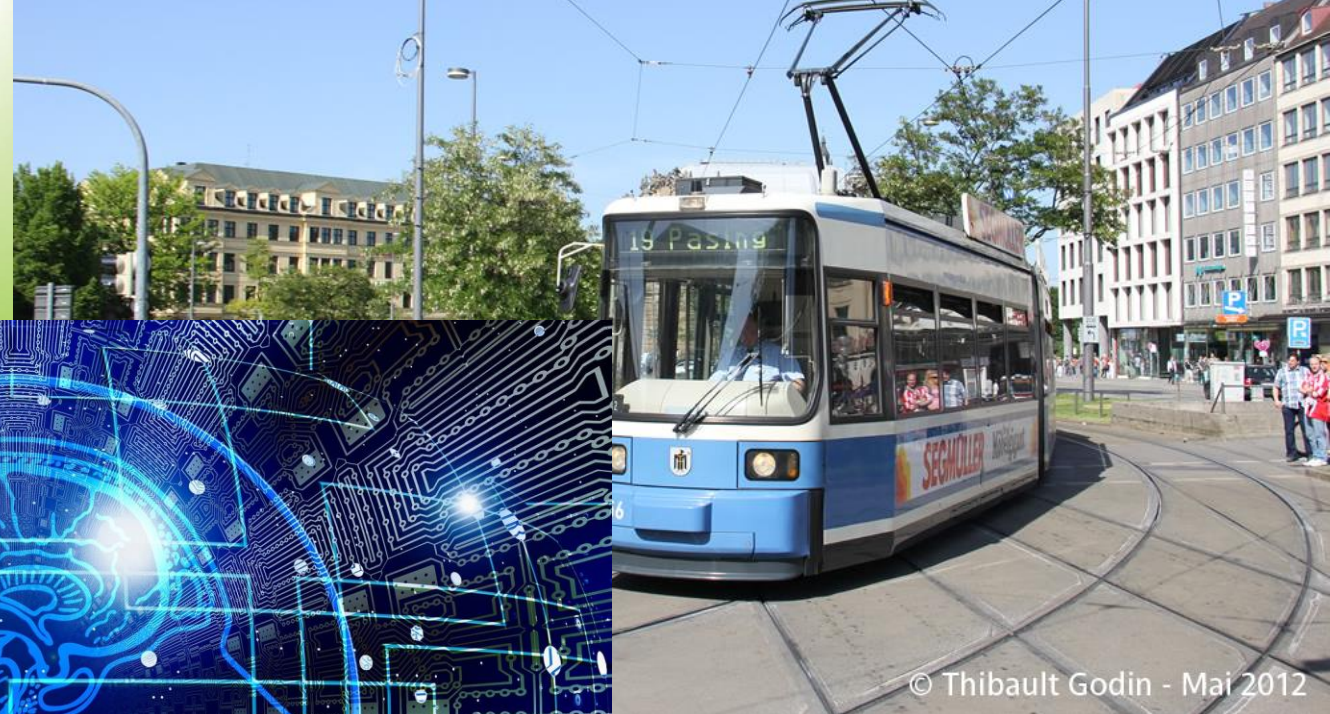


Smart Cities – Delivering Public Value through Responsible Urban Digital Innovation



© Thibault Godin - Mai 2012



Image by Beverly Buckley from Pixabay



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Tech and the city
Smart cities

The truth about smart cities: 'In the end, they will destroy democracy'

Outrage: 'for the Smart Cities Mission, cities are solely instruments of economic growth'

21 JUNE, 2016 • BY HIMANSHU BURTE

MailOnline Science

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Would YOU live in Google's 'city of the future'? High-tech Toronto neighbourhood that will monitor resident's daily lives using sensors in everything from bins to traffic lights raises privacy concerns

South China Morning Post | EDITION: INTERNATIONAL

LIFESTYLE

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Lifestyle

Technology

Smart cities: are we sleepwalking into a Big Brother future of constant surveillance in the name of improved efficiency and safety?



Economic stability

Resilience

Access to services

Sustainable growth

Employment

Social inclusion

Democracy & participation

Air quality

‘Digital City’ vs ‘Smart City’



Digital city as a comprehensive, web-based representation, or reproduction, of several aspects or functions of a **specific real city, open to non-experts** (Couclelis, 2004).

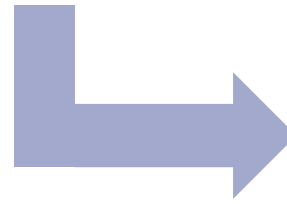
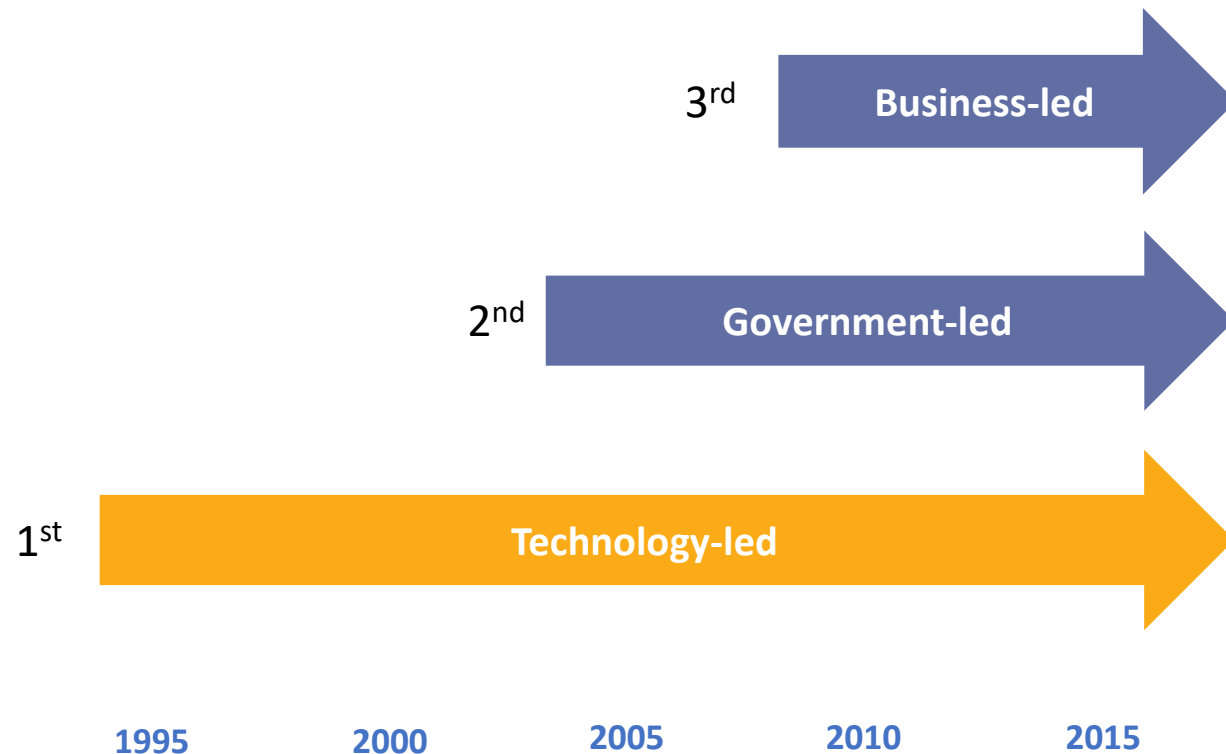


Table 1. Working Definitions of a Smart City

- A city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens. [24]
- A city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens. [28]
- A city “connecting the physical infrastructure, the IT infrastructure, the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city” [29]
- A city striving to make itself “smarter” (more efficient, sustainable, equitable, and livable) [45]
- A city “combining ICT and Web 2.0 technology with other organizational, design and planning efforts to dematerialize and speed up bureaucratic processes and help to identify new, innovative solutions to city management complexity, in order to improve sustainability and livability.” [56]
- “The use of Smart Computing technologies to make the critical infrastructure components and services of a city—which include city administration, education, healthcare, public safety, real estate, transportation, and utilities—more intelligent, interconnected, and efficient” [58]

Couclelis, H. (2004). The construction of the digital city. *Environment and Planning B: Planning and Design*, 31(1), 5–19. <https://doi.org/10.1068/b1299>

Smart Cities – An evolving concept



Adapted from the **2017 Smart City Strategies Report**
prepared by ARUP & FCC

1st Wave: Technology-led “Marketers’ Smart City”

- Driven by large tech firms
- Deploying technologies through investments on urban infrastructures

