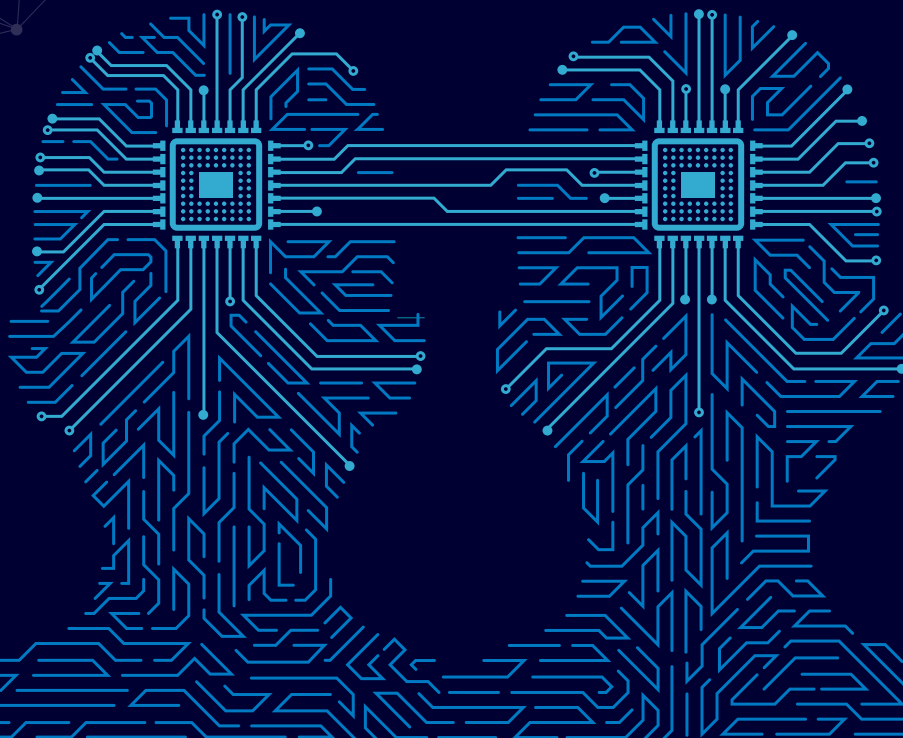


Operationalising Digital Twin Ethics

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The world is how we shape it

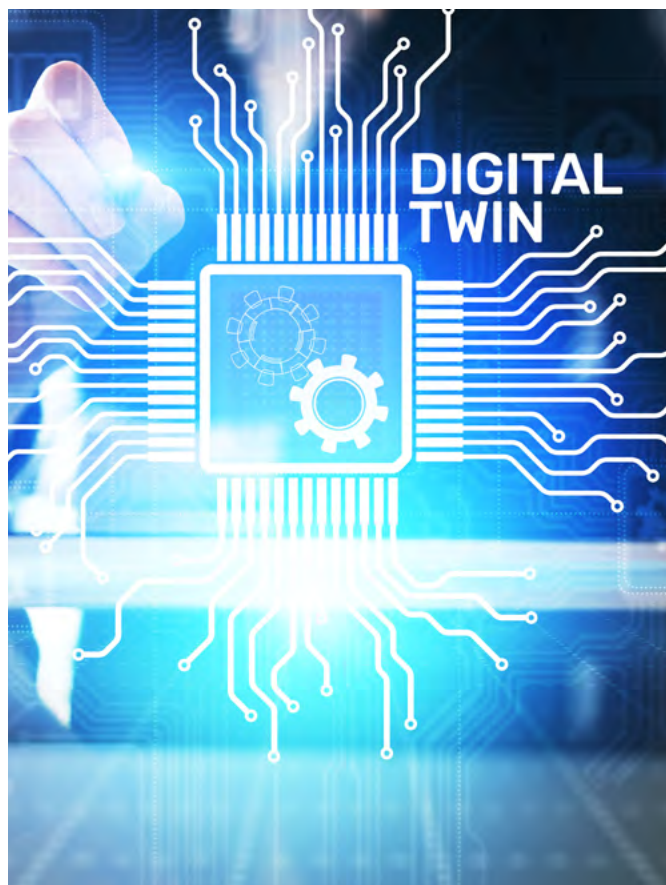
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Operationalising Digital Twin Ethics

