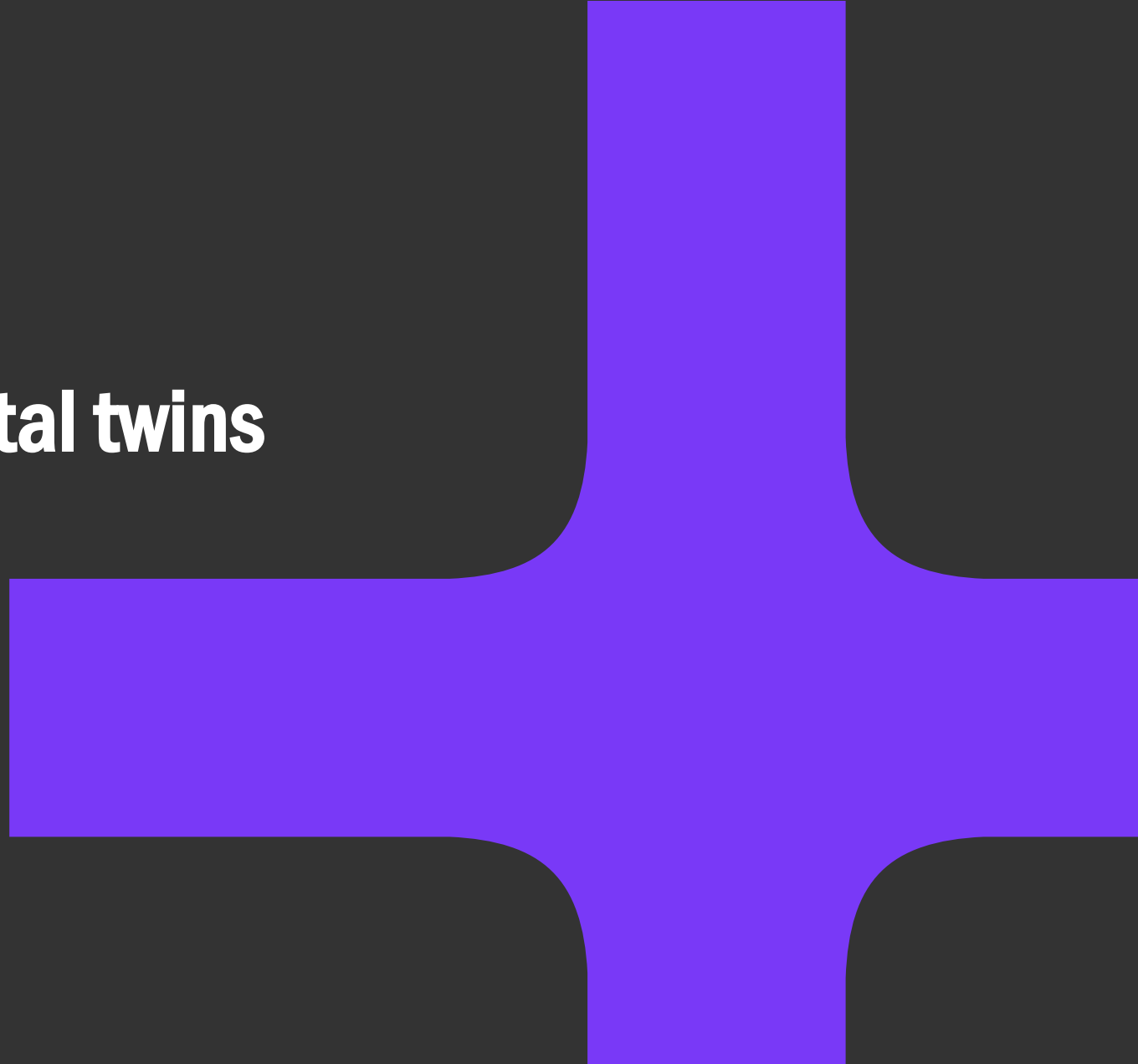


The future of connected digital twins

Mark Enzer OBE FREng

5 July 2022

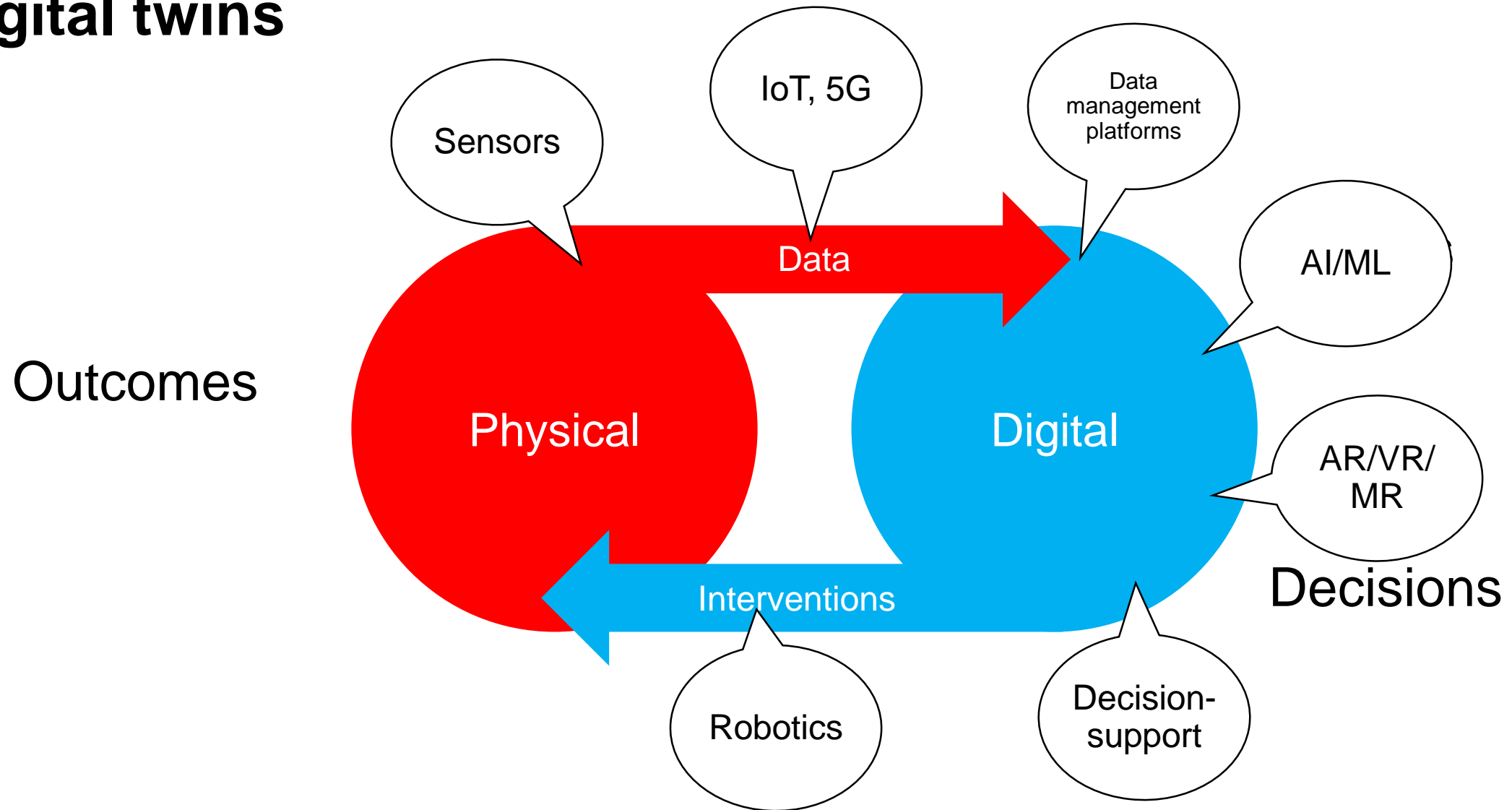


Running order

The future of connected digital twins:

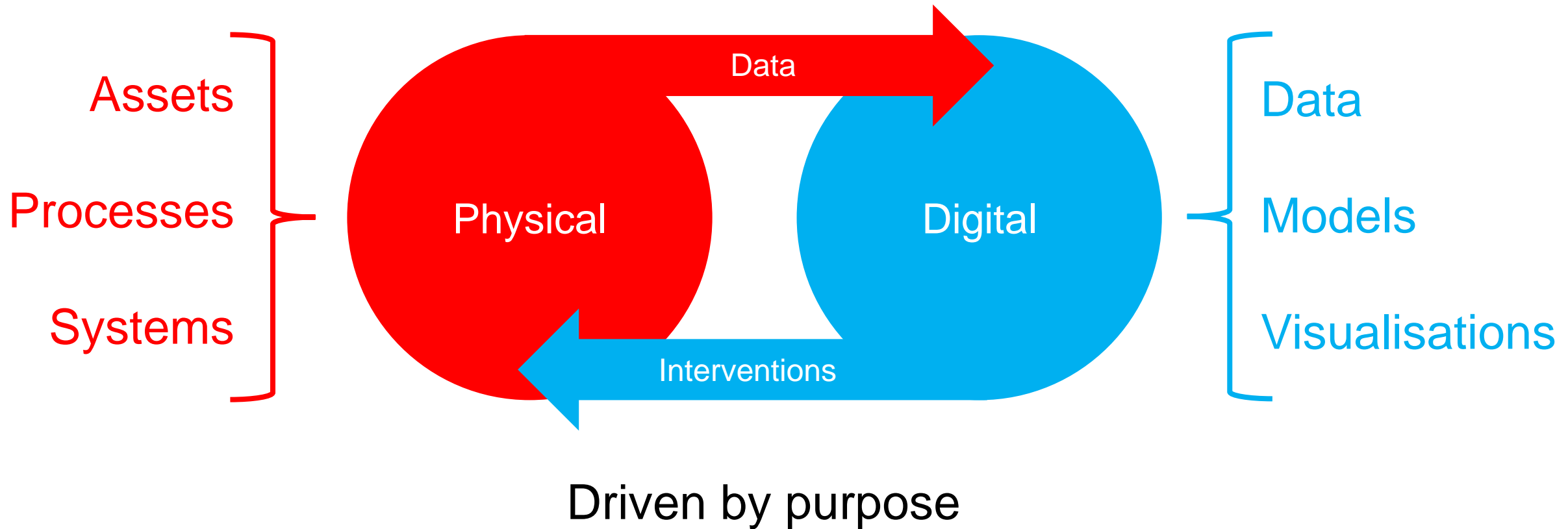
- What we mean by connected digital twins
- What we've learnt so far
- What's happening now

Digital twins

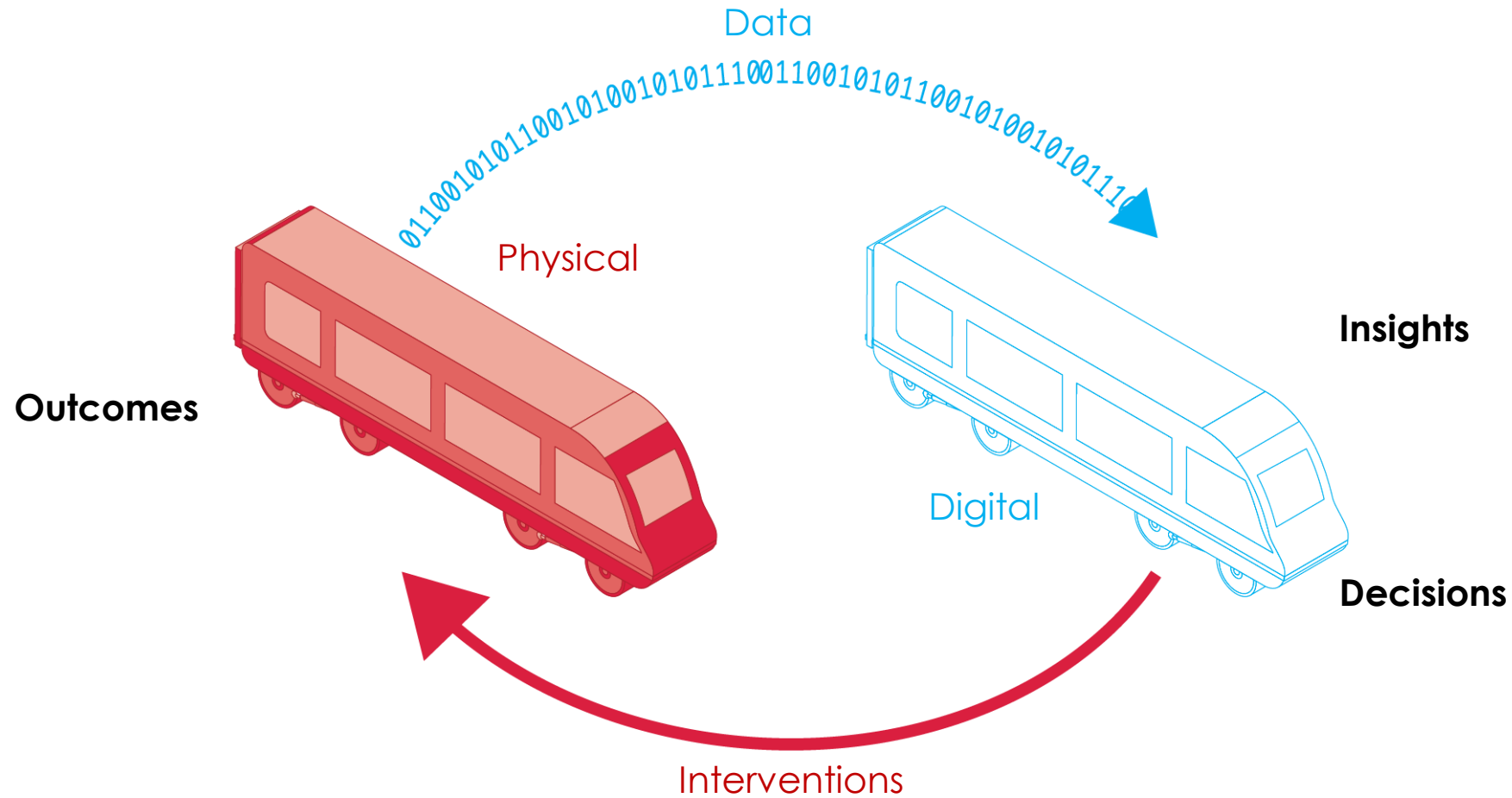


Digital twins – many digital twins for many purposes

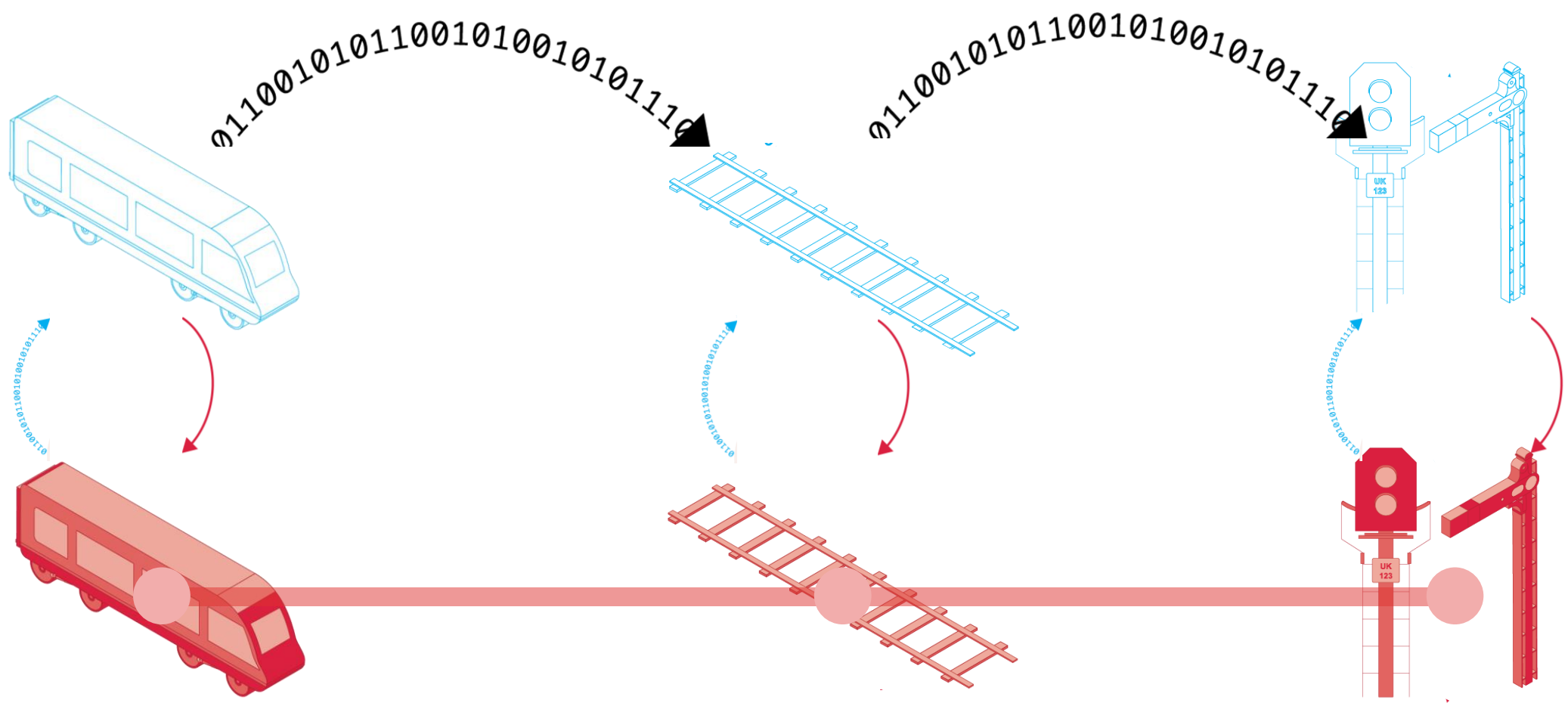
Delivering value: “better decisions faster”