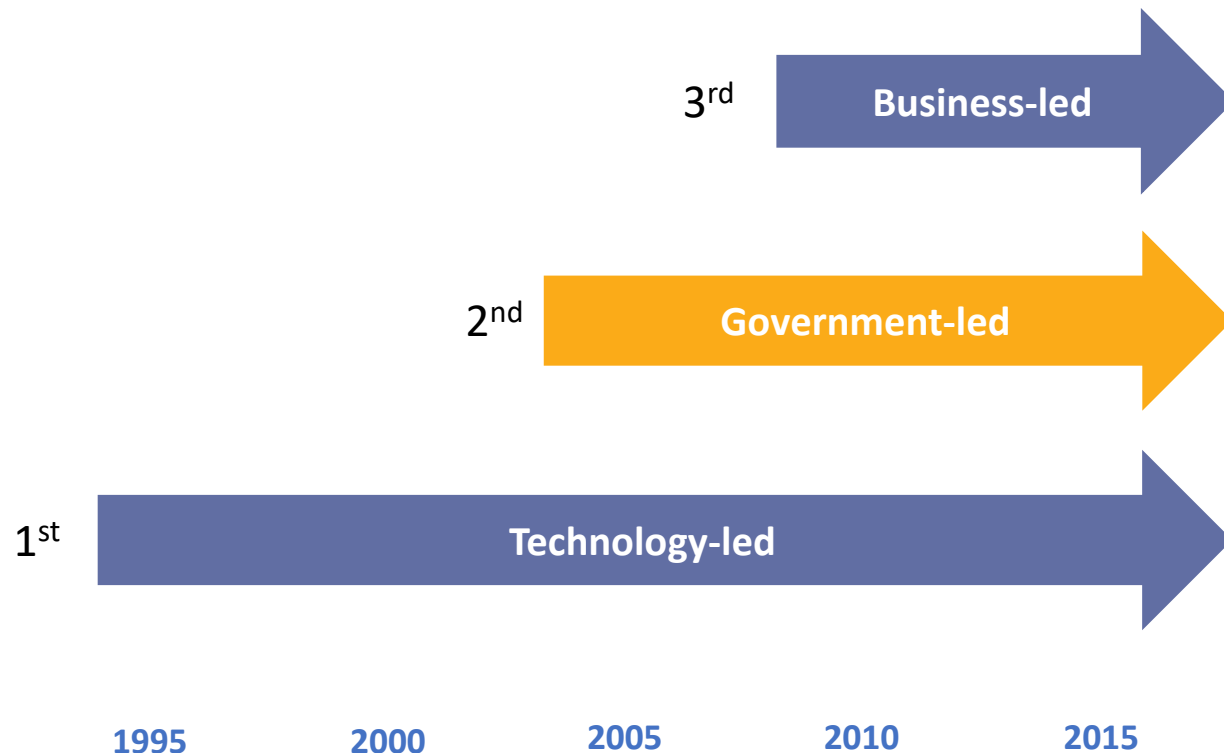
OUTCOMES:

- Lack of consideration for the **social dimension** (policy and social contexts)
- “**Pilot sickness**” – Smart city as a marketing & promotional tool to attract investment; lack of understanding of long-term operation and scalability

LESSONS LEARNT:

- ICTs are the tools/drivers to achieve “smartness” in cities, not the purpose of Smart City initiatives

Smart Cities – An evolving concept



Adapted from the **2017 Smart City Strategies Report**
prepared by ARUP & FCC

2nd Wave: Government-led “Citizens’ Smart City”

- Citizen engagement through digital platforms, open data portal, co-design and innovation competitions

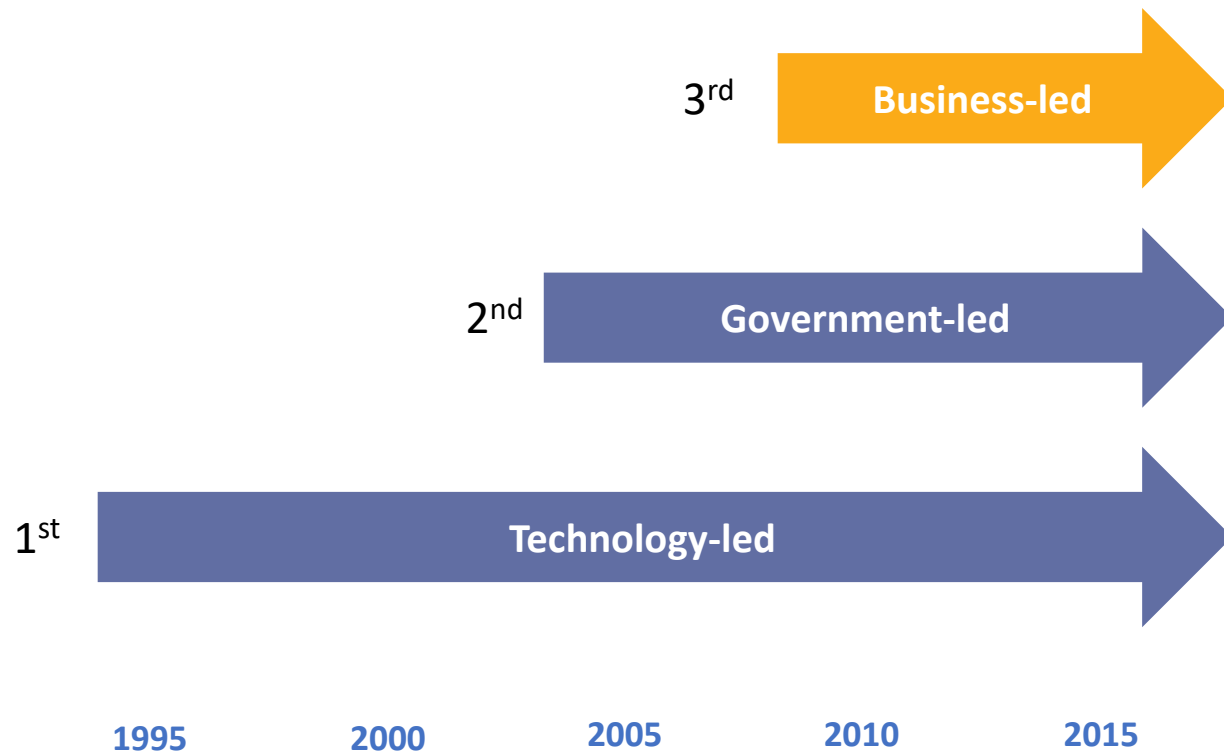
OUTCOMES:

- Numerous **city-scale digital strategies** (Songdo, Singapore, Chinese/Indian cities) are put forward
- Key focus: improving the **quality of life** and **efficiency** in public service

LESSONS LEARNT:

- Digital implementation has been oriented towards the service end-users, while the **decision-making** of the inner systems (urban managers) remained neglected

Smart Cities – An evolving concept



Adapted from the **2017 Smart City Strategies Report**
prepared by ARUP & FCC

3rd Wave: Business-led “Consumers’ Smart City”

- Tech companies disrupt old business models and bypass old systems by delivering services directly to citizens [Uber, Airbnb, Deliveroo etc.]

OUTCOMES:

- Services spread at unprecedented rate, catalysed by the **social media** network
- Innovation encouraged - Private sector to realize that they could play a much bigger role in the planning, operation and management of cities

LESSONS LEARNT:

Disruptive innovation prompts **government interventions** to

- enhance the positive impacts of technology both **internally** and **externally**
- **safeguard citizens** from negative impacts (albeit some are still unknown)

