

Digital Twin Ethics in The Travel and Transport Industry



Introduction

Spanning industries and contexts, Digital Twins will change how we experience, use and benefit from infrastructure and services. To ensure that the full value of Digital Twins is realised, ethics should sit at their core, especially in a critical industry such as Travel and Transport; Digital Twins in the Travel and Transport industry should take an ethics by design approach, embedding ethical principles throughout development, implementation, and management.

In the context of this industry, we will take a Digital Twin as 'a virtual representation of real-world entities and processes, synchronized at a specified frequency and fidelity'.¹ Digital Twins could be a digital representation of a process such as physical travel network, for example the UK rail network, or smaller entities such as individual drivers on the M25.

Ethics by design is an approach that works towards the systematic inclusion of ethical values, principles, requirements and procedures in the design and development processes. For a Digital Twin in this industry there are a number of key issues to consider, including but not limited to: data ethics, environmental impact and safety. **Throughout this article, these and more Digital Ethics issues will be outlined and explored. Trust is often presented as the elusive panacea in today's technological society. Through pre-emptive consideration of these issues, the first steps can be taken to ensure Digital Twins develop as trusted technology in society.**

¹ [Digital Twin Consortium](#)



Data Ethics needs be the bedrock of Digital Twins

Data ethics 'evaluates data practices with the potential to adversely impact on people and society – in data collection, sharing and use'.² As data forms the foundation of Digital Twins, data ethics is fundamental to an ethical Digital Twin.

Transparency, accountability and fairness are key components of data ethics, recognised in the three overarching principles of the UK Government's Data Ethics Framework. Taking these in turn, transparency around the purpose and processes concerning data collection and sharing should be upheld. This will help ensure that the relevant real-world entity represented by the Digital Twin is aware that data is being collected and fed into the digital environment, with the ability to review this data according to the Data Protection Act 2018. This could include the organisation and drivers of a parcel delivery firm using the road network, or engineers making repairs on a cargo ship.

The importance of Accountability and Transparency

Clear lines of accountability should be recognised and understood by all entities. Digital Twins remove the scope for plausible deniability. Within a Digital Twin environment, decisions can be articulated, logged and audited. Therefore, illuminating accountability should give oversight to the justifications given for, and subsequent decisions made using Digital Twins while also discouraging the use of Digital Twins by potential malicious actors. Coupled with this, stakeholder engagement should be encouraged throughout the development and use of the Digital Twin.

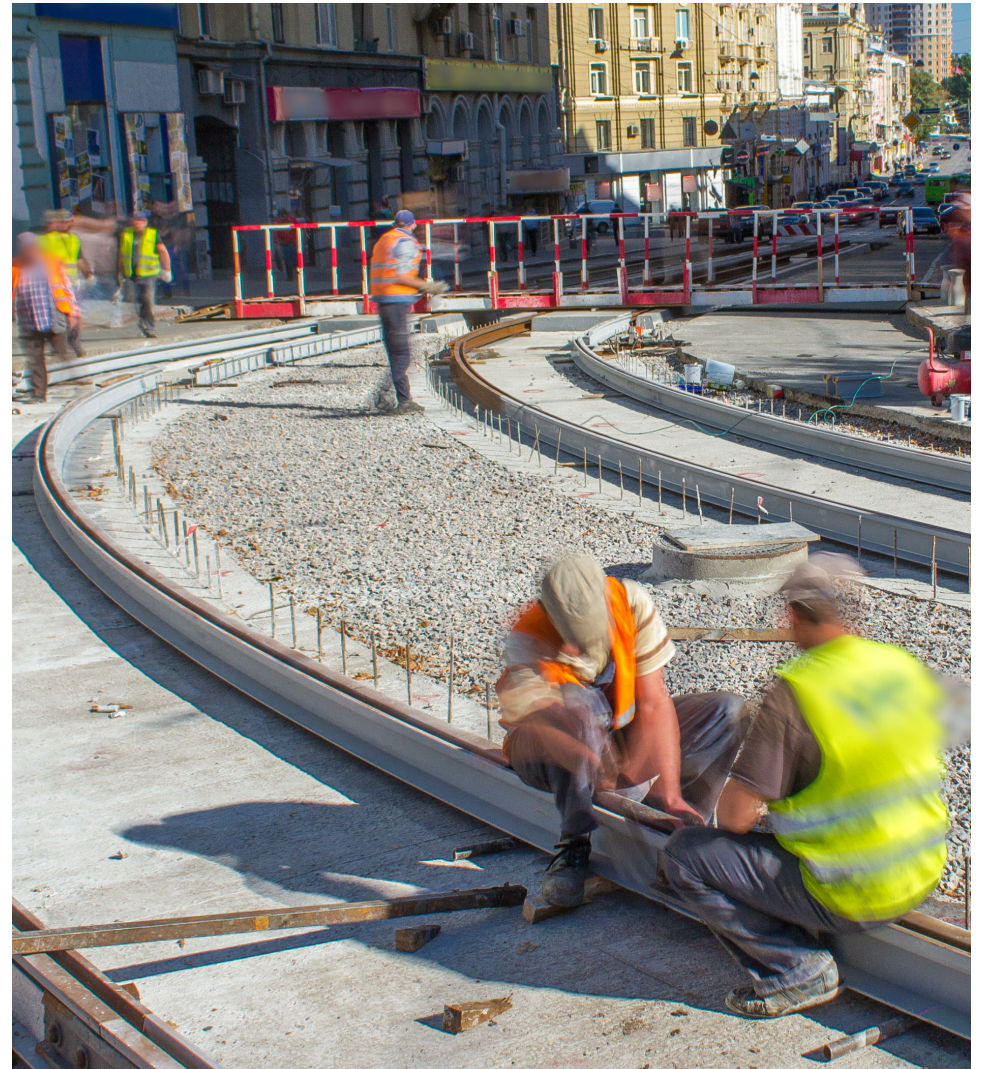
To this end, there should be channels available to allow stakeholders to understand why and when their data is collected, why and when it is shared and how it is processed. Accountability and transparency also factor in data protection. There is often a risk of de-anonymisation when using data, which is amplified in an industry where car number plates and other personal data could be collected. Therefore, privacy and data protection considerations should be built into the Digital Twin, along with data minimisation and other issues demanded by the Data Protection Act 2018.