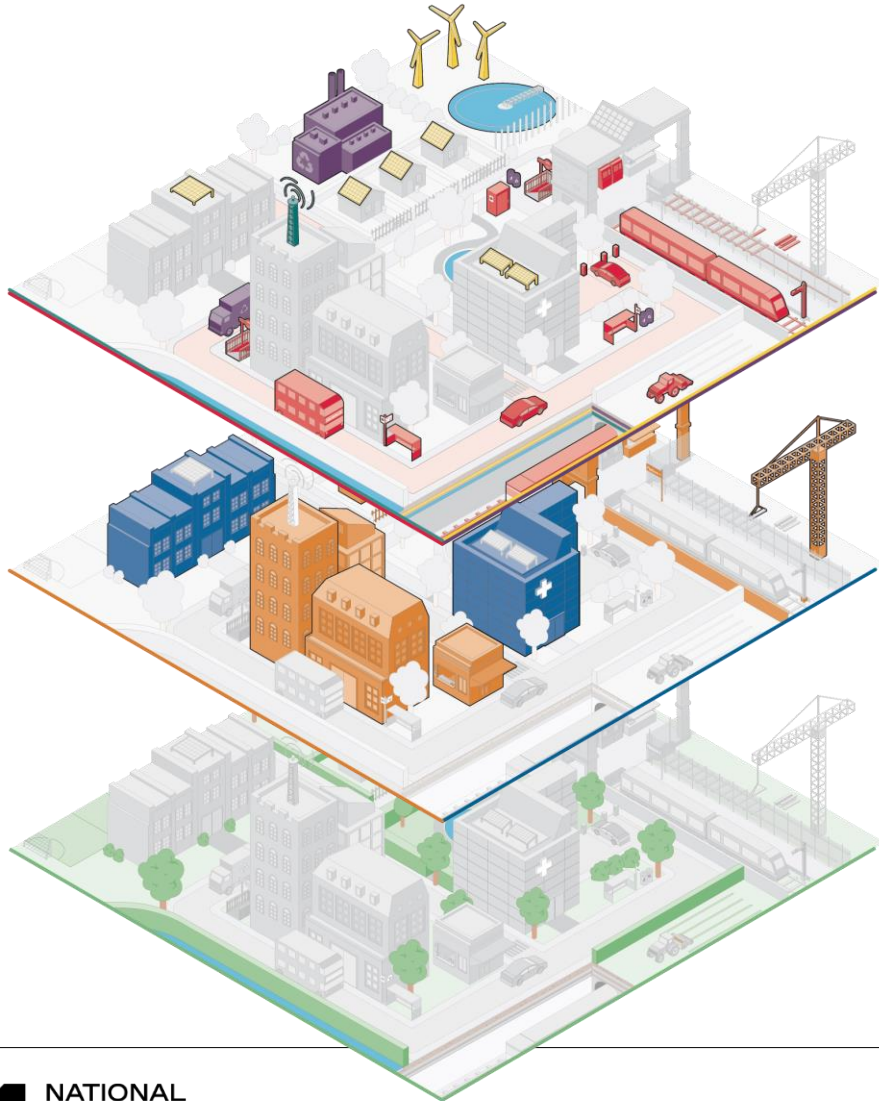
Individual digital twins



Connected digital twins



The built environment is a system of systems



Economic
infrastructure

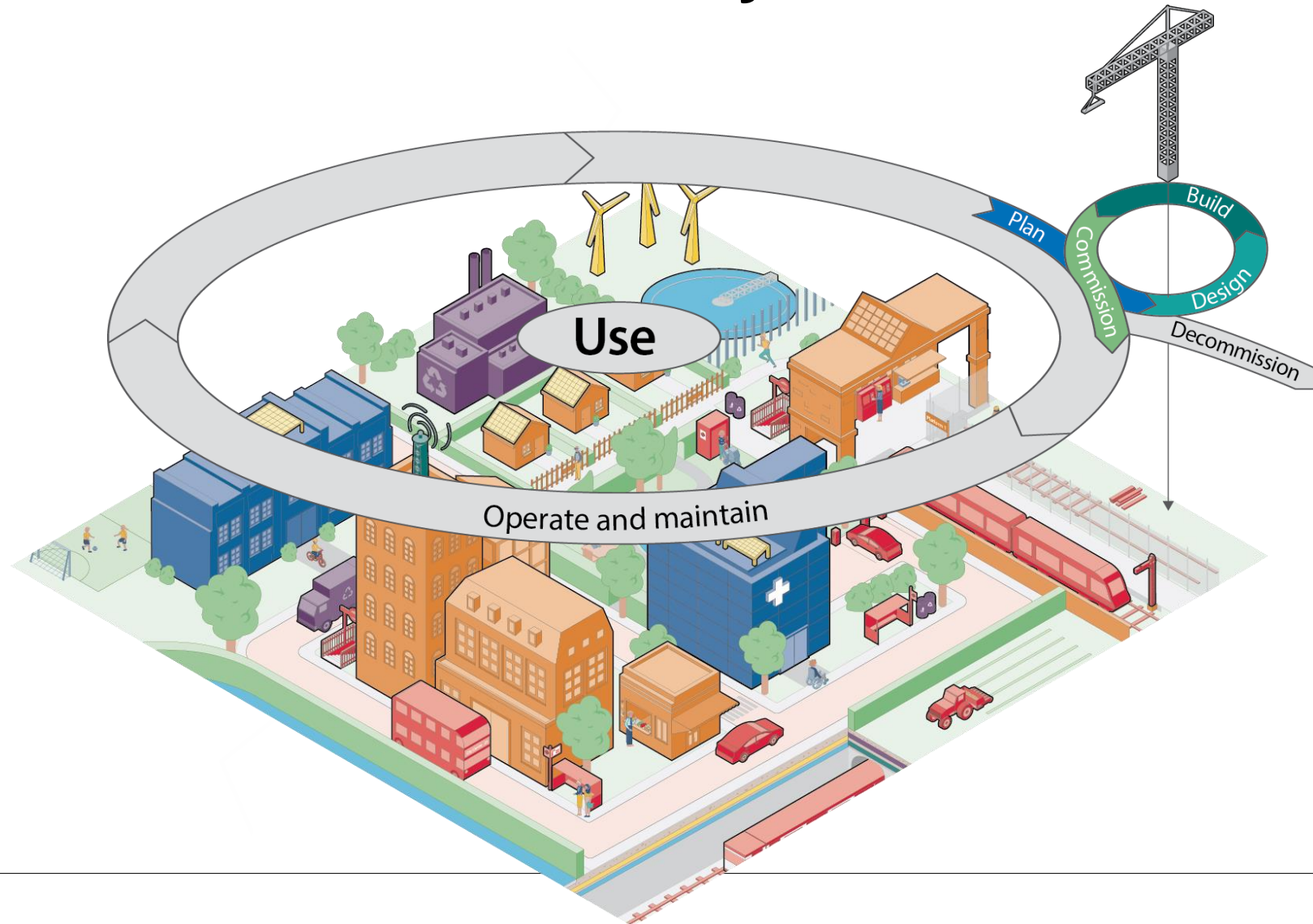
Social
infrastructure

Natural
environment

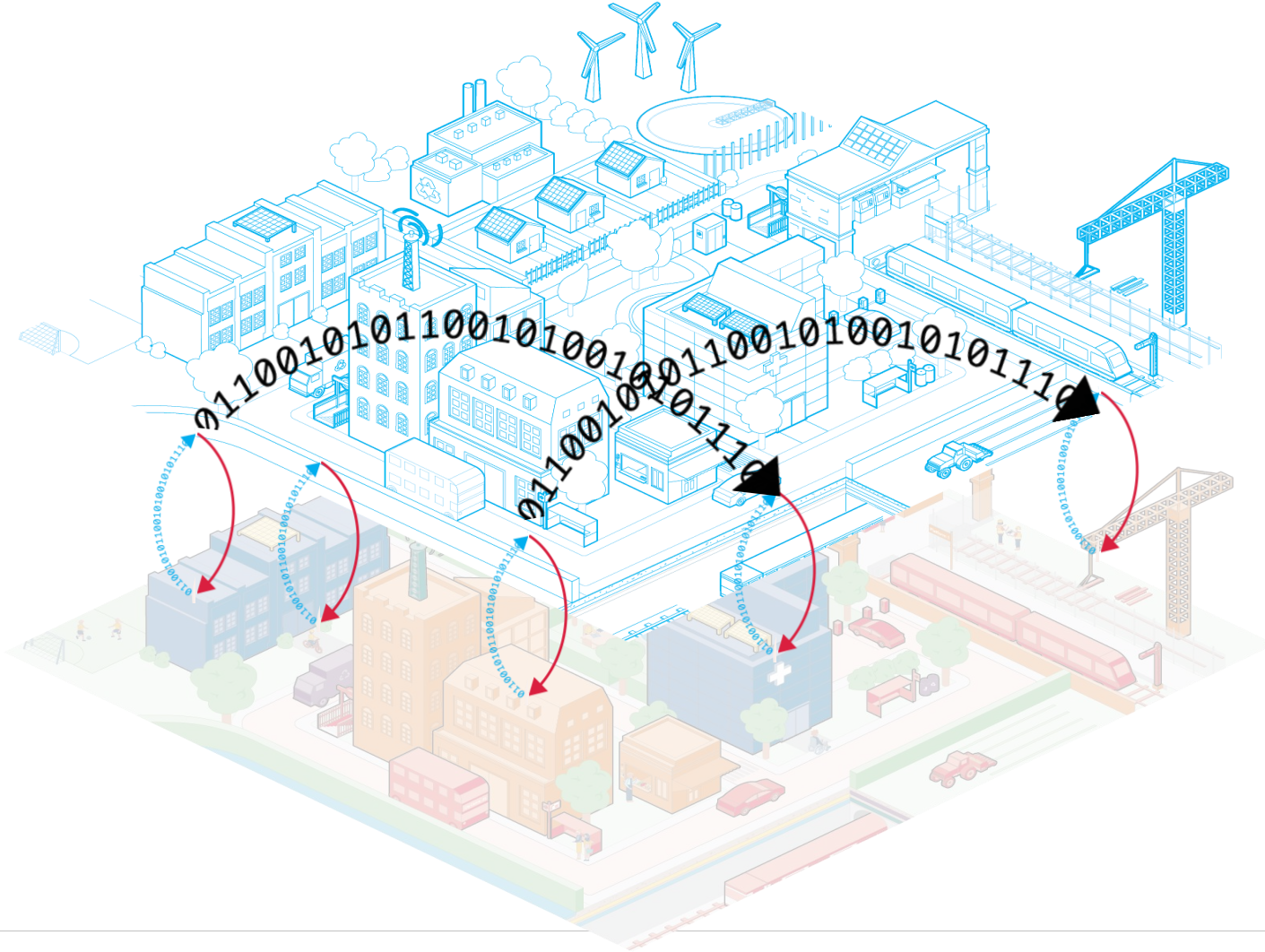


Built environment

System processes and asset lifecycles



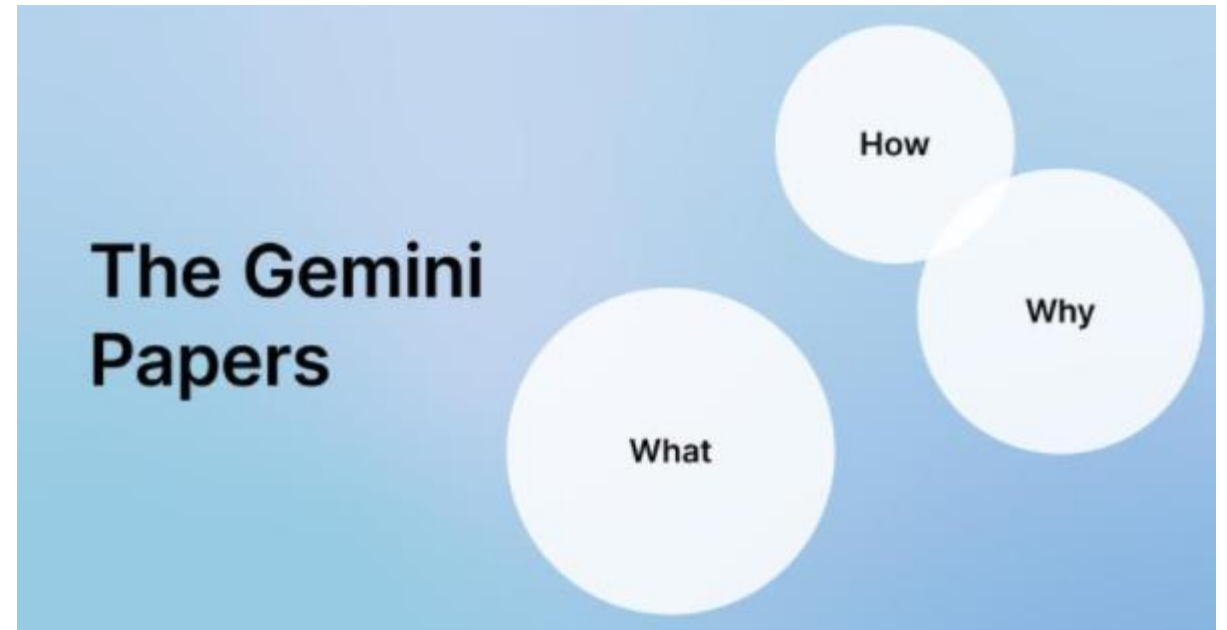
An ecosystem of connected digital twins



What we have learnt so far...

A connected digital twin programme at a national level should be:

- Outcome-focused
- Purpose-driven
- Systems-based
- Values-guided
- Socio-technical
- Community-enabled