CHALLENGES IN THE BUILT ENVIRONMENT

SILOEDNESS

sectoral
institutional
temporal

SKILLS & CAPABILITIES

ISSUES
smarter
government and
citizens

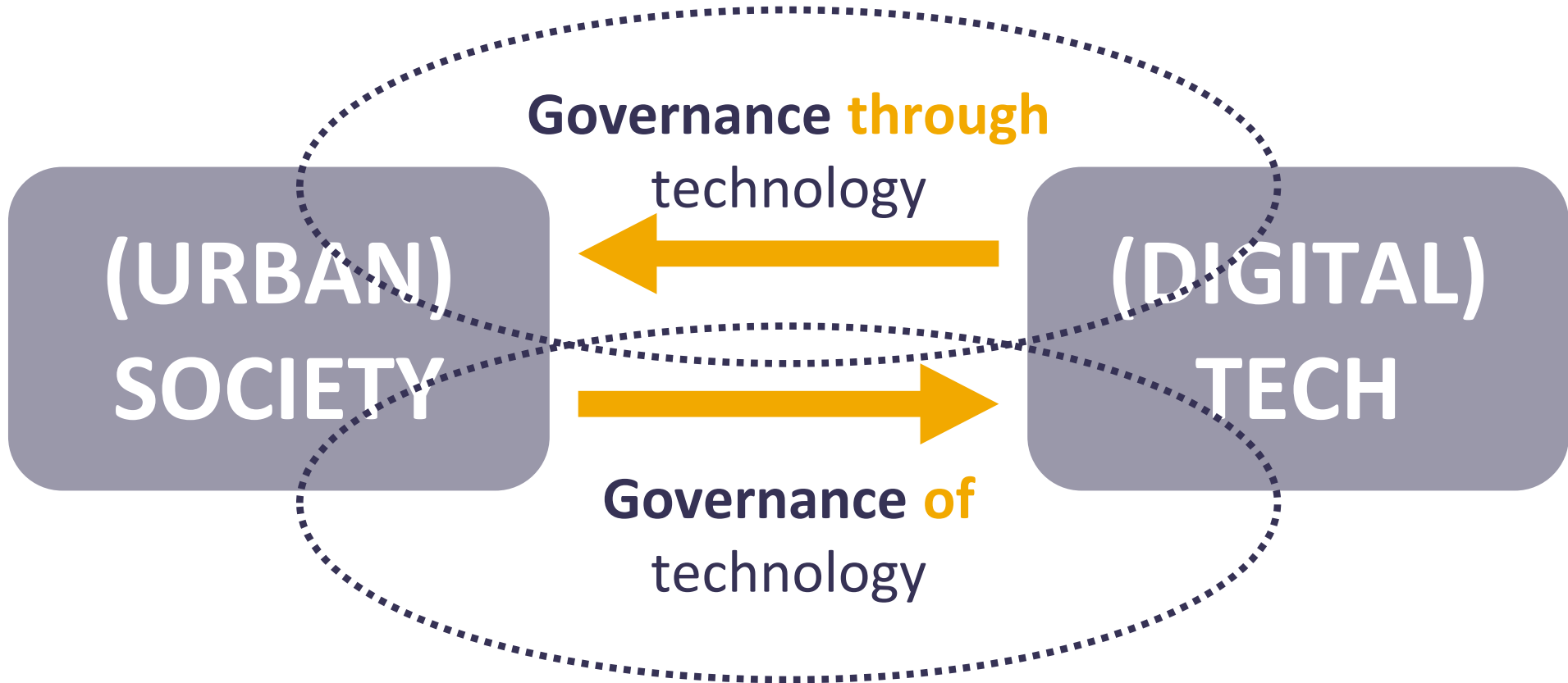
CONTEXT SPECIFIC

Systemic
inter-
Dependencies
(governance structures and
processes)

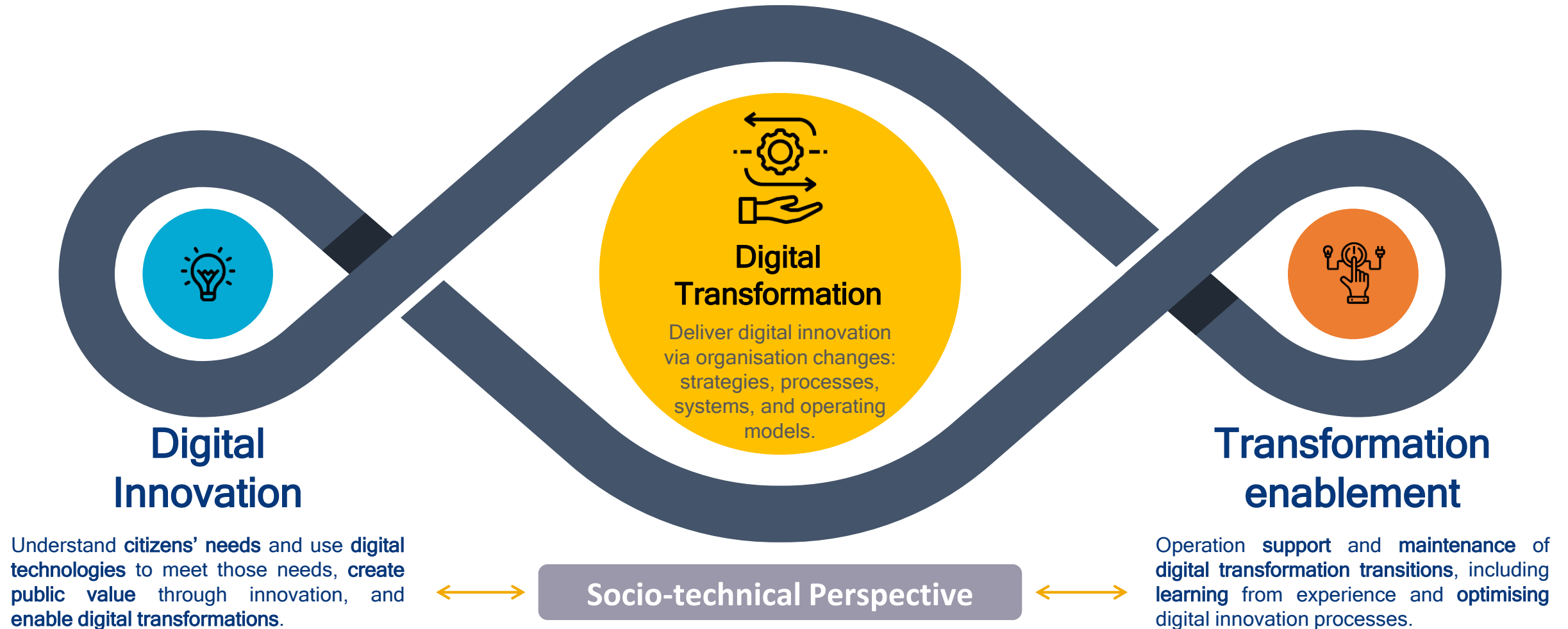
CITIES & PLACES

SMART(ER) CITY

DIGITAL TOOLS



HOW TO ADDRESS THOSE CHALLENGES?



GOVERNING

Governance: achieving socially desirable outcomes efficiently (resources), effectively (quality) and democratically (trust).

Ethics: anticipating, evaluating and managing societal impact



Create public value through responsible digitalisation in the urban built environment

Technology: data generation, processing, analysing, visualising, sharing, storing...

Empirical focus: built environment systems/sectors, interdependencies, impact on services and local economy

KNOWING



Image [freeaustralian.com](https://www.freeaustralian.com)

Table Work



involve

What do we want to achieve
in Greater Cambridge by
2030? By 2030 transport in
Greater Cambridge should.

PEOPLE
AT THE
HEART OF
DECISION-
MAKING

16. Top
What do we want to achieve
in Greater Cambridge by 2030?

Handwritten notes on a flipchart, including several yellow sticky notes.



DIGITAL TWINS...

SmartCitiesWorld
Sharing Ideas to Solve Urban Challenges

News Cities Opinions Special Reports Events

CONNECTIVITY & DATA GOVERNANCE AND CITIZEN ENERGY & ENVIRONMENT

Home | Connectivity & Data | Digital twins

Digital twin tool for smart cities and metaverse launched

Digital twins 24 Feb 2023 by SmartCitiesWorld news team



Menu

E&T ENGINEERING AND TECHNOLOGY



Digital urban planning: twins help make sense of smart cities

BIMTODAY

HOME PUBLICATIONS STAKEHOLDERS SPECIAL REPORTS GUIDES EVENTS

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BIM News

Cambridge set for 'digital twin' as part of new Urban Data Project

February 14, 2019

Information Age

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Topics
Smart Cities



Aaron Hurst
15 August 2018



Why will smart cities need digital twins?