The [Gemini Principles](#), which underpin the [National Digital Twin programme](#), hold that digital twins should be ethical. A digital twin must, for instance, **“be used to deliver genuine public good”** and **“must be trustworthy”**. A recent report by [Sopra Steria and the National Digital Twin programme](#) goes into detail as to the ethical implications of all nine of the Gemini Principles. The report also argues that if the ethical aspects of digital twins are ignored then they risk harming people, losing public trust, inviting strict regulation and preventing the realisation of the true value of digital twins.

It is one thing to say that a digital twin should be ethical. However, it is altogether more challenging to say how to make that digital twin ethical. As we have seen in discussions around AI over the last few years, it is easy to say that a technology or approach should respect privacy or not discriminate on grounds of sex or ethnicity. Ensuring that the technology or approach is privacy-respecting or non-discriminating is far harder, though. In short, the challenge remains as to how to operationalise ethics in technology. Given the rapid growth in digital twins, this is a particularly timely and acute concern.

One promising approach to the challenge of operationalisation is ethics by design. This goes beyond setting abstract ethical targets as requirements which must somehow be met in the design process. Instead, it engages with the design process as a whole and asks which ethical issues arise at which point in the process. An ethics by design approach then identifies key ethical questions which need to be asked at each stage of the process.



Generic efforts at ethics by design for AI can be seen in recent European projects such as [SHERPA](#) and [SIENNA](#). These have been summarised in [this report published by the European Commission](#). Albeit not explicit, the Alan Turing Institute's [Understanding Artificial Intelligence Ethics and Safety](#) implicitly follows a similar approach. Each of these, though, is limited by taking a generic approach to the broad concept of AI design in general.



This further challenge of making an ethics by design approach relevant takes operationalisation one stage further. It moves from generic operationalisation to operationalisation in context. This requires taking the ethics by design approach and applying it to a specific use case. As with AI, this is crucial to applying ethics to digital twins. As noted in the above report on Ethics and the Gemini Principles, digital twins vary widely in their application, from monitoring people to monitoring grain. As such, the ethical considerations will be strongly dependent on context.