<https://www.cdbb.cam.ac.uk/news/gemini-papers>


Outcome-focused

Our Vision for the built environment


This Vision is not about predicting the future for the built environment.

It is about describing the future we want.

Making better decisions now will create a better future.



Our Vision is for a built environment whose explicit purpose is to enable people and nature to flourish together for generations



Purpose-driven

Tomorrow Today

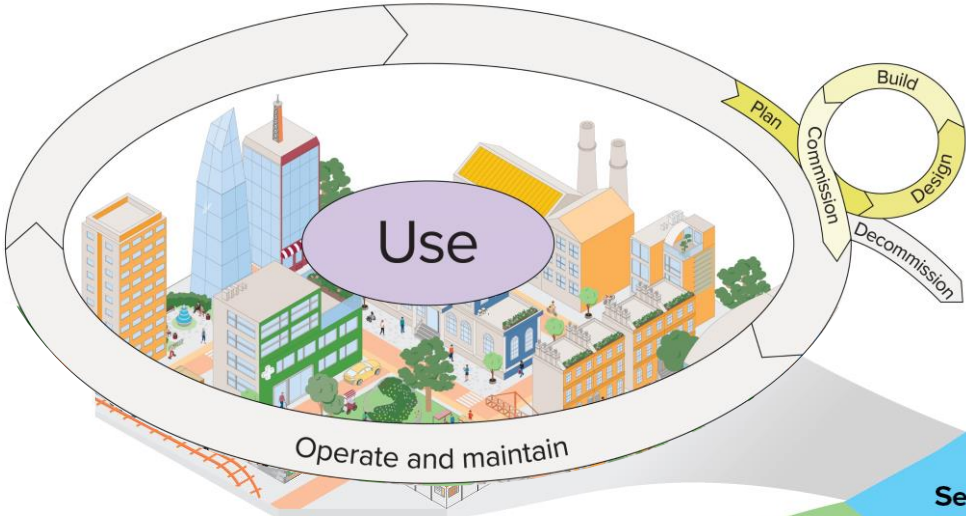
Operation Centre | Sunford City



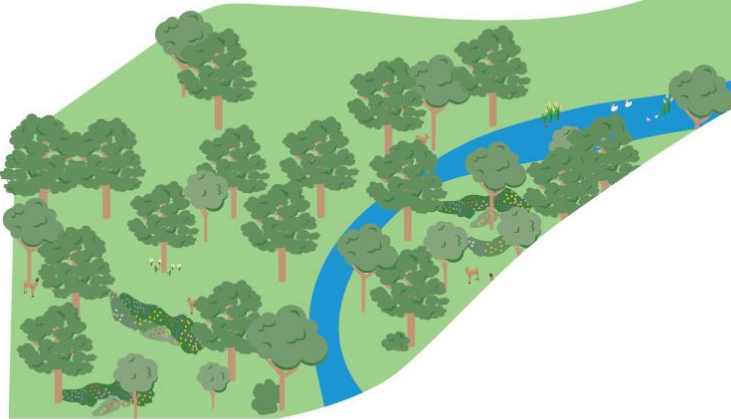
Collaboration through connected digital twins is key to tackling climate change