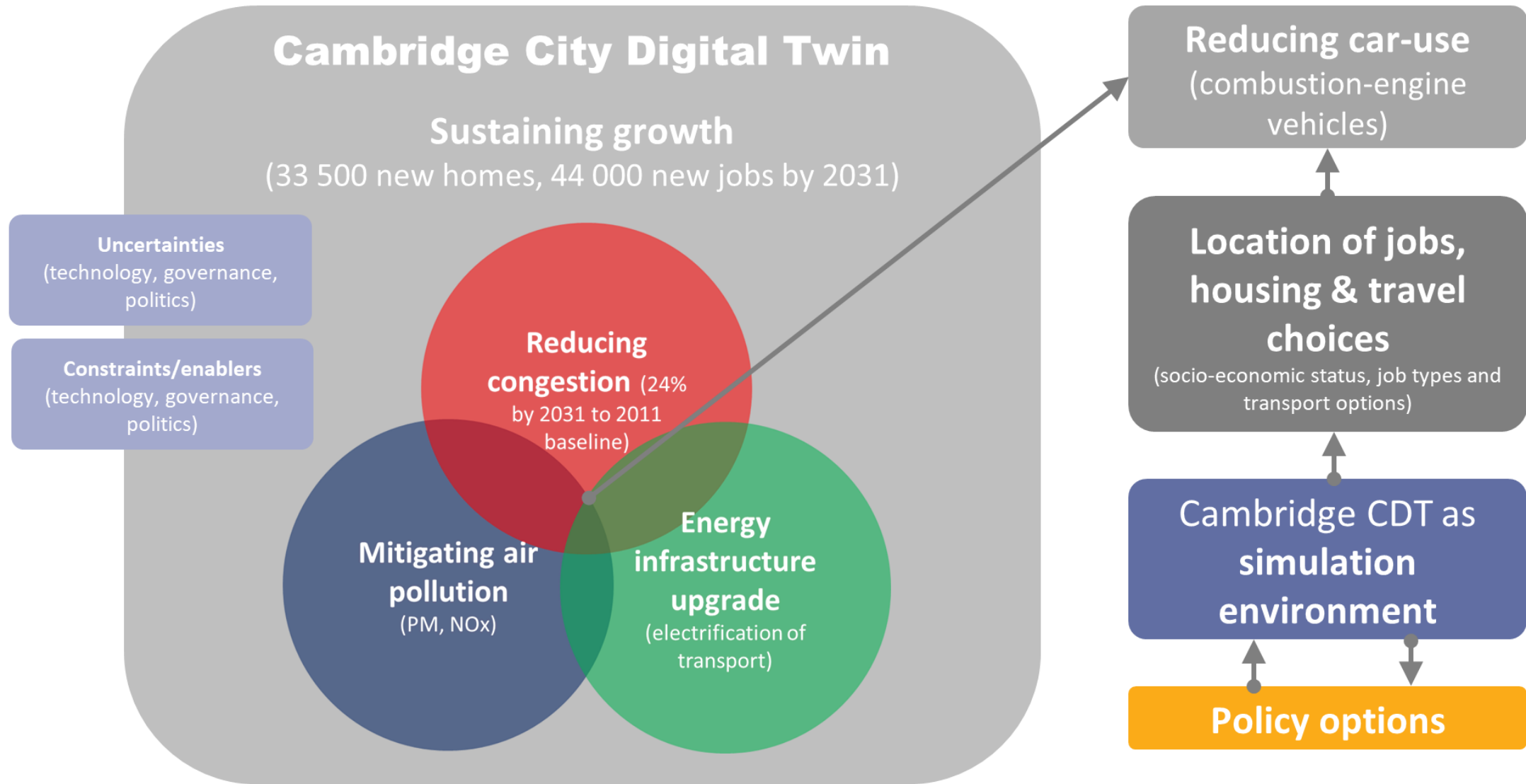
As the use of the Internet of Things (IoT) has become more cost-effective and popular, so has the possibility of digital twins.



Digital twins are becoming more popular thanks to the Internet of Things (IoT).

... FOR SMARTER CITIES

(Some of) The challenges in Cambridge:



Cambridge – Governance Challenges

- Powers and responsibilities in transport, energy, planning, air quality are dispersed across government levels in addition to sectoral silos; lack of transparency towards citizen(s) groups (structure);
- City & infrastructure modelling is conducted in silos – no support for systemic solutions; contradicting and/or incompatible modelling outputs hinder meaningful use of evidence to support policy decisions; (process);
- Public – private divide in data collection (service providers) and processing/analysis (consultants – public sector & citizens); (co-factors);

Cambridge – Governance Challenges

Structure

Sectoral silos (transport, energy, planning, air quality) & organisational silos (government levels)

Engaged citizen groups in transport & planning; less so in energy

Process

Siloed modelling / analytics - contradicting & incompatible outputs hinder evidence-informed policy decision-making

Periodic citizen engagement; lack of transparency in the use of evidence

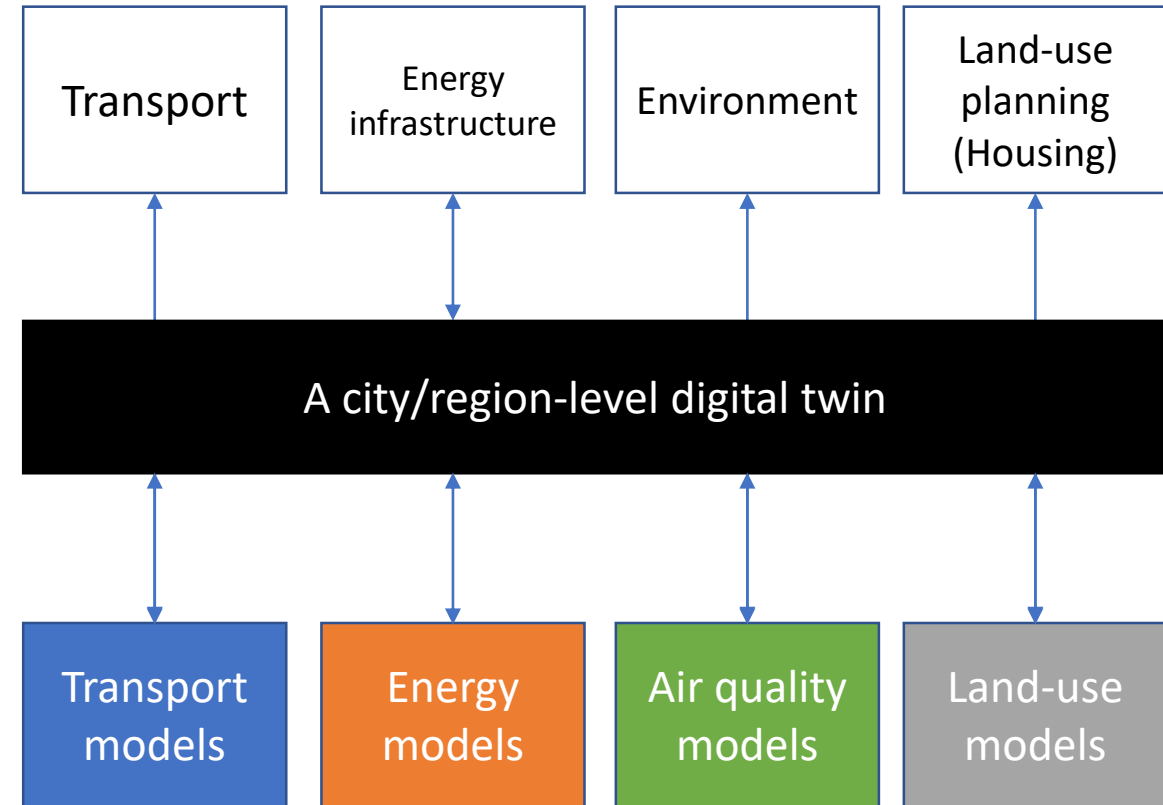
Co-factors

Public – private divide in data generation (service providers) and analysis (consultants)