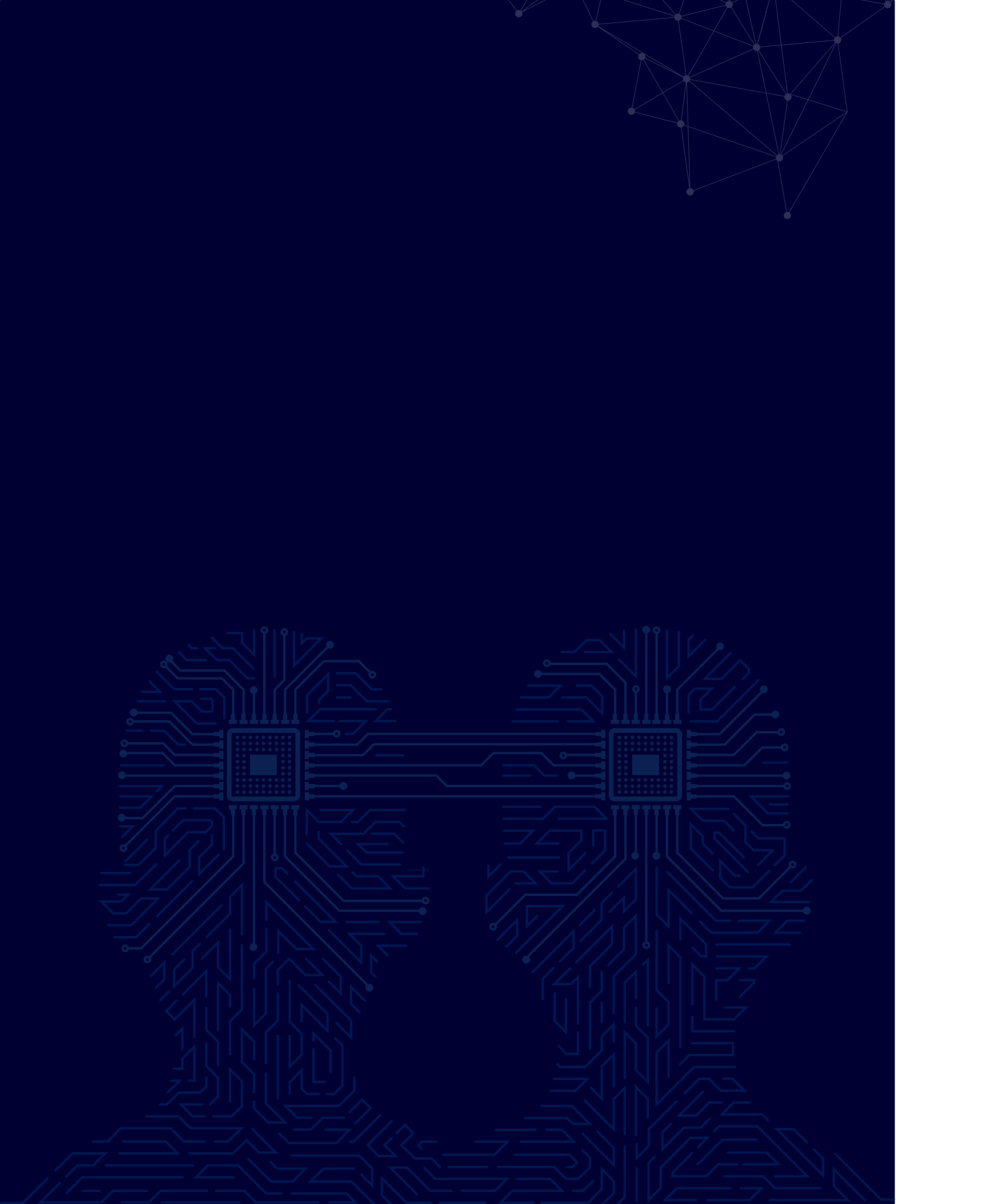
To address this challenge of operationalisation in context, Sopra Steria have produced a report on [Trustworthy Digital Twins in Intelligent Transport Systems](#). This identifies three phases of development (resource, representation, and action) within each of which are several sub-stages. The report then highlights the ethical issues likely to arise at each stage. For example, many will think of privacy as a potential issue at the resource phase, but probably fewer will consider the risk of function creep. Likewise, at the representation phase there are considerations around explainability and uncertainty relating to both input data and model outputs. Thinking this way will help developers understand where precisely which ethical issue needs to be addressed and when they should be addressed in the process of building a digital twin.



While there is a context dependent aspect to digital twins and ethical issues, we can still learn from examples in contexts different to our own. Although the report focuses on digital twins in intelligent transport, many of the design aspects considered will apply to other examples of digital twin development in different contexts, such as building information modelling and healthcare.

As noted at the start of this article, digital twins must be ethical. To ignore this is to invite untold problems. It is not enough to have good intentions, or to hold that technology is ethically neutral. We are judged on the consequences of our actions as much as anything else. The consequences of unethical digital twins will be *at best* harm to reputation, at worst they will invite harm to users and/or the public, damage to public trust in the industry, and lead to restrictive legislation. None of this will benefit industry or the growth of digital twins. By contrast, *ethical* digital twins will invite trust by the public and regulators and reflect the best of the industry.





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