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Digital Twins and Digitised Governance

Digital Twins Supporting Urban Development

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Smart Cities Lead

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Smart Cities Lead and Manager Data & Insights

Background;

- Chair Sustainability Working Group and Responsible AI Sub-Working Group DTC
- Data Ethics Facilitator and Professional
- EPSA best practice winner (CBS) on Regional Data Centers and measuring policy interventions
- Grant Development Manager at Statistics Netherlands
- Panel member of the Dutch European Advisory Board on Societal Challenges
- European Expert on Philosophy and Ethics of Science and Technology
- CBS academy Lecturer on Data Ethics and the Role of Research in Society / Using Data to create new Insights
- Research & Development advisor at Fontys University
- Member of the Fontys University Ethical committee for Research (STS Expertise)
- Real Estate Investment calculator & Business Analyst

Education:

- BBA Economics (Fontys University Eindhoven)
- MA Science and Technology Studies (Maastricht University)
- MESST Philosophy & Ethics of Science and Technology (UCLLN)

Recent Publications:

2025: Dokter, D. (2025). AI Can drive cars, but it can't make you listen. Public Sector Executive (134), 30-31.

2025: Dokter, D. (2025, April 30). AI-powered autonomous systems – transforming urban mobility in smart cities. Retrieved from DevOps: https://devopsonline.co.uk/ai-powered-autonomous-systems-transforming-urban-mobility-in-smart-cities/

2024: McKee, D., & Dokter, D. (2024). DISCS: An Approach for Accelerating the Development of Digital Twins for Smart Cities. In S. Sabri, K. Alexandridis, & N. Lee, *Digital Twin: Fundamentals and Applications* (pp. 31-58). Springer Nature.

2024: Dokter, D. (2024, December 23). *Digital twins: catalysts of business innovation*. Retrieved from Business Reporter: https://www.business-reporter.co.uk/ai--automation/digital-twins-catalysts-of-business-innovation?Preview=1

2023: David Wilkinson, Dennis Dokter. *The Researcher's Toolkit: The Complete Guide to Practitioner Research*. Taylor & Francis, 2023.

Two Types of Systems and Two Types of Coupling

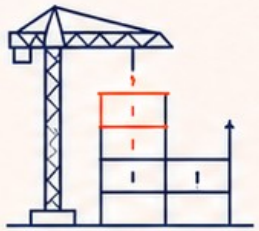
You cannot tackle complexity all at once.

COUPLING

TIGHT | LOOSE

LINEAR
Predictable
Repeatable

COMPLEX
Unpredictable
Emergent



TIGHTLY COUPLED LINEAR SYSTEMS

Efficient but Risky

LOOSELY COUPLED LINEAR SYSTEMS

Stable and Manageable

TIGHTLY COUPLED COMPLEX SYSTEMS

High risk and hard to control

LOOSELY COUPLED COMPLEX SYSTEMS

Adaptive and uncertain

Start here.

Linear systems are predictable and repeatable.

We can automate and build trust in the data.

Tackle later.

Complex systems are uncertain and interdependent.

They require a strong foundation of trusted data and proven processes.

Digital Twins begin with the linear and move towards the complex, building the foundation for informed urban development.

Start with a Digital Twin in a Linear System

Linear

- Predictable Behaviour
- Modelling is Easier
- Computation is more Efficient
- Integration is easier
- Scalable and Modular
- Simpler tot interpret

Complex

- Non-linear and dynamic
- Harder to model
- Require an established and robust framework
- Margins of risk and error are higher

Build a trusted foundation before tackling complexity

Collective Intelligence for Digitised Governance

Better Governance comes from systems that work together, capture the correct and validated data and use the right technology

1. **Trusted Data that Endures**

   We need to look at sustainable data and appreciate more the importance of data types, data provenance and data ownership

2. **Build a System of Systems**

   We first need to de-silo and design systems for interoperability

3. **Technology versus Solution**

   We need to understand the difference between enabling technologies and interventions that aim to solve the problem

- Well-governed and validated data is the foundation for long-term value and better outcomes
- Interoperable systems enable collective intelligence
- Enabling technology provides data and insights, interventional technology (or other) is targeted to deliver impact

Digital Twins Make Urban Development Predictable

An integrated digital twin of the built environment turns complexity into clarity and enables better decisions for society.

INPUTS

- Infrastructure Layout
- Legislation & Policy
- Utility Requirements
- Permit Requirements
- Tendering & Procurement
- Social Factors & Objections
- Mobility

DIGITAL TWIN FOUNDATION

Integrated Data Model
A single, connected source of truth for the built environment.

Opportunity to Use for Separate Predictive Models
Run specialised models for topics such as traffic, pollution, noise, crime, affordability, energy, and others.

Rules & Constraints
Legislation, standards and regulations built in.

Real-time
Live data to keep the twin current and relevant.

OUTCOMES

Faster, Smarter Decisions
Reduce planning time and bureaucracy.

Test More, Risk Less
Compare options and choose the best path.

Lower Cost, Higher Certainty
Avoid rework, delays and compliance issues

Focus on What Matters
More resources and attention for societal outcomes

Urban development stops being reactive... and becomes a controllable system.

Predictable Development

Sustainable Communities

Better Outcomes for Society

A SHARED DIGITAL FOUNDATION

- Interoperable Standards
- Open Ecosystem
- Trusted Data
- Inclusive Governance

Better cities. Stronger communities. Sustainable future.

Future of the Urban Development DT

Better Data → Better Understanding → Better Decisions

1 Richer, Validated Data

- Integrated, high-quality data from across the built environment
- Continuous feedback from real-world outcomes

2 Understanding Causality

- Move beyond correlation → identify cause and effect
- Understand why outcomes happen (not just what)

3 Smarter Predictive Models

- AI models become more reliable and contextual
- Used to inform decisions, not replace them

The Digital Twin becomes the foundation for increasingly intelligent, domain-specific models.

THANK YOU
ANY QUESTIONS?

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