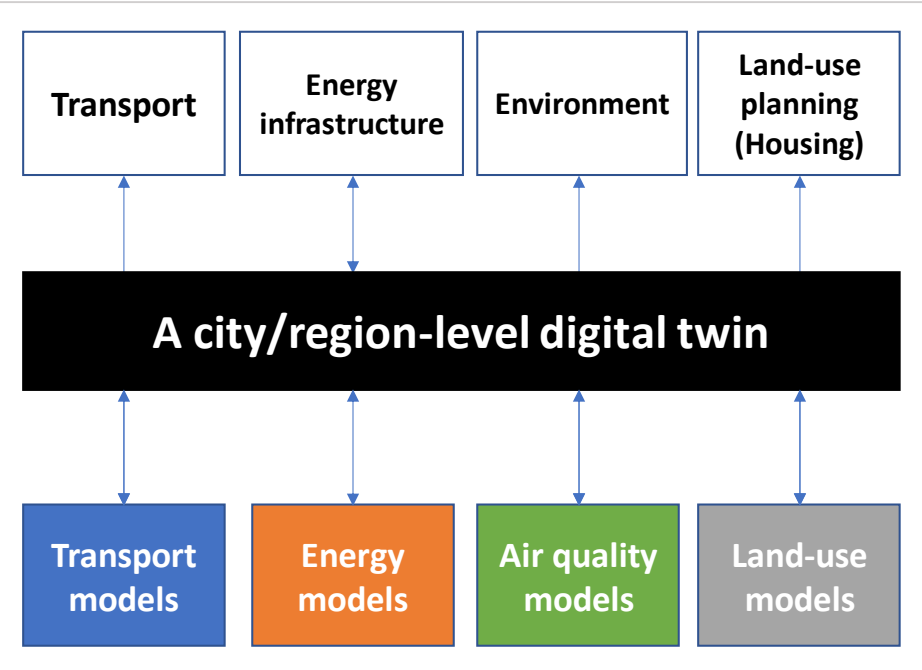
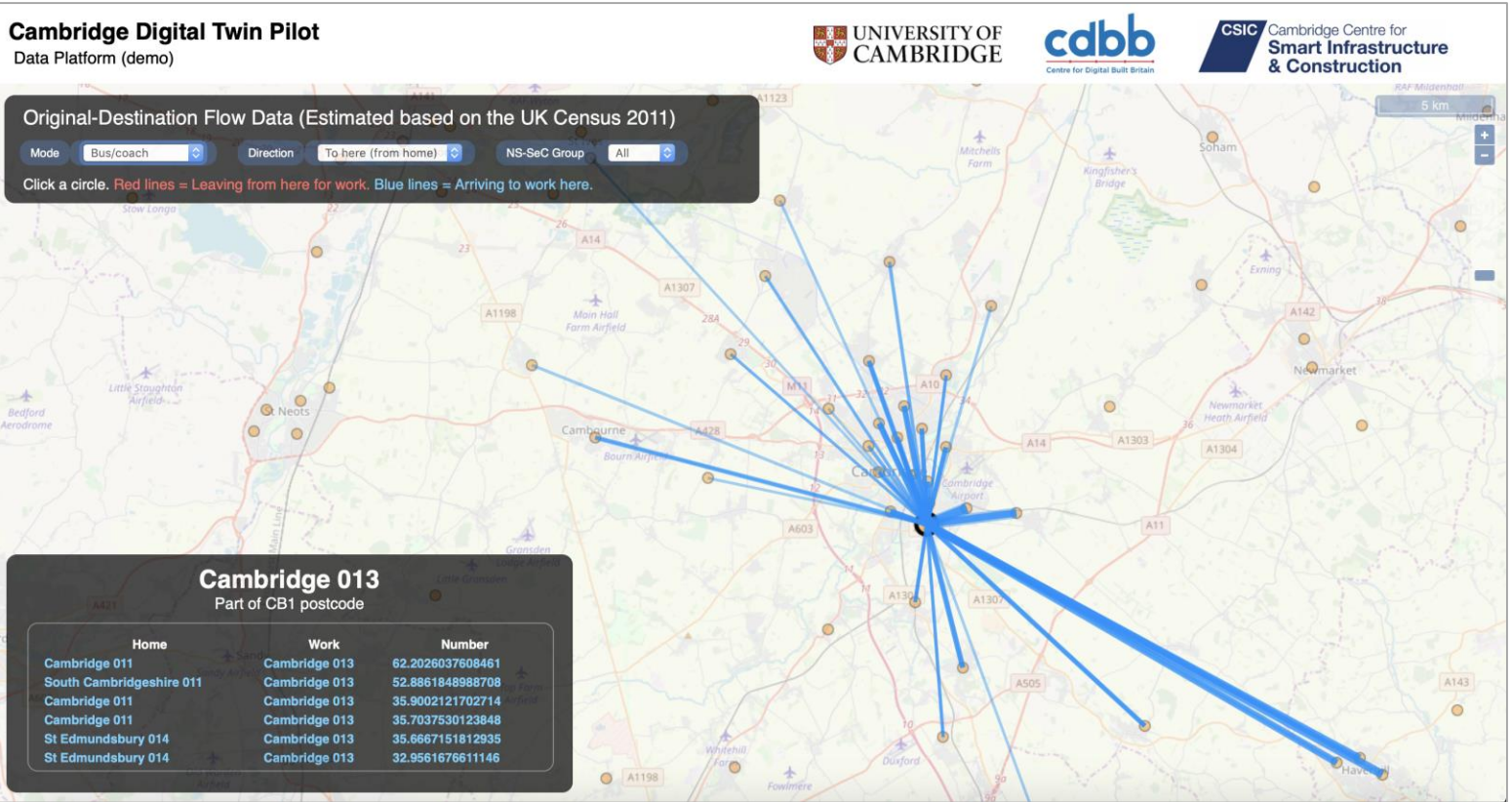
Citizens are aware of the amount of data collected on them; not aware of risks & potential misuse

Aims of the city-level digital twin for Cambridge

- Breaking sectoral boundary of urban data analytics and simulation
- Facilitating cross-sector policy making through an interactive interface that quantifies interdependences among multiple urban systems
- Illustrative scenarios:
 - a) Understanding commuting demand
 - b) Impacts of teleworking
 - c) Future EVs charging demand



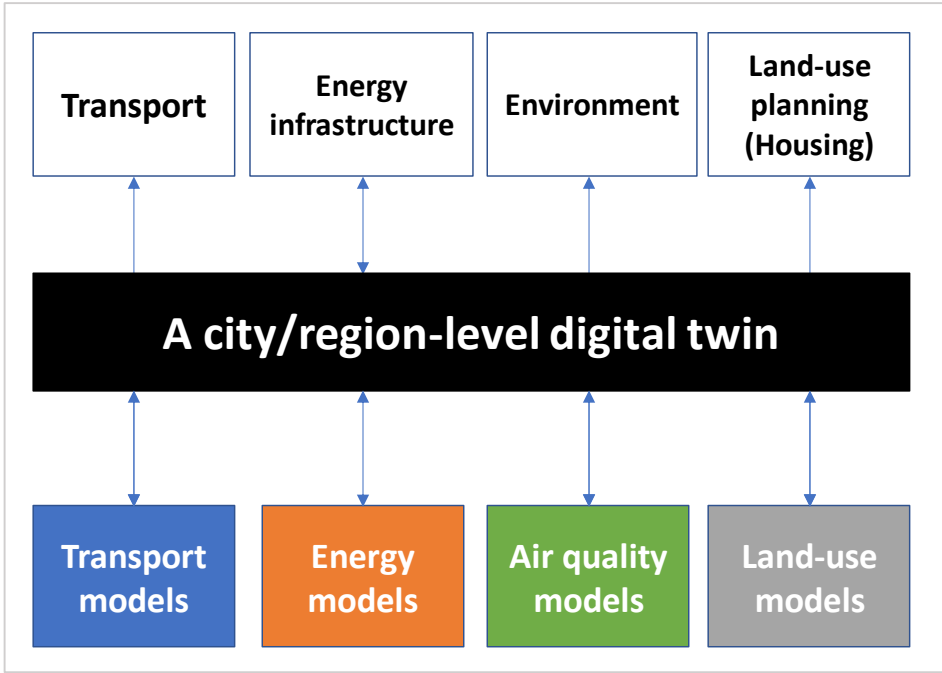
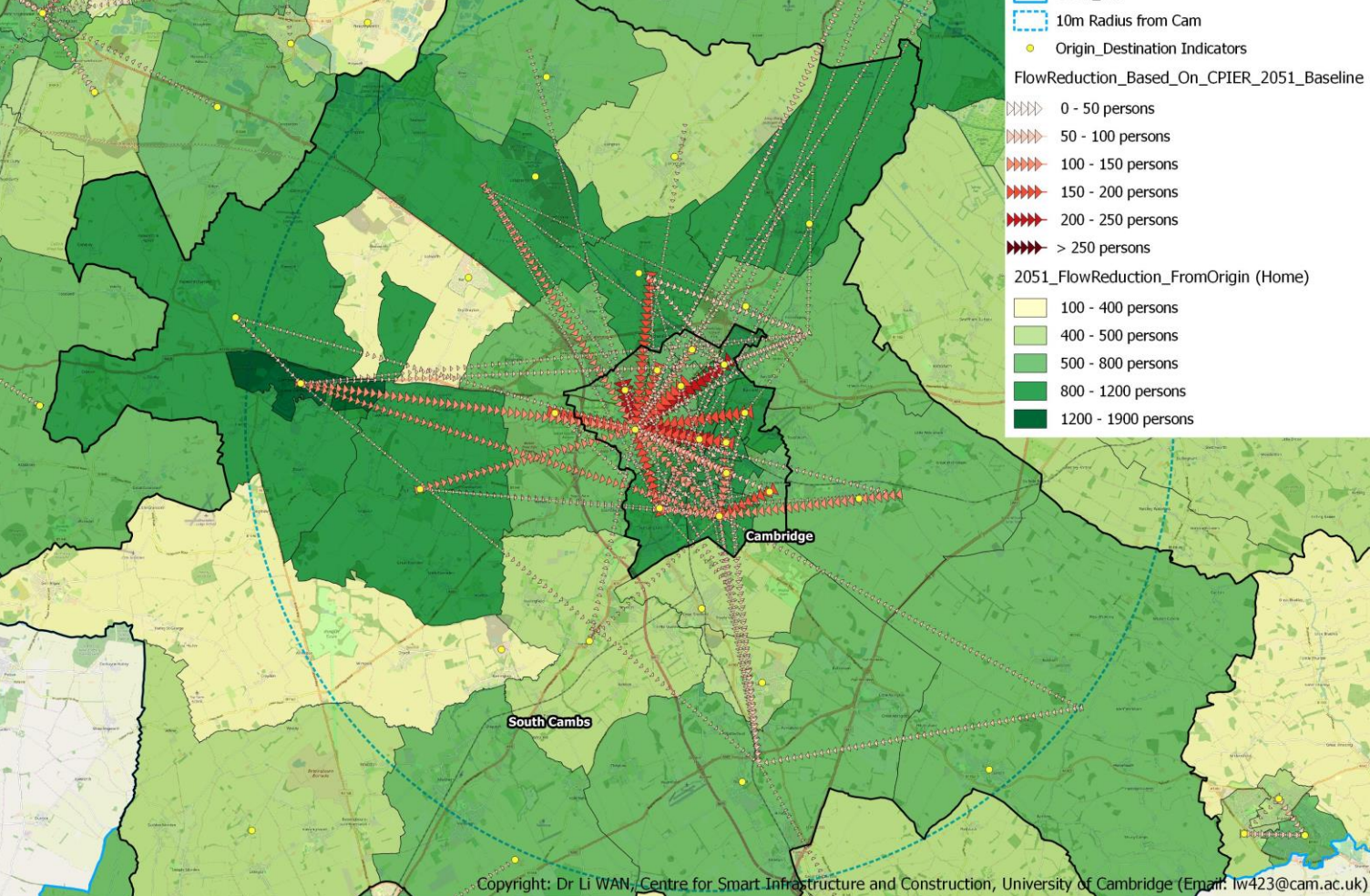
A digital twin for Cambridge - Understanding commuting demand