²[TheODI.org](https://theodi.org/)



Improving accessibility of the industry for all

A Digital Twin may identify unequal quality in experience of or access to the industry. For example, working class or BAME neighbourhoods may have poorer quality roads than middle-class or white neighbourhoods. A Digital Twin may also identify that there are unequal negative impacts of the industry, or could reinforce and perpetuate existing harmful and discriminatory social and power structures when ethics is neglected. For example, a disproportionate number of ethnic minority neighbourhoods may be forced to relocate because of planned rail-works or airport extensions. By recognising these insights, a Digital Twin can help improve the impact of the industry on all society.



Leading the fight for environmental sustainability

A Digital Twin in this industry should shoulder some responsibility to help reduce impacts on climate change due to the industry's relationship with the environmental crisis. The industry has an opportunity to use Digital Twins to play a significant role in the fight against climate change. This could be through exploring opportunities to reduce the harmful emissions of individual vehicles; encouraging the use of multi-modal forms of transport; or using data insights to highlight where investment in infrastructure, public transport or service optimisation could reduce the number of vehicles throughout the travel network.

Digital Twins are also in the unique position to assess and tackle pollution created by the industry through the use of sensors or IoT providing real-time metrics of the physical world. For example, highlighting congestion hotspots could help to identify alternative routing which encourages traffic flow. Digital Twins could also be used to identify communities living near the network which are most impacted by pollution, and where investments in green infrastructure could have the greatest impact. The environmental impact of Cloud services which will be used to support Digital Twins should also be considered.



Creating a safer industry

In terms of safety, we must recognise that there are limitations in both physical and digital environments. Consequently, there should be human oversight and engagement in the use of a Digital Twin. This is particularly true when considering physical emergencies and the responses they require, as individuals often act differently or unpredictably in emergency situations. The differing requirements of respective emergency response teams should also be recognised and intrinsic to a Digital Twin to allow them prompt access to emergencies. Likewise, human intervention should be sought if the Digital Twin monitors extreme anomalies from predicted events. Furthermore, Digital Twins could monitor and predict routes that are no longer suitable for vehicles, recommending alternative and safe routes.

Final Thoughts

Recognising that there are ethical risks to implementing Digital Twins in this industry is therefore not a hindrance to development. Rather, ethical risks, when identified and mitigated, can be used to create value for the industry and society, and through this the development of better technology. We believe that the best, most consistent means of achieving this is through adopting an ethics by design approach, which encompasses the design, use and consequences of Digital Twin, as outlined in this paper.

Over the following weeks and months, the Digital Ethics practice at Sopra Steria will be sharing more from our work on the ethics of digital twins. Watch this space and join in the conversation by connecting on [LinkedIn](#).



More Information

Many organisations talk about the ethical implications of technology, few are taking action. Backed by research and industry-recognised standards, Sopra Steria's Digital Ethics experts help you to gain a better understanding of the ethical challenges your digital strategy, programme or project faces; uncover the practical changes you can make and develop the business case for change.

Our comprehensive understanding of technology, combined with our leadership in managing our business for economic, social and environmental sustainability, make us a natural partner to take action on Digital Ethics issues. We move the discussion from the philosophical to the practical, collaborating with a range of stakeholders and industry groups to shape a better future, while helping organisations navigate the challenges of Digital Ethics today, leading to better business outcomes now.

For more information about our Digital Ethics consultancy services please contact Nick Wild at the details below:

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Or you can visit us at <https://www.soprasteria.co.uk/capabilities/digital/digital-ethics>

We look forward to working with you.