Systems-based

Built systems

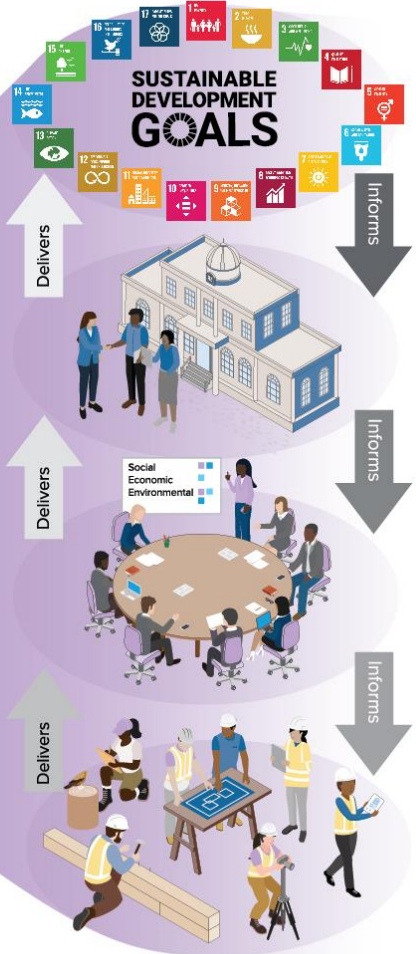


Natural systems

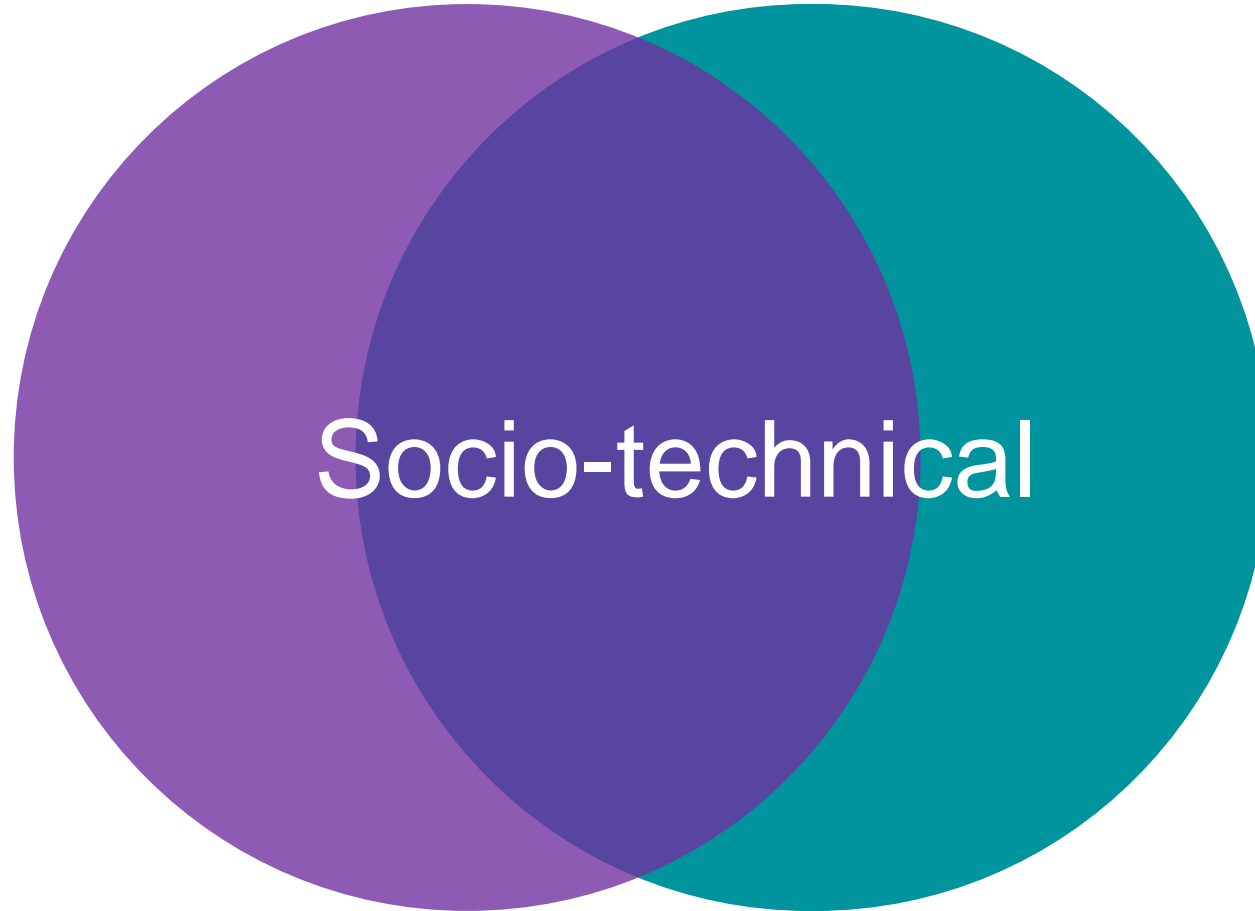


Services

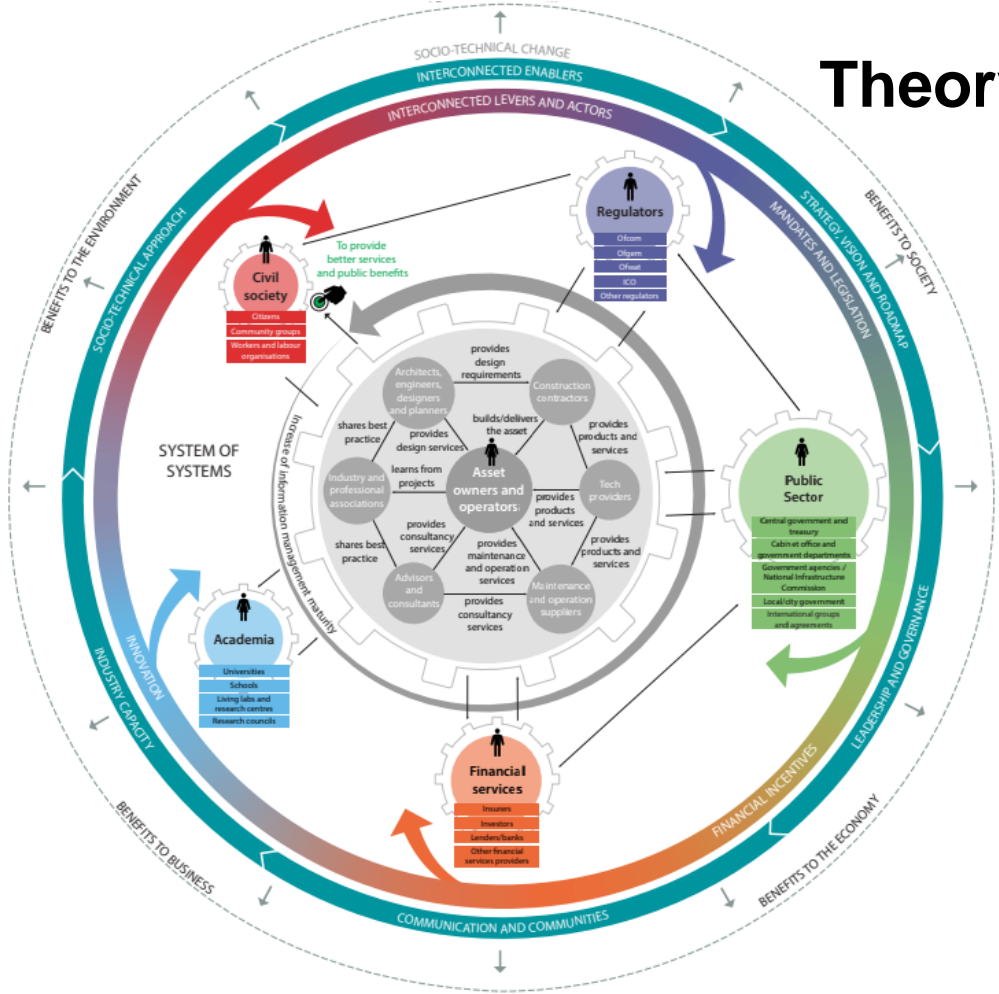
Outcomes for people and nature



Socio-technical

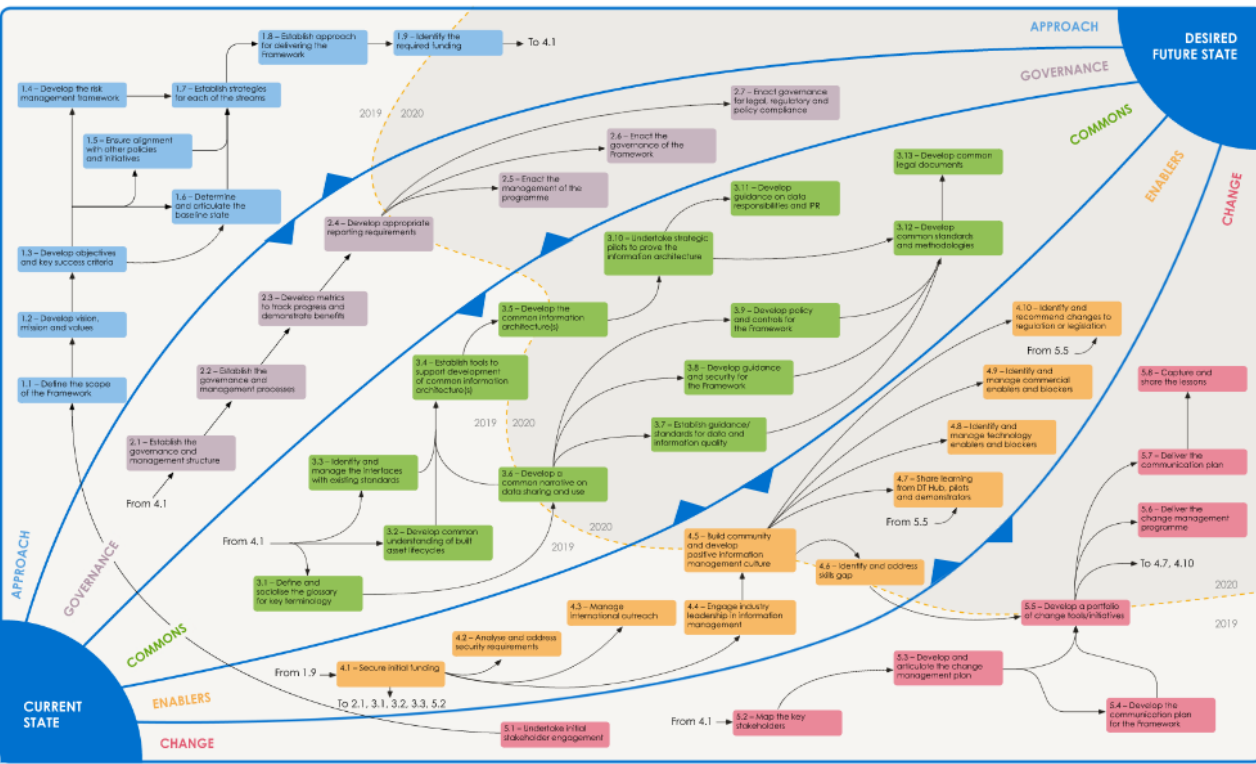


Actually, a socio-technical change programme




Theory of change

Roadmap



Values-guided


Centre for Digital Built Britain

The Gemini Principles

Digital twins of physical assets are helping organisations to make better-informed decisions, leading to improved outcomes.

Creating an ecosystem of connected digital twins – a national digital twin – opens the opportunity to release even greater value, using data for the public good.

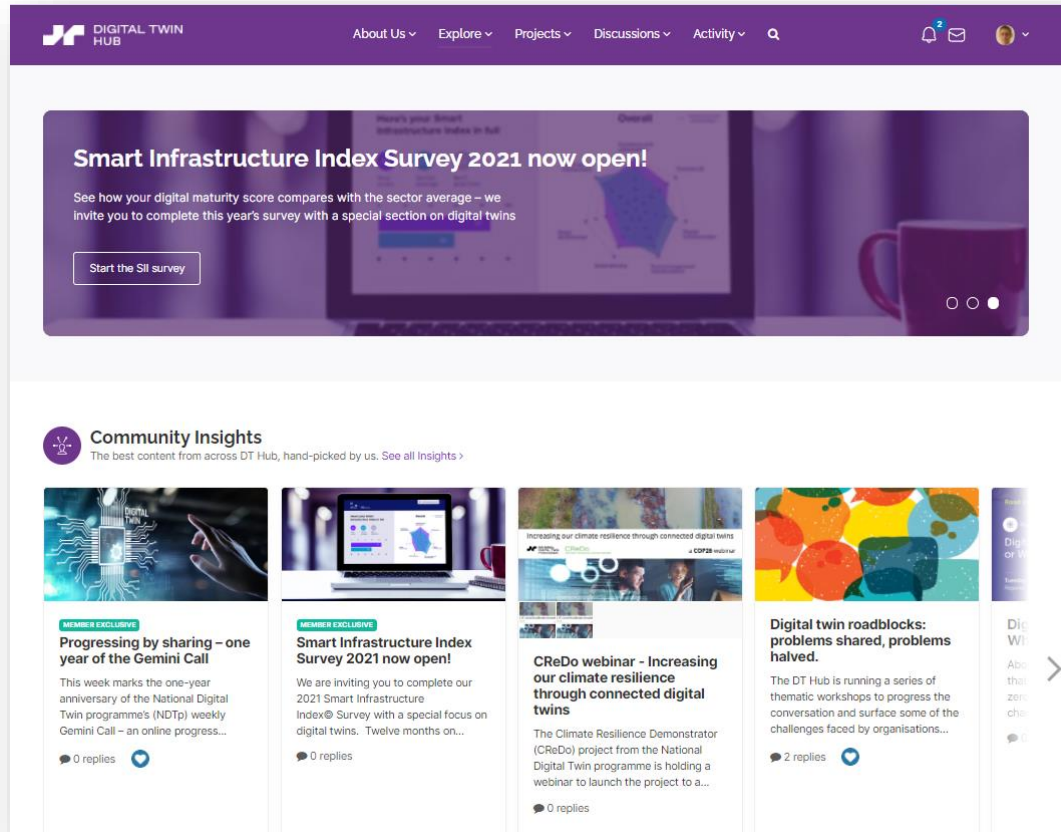
This paper sets out proposed principles to guide the national digital twin and the information management framework that will enable it.

| | | | |
|---|--|---|--|
| Purpose: Must have clear purpose | Public good Must be used to deliver genuine public benefit in perpetuity | Value creation Must enable value creation and performance improvement | Insight Must provide determinable insight into the built environment |