A digital twin for Cambridge - Impacts of teleworking

Potential Reduction of Commuting Flow Due To Teleworking

2051 Teleworking Scenario based on the 2051 Baseline as in CPIER Report (Provisional Results)



A digital twin for Cambridge - Future EVs charging demand

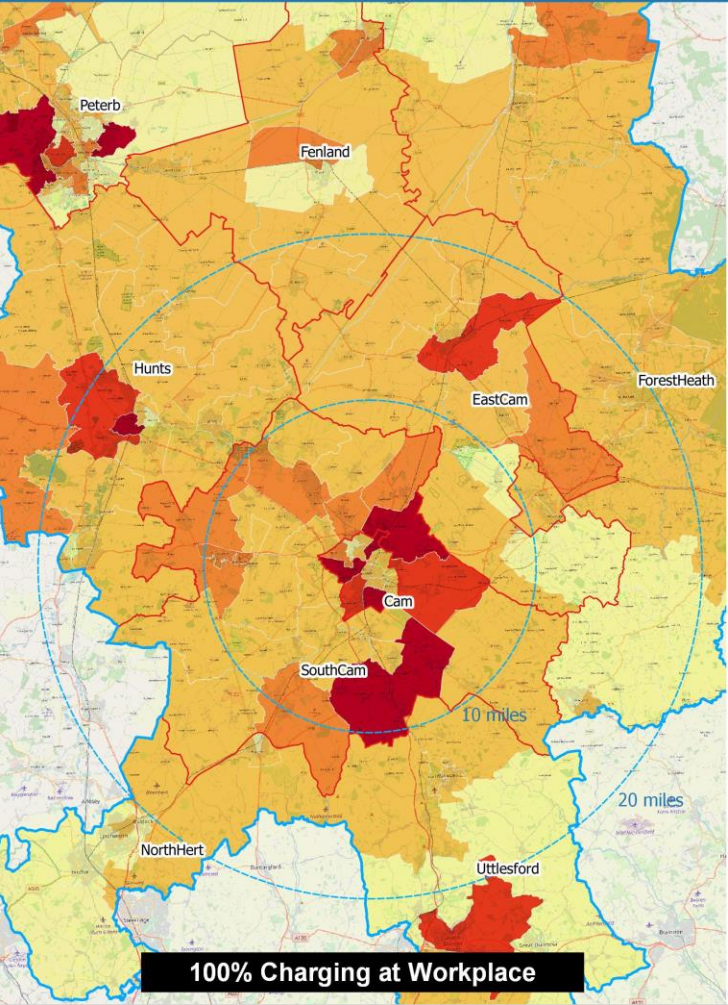
2051 Electric Vehicles (EVs) Charging Demand

ASSUMPTION: All commuting cars into Cambridge are EVs

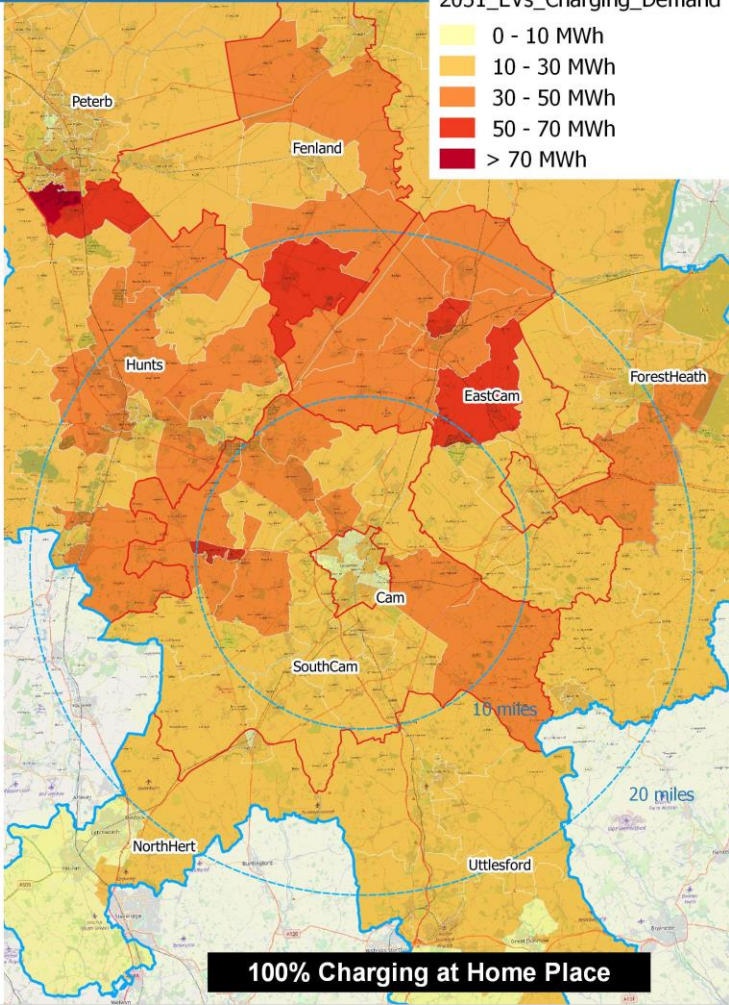
Legend

2051_EVs_Charging_Demand

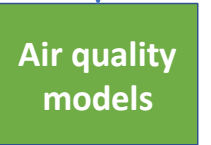
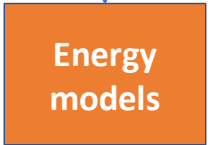
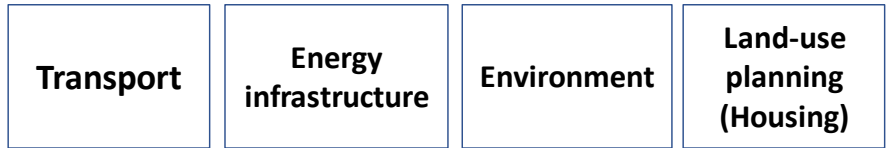
- 0 - 10 MWh
- 10 - 30 MWh
- 30 - 50 MWh
- 50 - 70 MWh
- > 70 MWh



