

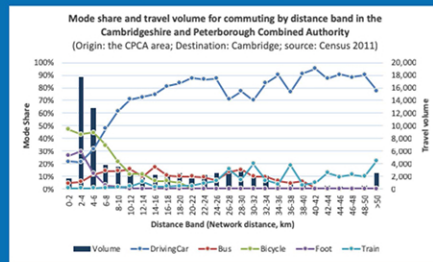


A City-Level Digital Twin Experiment for Exploring the Impacts of Digital Transformation on Journeys to Work in the Cambridge Sub-region

Benefits to urban planners, transport and energy infrastructure planners, local policy makers

Summary

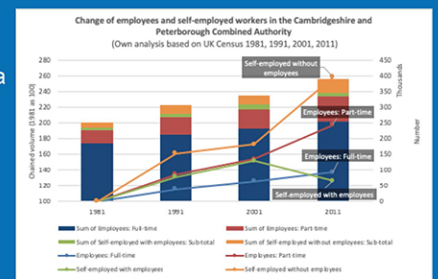
The 'digital twin' represents one of the latest technical trends for smartening our cities. However the roadmap to develop a city-/national-level digital twin is not yet clear. This project represents a timely effort to explore a policy-oriented strategy for developing a city-level digital twin prototype for the Cambridge sub-region, with a particularly focus on journeys to work. The investigation of past trends in journeys to work is reported, and the analytical capability of the twin model is demonstrated through two digital scenarios (teleworking and EVs charging demand). Initial feedback from local authorities suggests that the city-level digital twin has a great potential for bridging professional/disciplinary silos in city and infrastructure planning and management. The project is nothing but a small step towards the ambition of creating a national digital twin for the UK infrastructure. It is expected that more and more empirical evidence will be gathered to establish a new body of knowledge for leveraging and regulating the power of digital twins. As a reflection of the project, a series of propositions are proposed for guiding the future research on city-level digital twins.



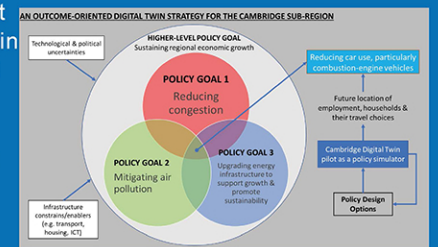
Topic 1: mode choice in the Cambridgeshire and Peterborough Combined Authority

Key Findings

Proposition 1: The upscaling from an engineering digital twin to a city-level digital twin is not straightforward. For a city-level digital twin application to be useful and the associated discussion to be meaningful, key dimensions of a city-level digital twin need to be articulated pertaining to the purpose, boundary, context and resolution of specific digital twin as well as the interdependences among twin models.



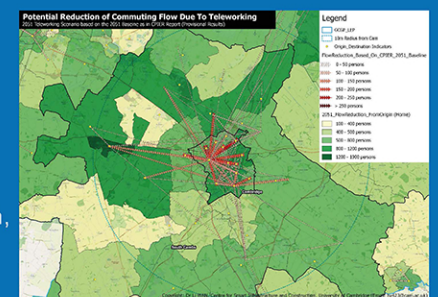
Proposition 2: Digital twin development is a progressive process; the digital twin and the social system that creates and uses it must co-evolve with each. On the one hand, our existing knowledge about cities and societies defines how well we could development and use a city-level digital twin. On the other hand, artificial intelligence (AI) may eventually become comparable to or even surpass human intelligence in terms of knowledge production and decision making.



Proposition 3: Real time is a relative term. The temporal scale of the digital twin should reflect the rate of change of the subject in reality.

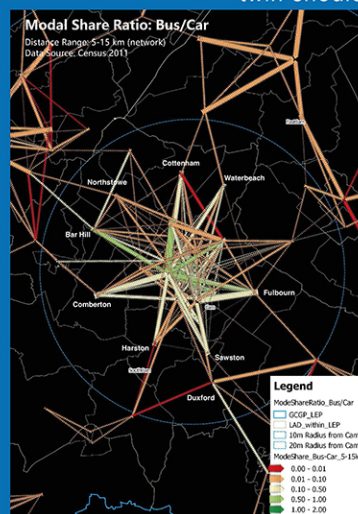
Proposition 4: To advance the city-level digital twin agenda, digital twin applications should be focused on enabling more frequent and effective feedback loop between the twin model, policy makers, stakeholders and the public. New interface needs to be explored which can translate data analytics into cogent narratives targeted to various stakeholders.

Proposition 5: A realistic use of a city-level digital twin is to identify system-level risks and inefficiencies of policy interventions and to foster cross-disciplinary/professional collaboration, as opposed to providing a singular model-based optimization.



Next Steps

- Further developing and applying the digital twin prototype to support the planning and management of major development initiatives in Cambridge through case studies in collaboration with local authorities, key stakeholders and citizens;
- Collecting feedback on the design, use and communication of the digital twin tool and developing preliminary guidelines for city-level digital twin development;
- Exploring a new competence framework for city managers.



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