| Trust: Must be trustworthy | Security Must enable security and be secure itself | Openness Must be as open as possible | Quality Must be built on data of an appropriate quality |
| Function: Must function effectively | Federation Must be based on a standard connective environment | Curation Must have clear ownership, governance and regulation | Evolution Must be able to adapt as technology and society evolve |

<https://www.cdbb.cam.ac.uk/system/files/documents/TheGeminiPrinciples.pdf>

Community-enabled

The Digital Twin Hub – “learn by doing, progress by sharing”



Established community

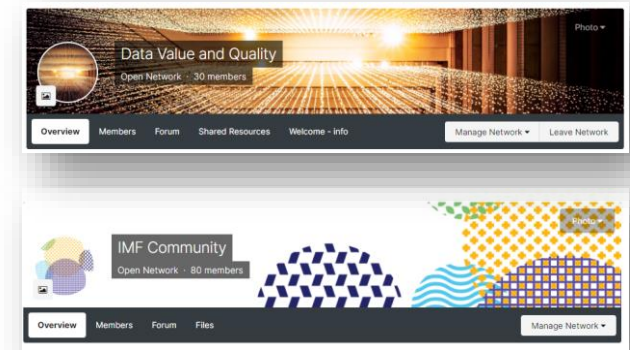
3600+ members

1600+ organisations

60+ Countries

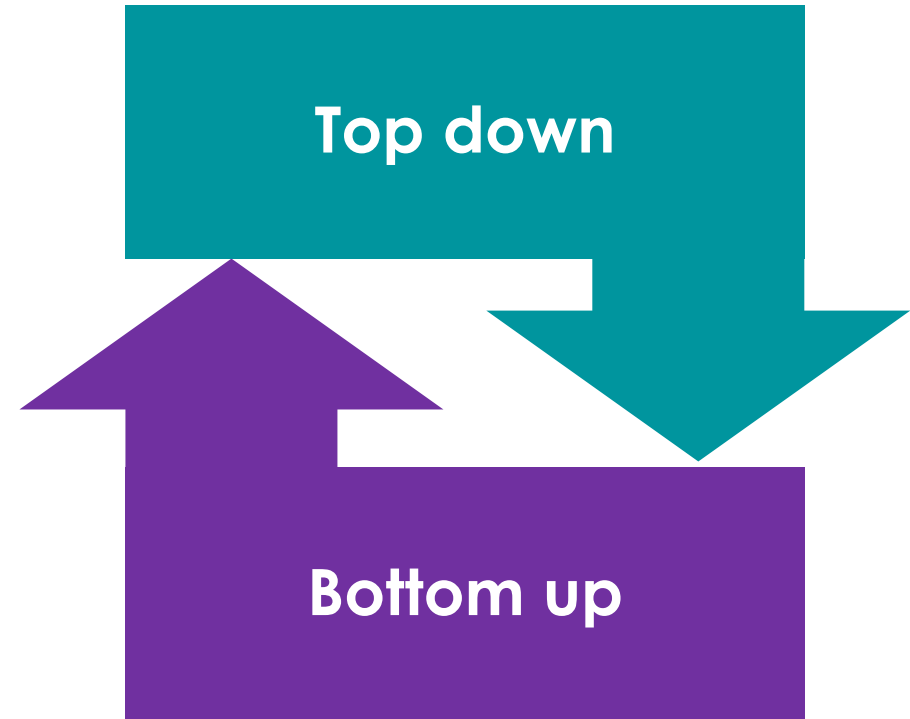
Examples of existing content

- Digital twin case studies
- Digital twin toolkit
- Media and events recordings
- Digital twin register
- Digital twin research register
- Groups and networks
- Articles and publications
- Forums and networks
- Glossary