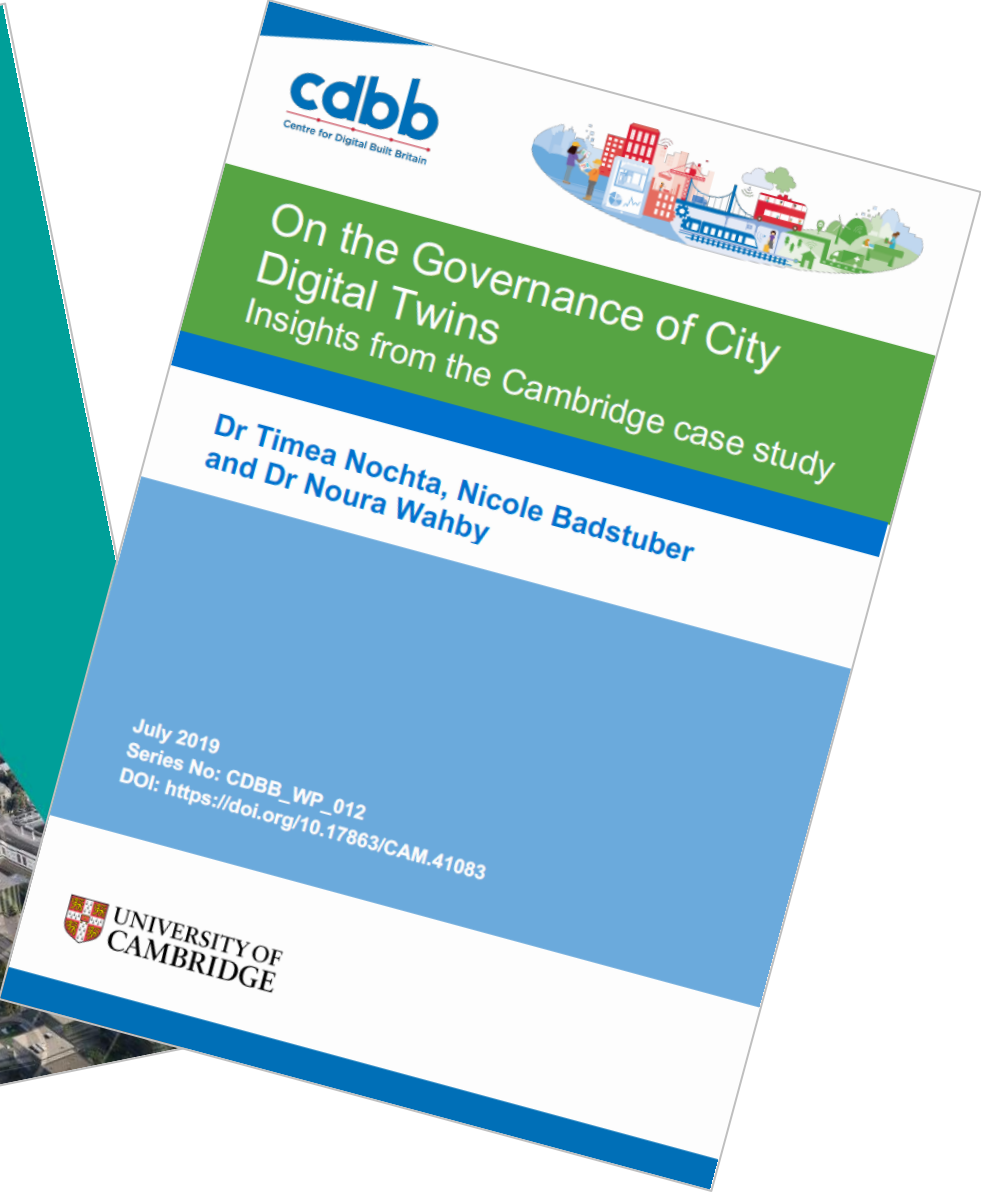
100% Charging at Workplace



100% Charging at Home Place



A digital twin for Cambridge - Governance and Citizen Engagement



A background image showing a canal with a bridge in the distance and modern brick buildings on the right side. The sky is overcast.

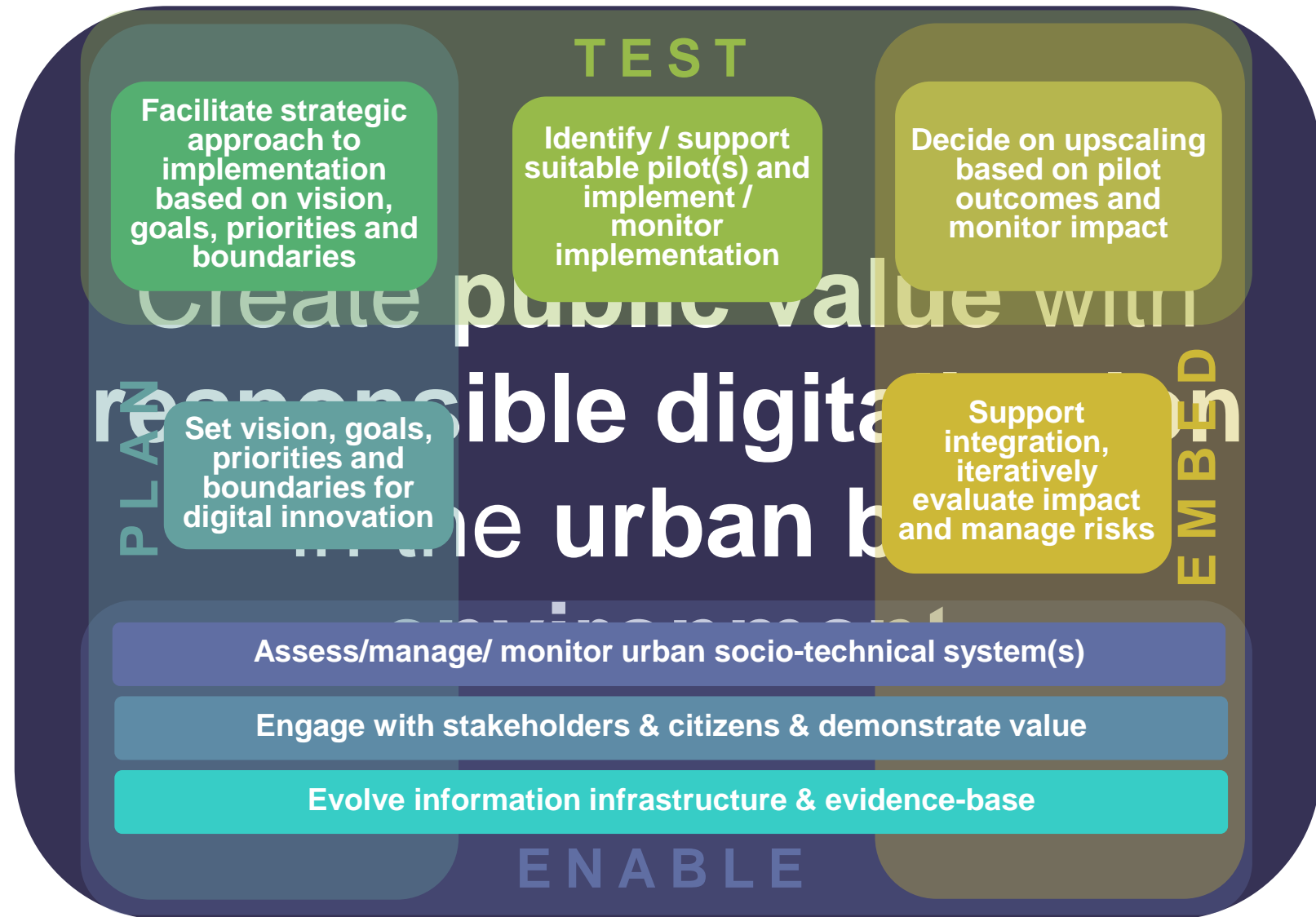
“You’ve got different layers of local government all with transport responsibilities and it feels like none of them really quite know where their responsibilities start and finish.”

“I think the digital twin would be helpful for us to quickly be able to understand at a high level some of the strategic impacts of doing things and make a strategic case”
Local authority respondent

“It’s quite difficult sometimes to get proper community views because we’re reacting to things that have suddenly been sprung on us.”
Residents’ group

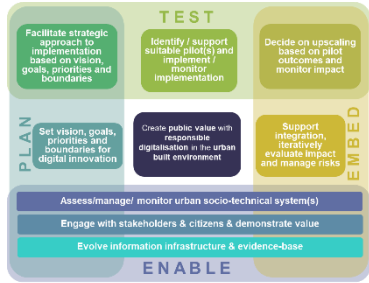


DIGITAL INNOVATION PROCESS MODEL



COMPETENCY FRAMEWORK

DELIVERY STRUCTURE

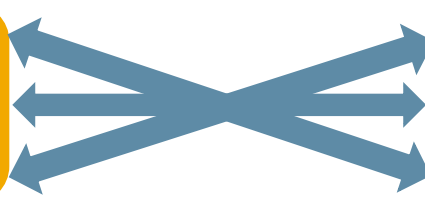


TASKS

What are the key stages in the digital innovation process model being followed?

- What tasks are critical for each relevant stage?
- What is needed to execute them?

COMPETENCIES



ROLES

What knowledge and abilities are needed?

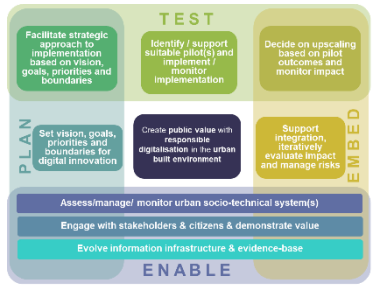
- What are the competencies needed to define each of the relevant roles adequately?
- Where can these competencies be found (internally/externally)?

What are the roles needed to effectively accomplish the tasks?

- Which competencies are essential for each role?
- Where can these roles be found?
- How might they be created to meet the need?

