability to think about abstract concepts. They can logically test hypotheses and think about possibilities, including hypothetical and deductive reasoning, and apply to operations.

The formal operational stage is often referred to as the 'abstract stage' and this is the basis of critical thinking. As you can see, school progression structure is arranged roughly around these stages, with a focus on abstract thinking in the later secondary school years, and at college and university.

Does critical thinking really matter?

I sometimes frequent the social media platform X, and leaving aside social media in general and its effect on critical thinking for another article, I often see the meme 'I never used Pythagoras theory since I left school' or 'what use is algebra when I never use it in real life?'

While it may be true that some people who learn algebra at school never use it in their lives, it is a perfect example of how, on the Formal Operational Stage of Learning, our brains are 'trained' at school to solve problems and develop the cognitive skills needed to think critically and abstractly.

Critical thinking does matter; we need it not only to pass exams, but to deal with problem solving in many areas of our lives.

Critical thinking and SaRS

As safety and reliability practitioners, you will inevitably need to use critical thinking in your role. When you applied for Membership, our Membership Committee looked at your academic qualifications, which test your critical thinking through education, as described above.

Registration with the Engineering Council requires a level of critical thinking to translate your qualifications and experience from your CV into competencies A-E. This is then assessed by peers with a similar level of critical thinking that has been previously assessed.

But there are other areas of SaRS where critical thinking is required. The very essence of SaRS is the dissemination of knowledge about safety and reliability and this involves the demonstration of critical thinking as to how to exchange this knowledge.

We see this in SaRS in many ways, including webinars, committee work and, of course, in this journal in written papers, which brings us back to AI and writing.

AI and critical thinking

A pressing question in these early days of AI is: does AI diminish critical thinking?

It could be argued that using ChatGPT as a tool to solve a problem is critical thinking. But the issues arise when, as discussed in my previous article, we start to use AI to create articles, papers, books, novels and other knowledge-based work.

While it is true that AI works in a logical way, it is difficult to imagine AI having 'abstract' operations. To do this, it must be capable of examining a situation, applying facts and turning it around to apply it to another situation.

In the case of writing academically or professionally, this is reflected in the structure of documents and papers; literature review, analysis, methodology, discussion, conclusion. It is the advancement of other people's ideas and thinking with your own ideas and thinking.

In more creative writing, it is the same advancement of ideas and thinking, but a different structure. Most kinds of writing involve understanding and meaning, and a moral and ethical consideration – both of these are reflected in the Engineering Registration Application in UK&U (Underpinning Understanding and Knowledge) and in the E5 section of UKSPEC competencies.

It is difficult to see how AI could ever develop the cognitive stages of development necessary for human critical thinking. But even if it did, there is another consideration.

Personal development and AI

If you were able to prompt AI to write an academic paper for you, would you?

The personal development question here becomes separated from the potential of AI and whether it is detected in various checkers on submission. It begins with intention and, in my own opinion, truth.

I covered AI as a tool in my last article and pushing the boundaries of AI into writing an article or paper for you seems, in the light of Piaget's stages of cognitive development, pointless. By 'operating' your critical thinking on problem solving, you are continuously developing your cognitive function.

I will leave you to decide on this. I would welcome any comments or discussion on this evolving subject, please email me with your thoughts.

In this Journal we have two papers. The first from Shabani et al. undertakes a review of safety audits concerning workforce safety and compliance in Zimbabwe. The second from Okoh and Myklebust investigates whether

and how safety levels defined in ISO 26262 can be mapped to safety levels in IEC 61508. I hope you read them in light of the optimistic personal and professional development that SaRS is committed to bring you to develop your cognitive functions!

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Registration with the Engineering Council through the Safety and Reliability Society

The Safety and Reliability Society was successful in April 2020 in their application for a Licence to Register CEng and IEng SaRS Members. The SaRS Engineering Membership Committee has been busy in the first year of the Licence honing our systems and working with the Engineering Council to provide a route to registration for our members. Many thanks to the Engineering Council for their guidance and support in SaRS achieving this goal. In March 2021, the Engineering Council extended this interim licence for a further four years. In 2025, SaRS will undergo a licence review, and we are currently preparing for this.

Registering with the Engineering Council through SaRS

Our registration application programme is open, and we are happy to receive applications from candidates for CEng or IEng.

You can find details of how to apply and guidance for your application on the SaRS website under the main Membership green tab—please select ‘Registering with the Engineering Council’ on the drop-down menu.

We strongly recommend that you read UK-SPEC in conjunction with the application process and make sure that you are planning and completing your continuing professional development (CPD).

As always, we are happy to answer any questions and assist you through the process with three rounds of professional review advice (PRA). Please get in touch if you have any questions by emailing info@sars.org.uk.

We very much look forward to receiving your application to begin your journey to registration with SaRS.