Community-enabled

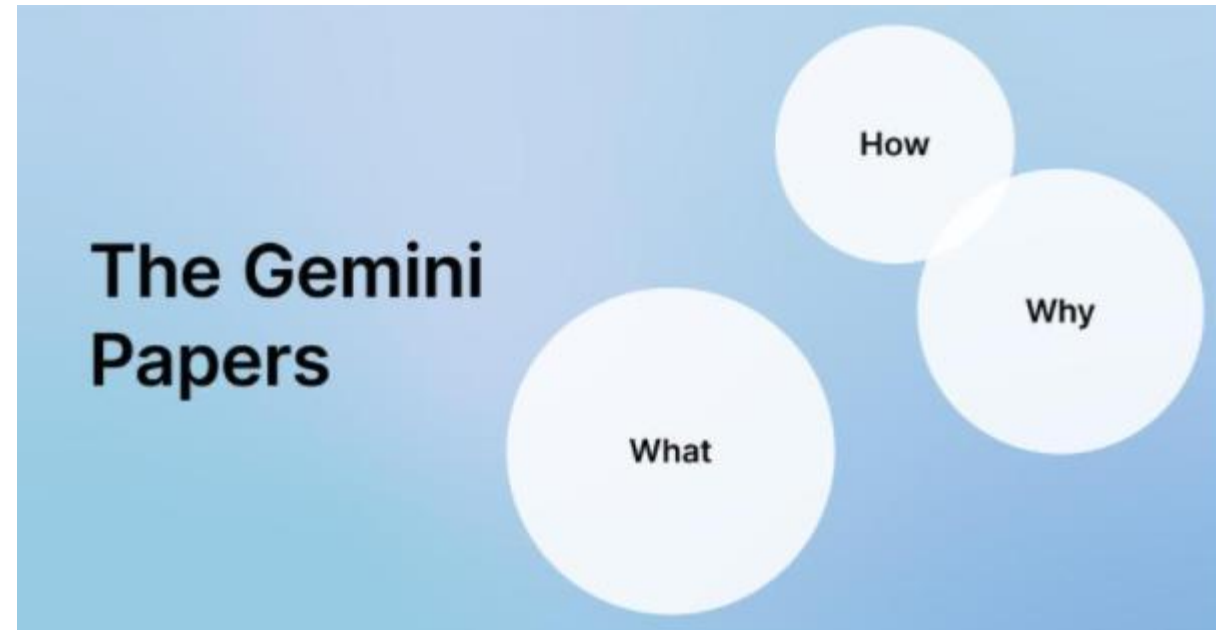
“Collaborate on the rules;
compete in the game”



What we have learnt so far...

A connected digital twin programme at a national level should be:

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- Values-guided
- Socio-technical
- Community-enabled



<https://www.cdbb.cam.ac.uk/news/gemini-papers>

What's happening now



Convene | Connect | Coordinate

- Recognise the sum of all the UK's key work on connected digital twins
- It is a distributed/connected model
- It requires collaboration between the UK's leaders in CDTs

- It needs visionary boundary-spanning leadership
- It requires convening/connecting/coordinate (not command and control)
- It should develop a coherent shared narrative and shared roadmap(s)

Industry

DT Hub
Owners
Solution providers
Advisors
Investors
Catapults
4DSIG

Other key players:
Ordnance Survey
ODI; techUK
IPFA; Institutions; RAEng

Government

CPNI (NDTP)
CDDO
x-HMG DT Working Group
x-Agency DT Working Group

Other key players:
Go Science
Government Departments
Regulators/UKRN
ONS
Geospatial Commission
Met Office

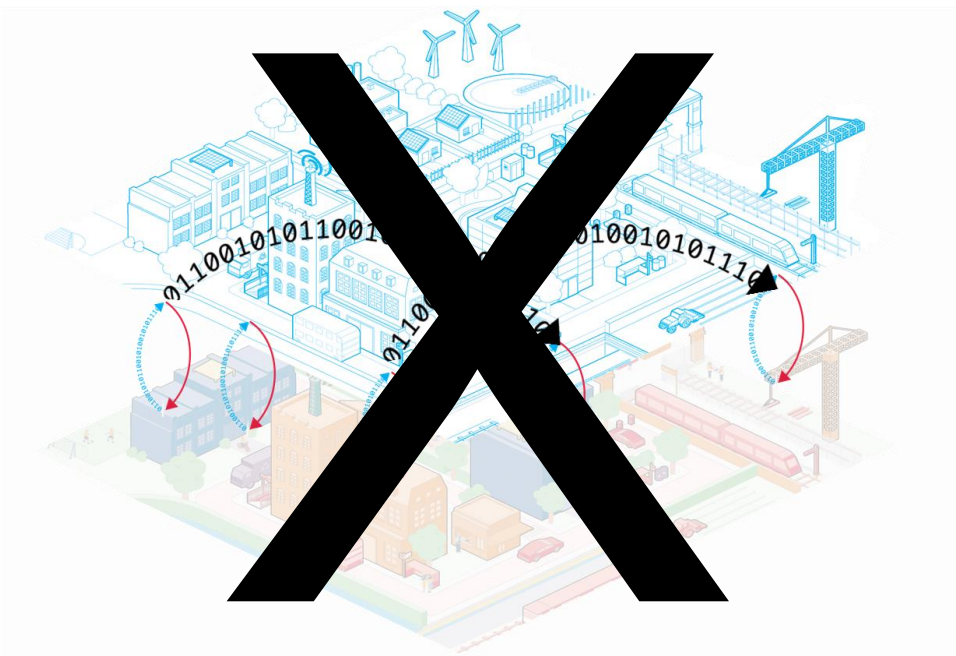
Academia

Alan Turing Institute (DT Research and Innovation Cluster)
EPSRC (UKRI DT programme)

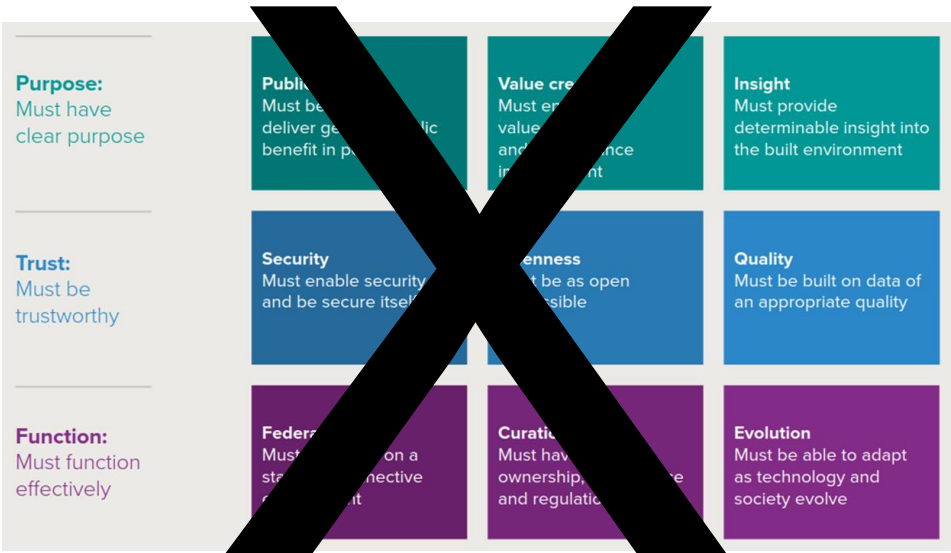
Other key players:
DAFNI
UKCRIC
Hartree
Non-ATI universities

Potential market failure...