COMPETENCY FRAMEWORK

DELIVERY STRUCTURE



TASKS

Specific, well-defined activities that are relevant to the digital innovation process

- Should align with the objective of public value creation through responsible innovation

COMPETENCIES

Repertoire of knowledge and abilities defining a specific role

- Multi-disciplinary emphasis
- Multi-dimensional (Governance & Mgt; Digital/Technical; Ethical/Responsible Innov.)
- Knowledge and Action-based

ROLES

Specific, well-defined portfolios needed to under the digital innovation tasks

- 1 role will require multiple competencies
- Strategic or Operational levels
- 1 role may need more than 1 person

COMPETENCY FRAMEWORK

COMPETENCIES



COMPETENCY FRAMEWORK

COMPETENCIES - GOVERNANCE & MANAGEMENT



COMPETENCY FRAMEWORK

COMPETENCIES - ETHICS & RESPONSIBLE INNOVATION



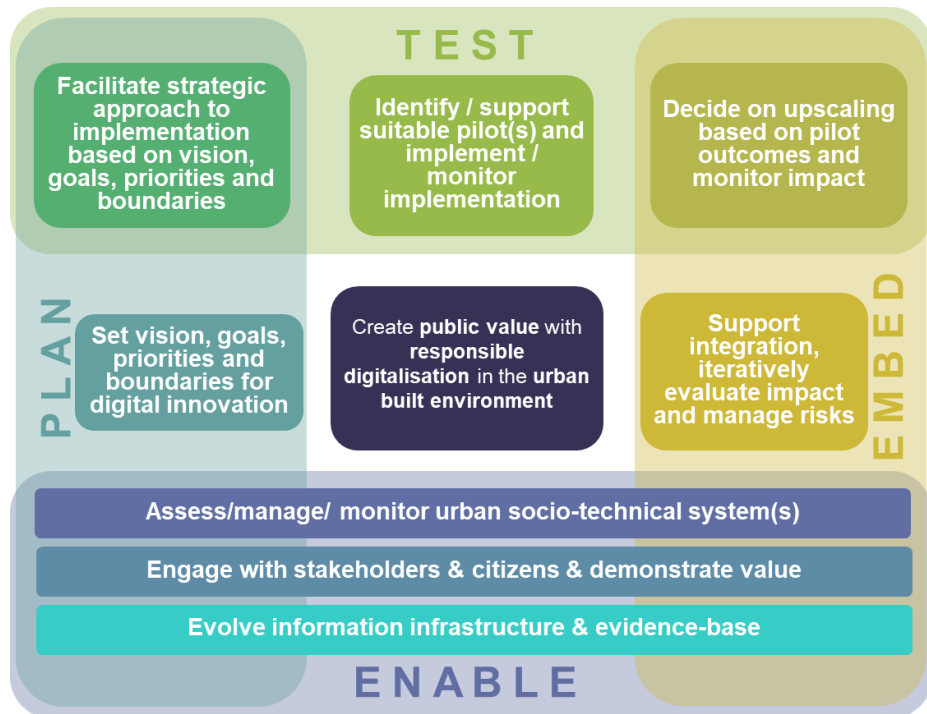
COMPETENCY FRAMEWORK

COMPETENCIES - DIGITAL AND TECHNICAL



COMPETENCY FRAMEWORK

ROLES AND STRUCTURES - INFLUENCE



“Sponsor”

Actors who have political authority and can deploy resources and give legitimacy to collaborations and innovative ideas.

“Champion”

Person(s) leveraging informal authority to mobilize capacities in their organizations to organize, facilitate and energize collaborations.

“Catalyst”

Persons with formal/informal authority to create appropriate disruptions in a collaborative network to drive ‘out-of-the-box’ innovative thinking.

“Implementer”

People who get things done by converting visions/plans into materialisation / reality.

COMPETENCY FRAMEWORK

NEW COURSE:

**Leadership of Urban Digital
Innovation for Public Value (LeadUP)**

POSITIONING THE COURSE

Closing identified training gaps

- Existing international offerings do not cover the **nexus of technology, governance and economics**
- Existing courses typically offer **more engineering** (or economics) **perspectives**
- Existing Cambridge courses either **emphasise sustainability** or **digitalisation** – offerings linking the two explicitly and with a focus on ‘place’ are lacking

Providing new thinking on Place-based Leadership

- **“Leadership of Urban Digital Innovation for Public Value”**
- Leadership competencies to cover **technology, governance and economics**, and **responsible innovation** (not MBA!)

Addressing new educational needs and training challenges

- Demand for **interdisciplinary post-graduate courses**
- Trend in Cambridge for **PG Cert/Dip/MSt courses**
- Strong appetite in Cambridge for **part time post-graduate courses** aimed at **practitioners**
- **Executive Education** offering developed for LeadUP

COURSE OVERVIEW

TARGET AUDIENCE & AIM

Who is this course for?

- **City managers** and urban **planners**
 - **Built environment professionals**
 - Local government and public sector **consultants** and **advisors**
 - **Technology & Digitalisation** experts
- Professionals seeking to transition into a **city leadership role**

What will the participants learn?

- Participants will learn how to better utilise **urban data** and **emerging digital technologies**, informing **decision-making** in urban planning, management, and public service delivery

What is the course aim?

- Provide participants with the **knowledge** and **tools** to develop the **competencies** required to create **public value**, enable **socio-technical** and **responsible digital innovation**, and ensure **improved outcomes** for communities

LEARNING FOCUS



Explore urban complexity

- Explore the complexity of the **socio-technical innovation** and transition process in the public sector



Bridge urban silos

- Use digitalisation to **bridge the technical, societal and operational** aspects of cities and their supporting infrastructure



Gain new perspectives

- Discover **new ways of thinking** to tackle cross-cutting urban challenges and improve outcomes for urban communities



Lead digital innovation effectively

- Acquire **new competencies**, aimed at leading digitalisation and responsible innovation



Manage digitalisation successfully

- Identify the **changing roles and tasks** required for successful digitalisation



Learn from other professionals

- Connect with an **interdisciplinary network** of city managers while facilitating **knowledge sharing and support**

COURSE OVERVIEW

COURSE CONTENT DEVELOPMENT (by topic)

Topic 1: Intro to Digital innovations in the urban built environment

Digitalisation in the urban built environment and smart cities

Urban systems and built environment

Sociotechnical innovation

Public value creation through responsible digital innovation

Responsible digital innovation, ethics and the public good

Boundary spanning and management

Competency requirements for digital innovations

Digital innovation process (9 box model)

Research methodologies for investigating digitalisation in the urban built environment

Role discovery for digital innovations

Topic 2: Digital technologies

Digital innovation and digital technologies application

System dynamics and performance

Landscape of digital tools and technologies (digital toolbox)

Public value creation through responsible digital innovation

Technology requirements management

Best practices for technology application

Architectures for digital cities

Data science and analytics in urban systems

Cybersecurity in urban systems

Benchmarking of new digital technologies

Topic 3: Governance and Management

Governance in the digital era

Public value creation through responsible digital innovation

Digital innovations for public value creation

Competencies for delivering public value using digital innovation

Governance systems

Government, policy, and regulation

Stakeholders and collaboration

Citizen engagement and participation

Business models and digital innovations

Finance and procurement of new digital technologies

Topic 4: Place-based leadership

Leadership for digitalisation projects in the urban built environment

Leading public value creation through responsible digital innovation

Digital innovation leadership

Leading multi-disciplinary teams

Leadership skills gap for digital innovation to deliver public value

Competencies for leading digital innovations

Topic 5: Ethical and Responsible Digital Innovation

Responsible and Ethical urban Digital Innovation

Landscape of data ethics frameworks

Ethics and embedding responsiveness for urban digital innovations

Responsible innovation and ethics: exploring the nexus

Anticipating impact and deliberating options

Ethical considerations for urban digital innovation projects

COURSE LEVELS AND MODULES

LEVELS		MODULE	FOCUS
Postgraduate Certificate (PGCert.)	Module 1	Introduction to digital innovations in the urban built environment	
	Module 2	Responsibly managing and applying digital technologies to create public value	
	Module 3	Sociotechnical implications of digital innovations in the urban built environment	
Postgraduate Diploma (PGDip.)	Module 4	Responsible leadership and governance of data to create public value in the urban built environment	
	Module 5	Managing and governing actors involved in digital innovation projects	
	Module 6	Digital innovations in the urban built environment: Implications for business, finance and procurement models	
MSt.	Module 7	Methods and methodologies for investigating digitalisation in the urban built environment	

Executive Education Programme

An intensive **2-day course** – starting in September 2023

COURSE OVERVIEW




Executive Education



Leadership of Urban Digital Innovation for Public Value

18-19 SEPTEMBER 2023
UNIVERSITY OF CAMBRIDGE

[APPLY NOW](#)



Thank You