# Will computer programmes ever fully replicate human skill?

Computer programmes have undeniably streamlined workplaces across every industry. However, this has naturally brought some concerns to the mind of workers — whether or not they will be deemed obsolete in favour of computer programmes. However, these concerns have been left to run a little too rampant. Consider it this way: computer programmes can only output a level of quality based on their input. And for now, at least, that input must come from a person.

At the very least, engineering skill cannot be replicated by computers.

Computer assistance is simply that: an assistance. The successful link between computer programmes and engineering skill varies depending on which part of the AEC industry they are being used in. To understand how this factor can impact their relationship, we must first look at the three main stages of engineering design.

1. **Concept design:** At this stage, the majority of the design comes from the imagination of the engineer, supported by some simple sizing elements or calculations.
2. **Drafting and analysis:** This stage brings the concept design into the real world more earnestly, checking that it is feasible and how it will succeed. This stage is predominantly computer-based, using programmes such as [building design software](https://www.oasys-software.com/products/structural/gsa-building/) to help engineers work to a greater degree of accuracy.
3. **Detailed design:** This stage is when, as the name suggests, the design becomes much more detailed. At this point, the design is almost completely computer-based, with analysis happening in the background.

Projects will always need a degree of human ingenuity. But it’s not just the imaginative aspect that machines cannot replicate in full: fine tuning, for example, still needs a guiding human hand in order to ensure the outputs are correct. While leaps and bounds are certainly being made in machine learning, whereby computers can now make decisions based on historical data and records, it is highly unlikely that this will develop to the point where human skill and judgement become obsolete.

That’s not to say human decision is infallible. Mistakes can be made when writing the programmes designed to support design, or further along the line when inputting data into these programmes. Either error will result in an inaccurate output. For this reason, the topic of automated checking — whereby computer programmes will check the input against previous projects and their success or failure — has been a hot point of discussion within the AEC industry lately. However, it is worth bearing in mind that the majority of engineering disasters have occurred due to something unusual; that is, something that has not happened in previous related projects. While rule-checkers help when situations where rules apply, they aren’t able to flag something that hasn’t happened in previous records, i.e. something unusual.

There have been instances in the past of mistakes coming to fruition. For example, the Millennium Bridge’s well-known wobble was not picked up on at any point by the design’s code. Programmes failed to predict the wind instability of Tacoma Narrows. While engineers can make use of a value judgement, computer programmes do not. As the world changes, engineers will make a value judgement to adapt their designs accordingly.

Formulas are made to aid in making choices and judgements more accurate. There are several structures and designs that have had formulas developed exclusively for them. For example, the original formula creation for shell structures had to be created by expert mathematicians to ensure success. Now, with Finite element Analysis, almost any form can be analysed — but that does not mean these forms are always sensible. There’s a certain amount of tension between architects and engineers surrounding this. Where engineers are seen as wanting functionality, architect are seen as wanting novelty first. But this disparity makes for the perfect partnership towards the best designs.

John Hannen

Outreach Executive

john.hannen@mediaworks.co.uk

+44 (0)191 404 0100

www.mediaworks.co.uk