Federation failure

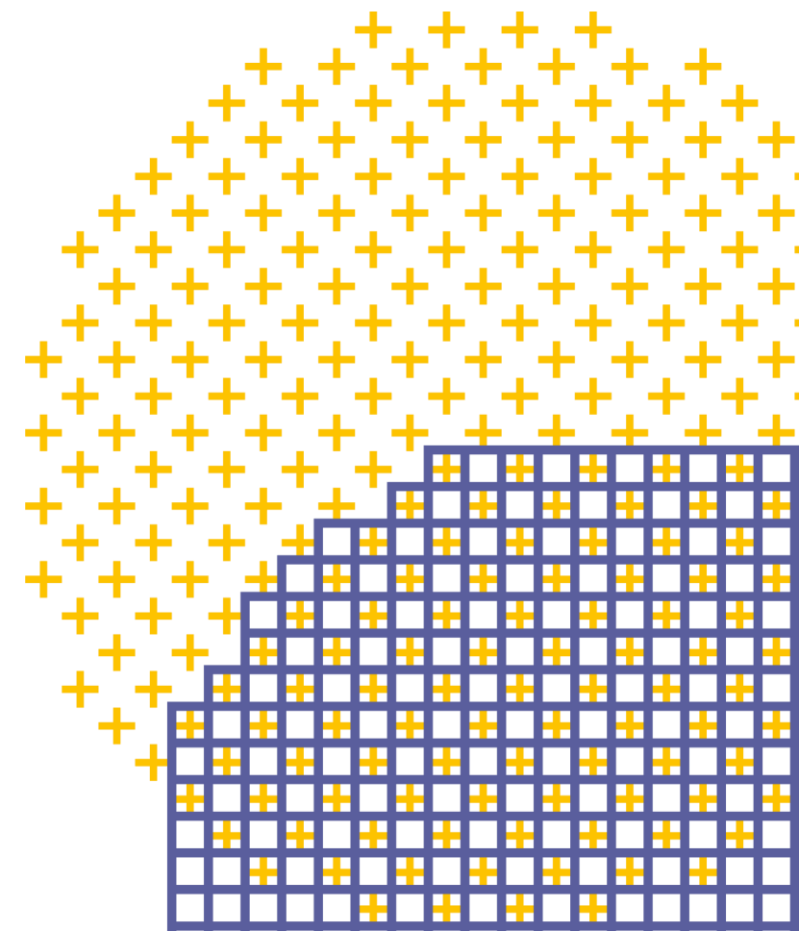


Ethical failure

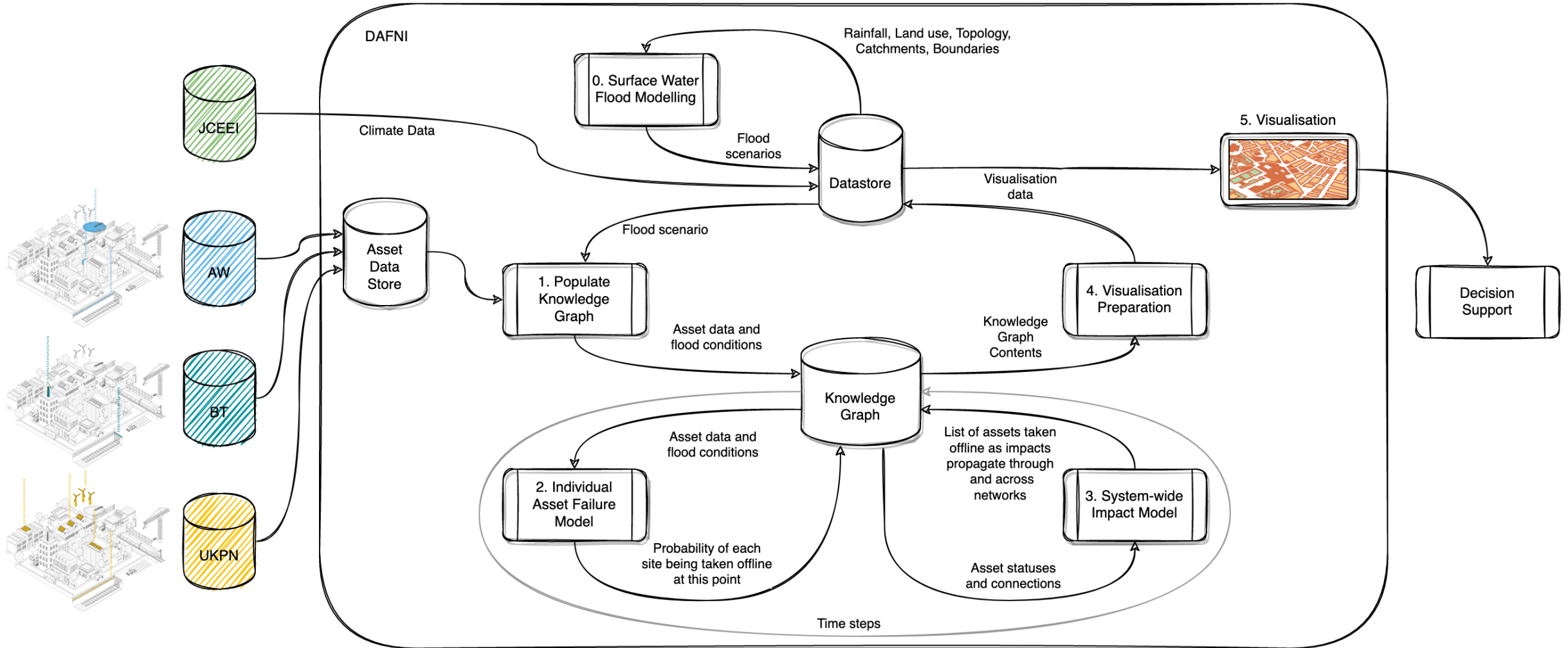


Thank you

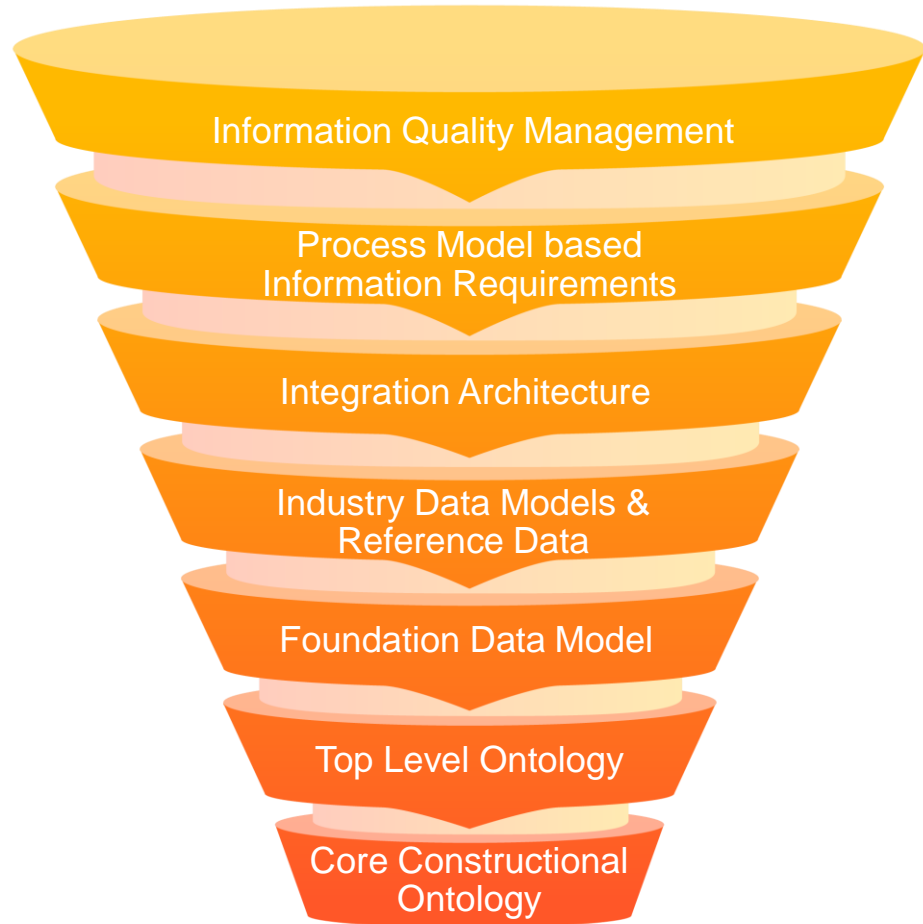
Build better connections:
digitaltwinhub.co.uk



Building a Connected Digital Twin



The Information Management Framework



The semantic solution at the core of the NDT

1. A consistent approach to data modelling
2. Shared reference data
3. Common security and access protocols