Digital Twins in cities
How data can help us better understand the Places, Processes and People in the city

Michael Mulquin

The Digital Twin

digital representation of a particular entity or process with data connections that enable convergence between the physical and digital states at an appropriate rate of synchronization (Draft definition from JTC1 SC41)
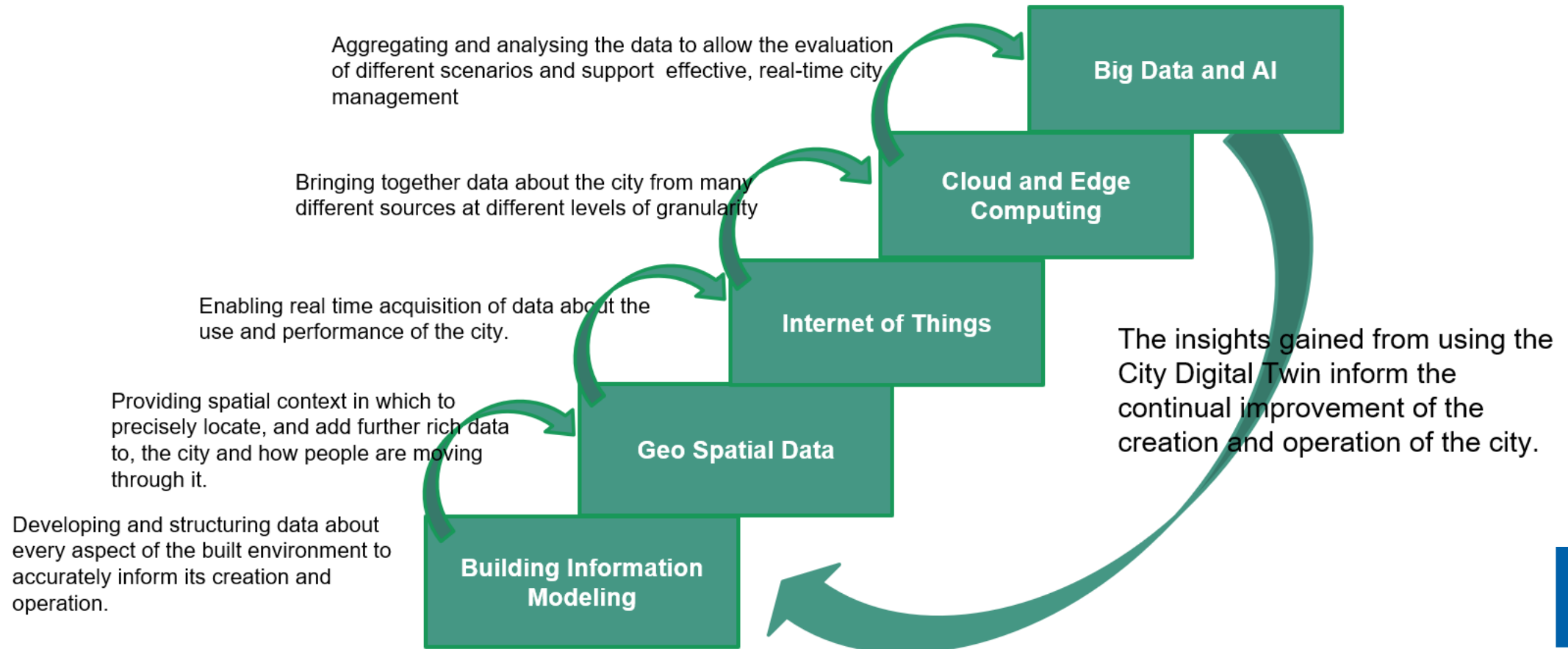
City Digital Twins

Providing key insights on:

- The Places and Physical assets
- The Processes; and
- The People

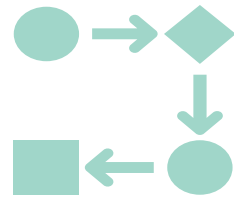…. of a city and enabling the city to bring together all its resources to achieve its objectives

City Digital Twins

How it helps

Planning

Show me what it will look like

Show me the pros and cons of different options

What if we change something in the object?

What if something happens to the object?

Management

What is happening to the object now?

How will that change over time, if nothing is done to affect it?

What options do I have to optimise the situation?

Where are all my ..staff … vehicles … equipment?

What needs to be fixed, what parts do I need and where to put them?

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1. Places and physical assets
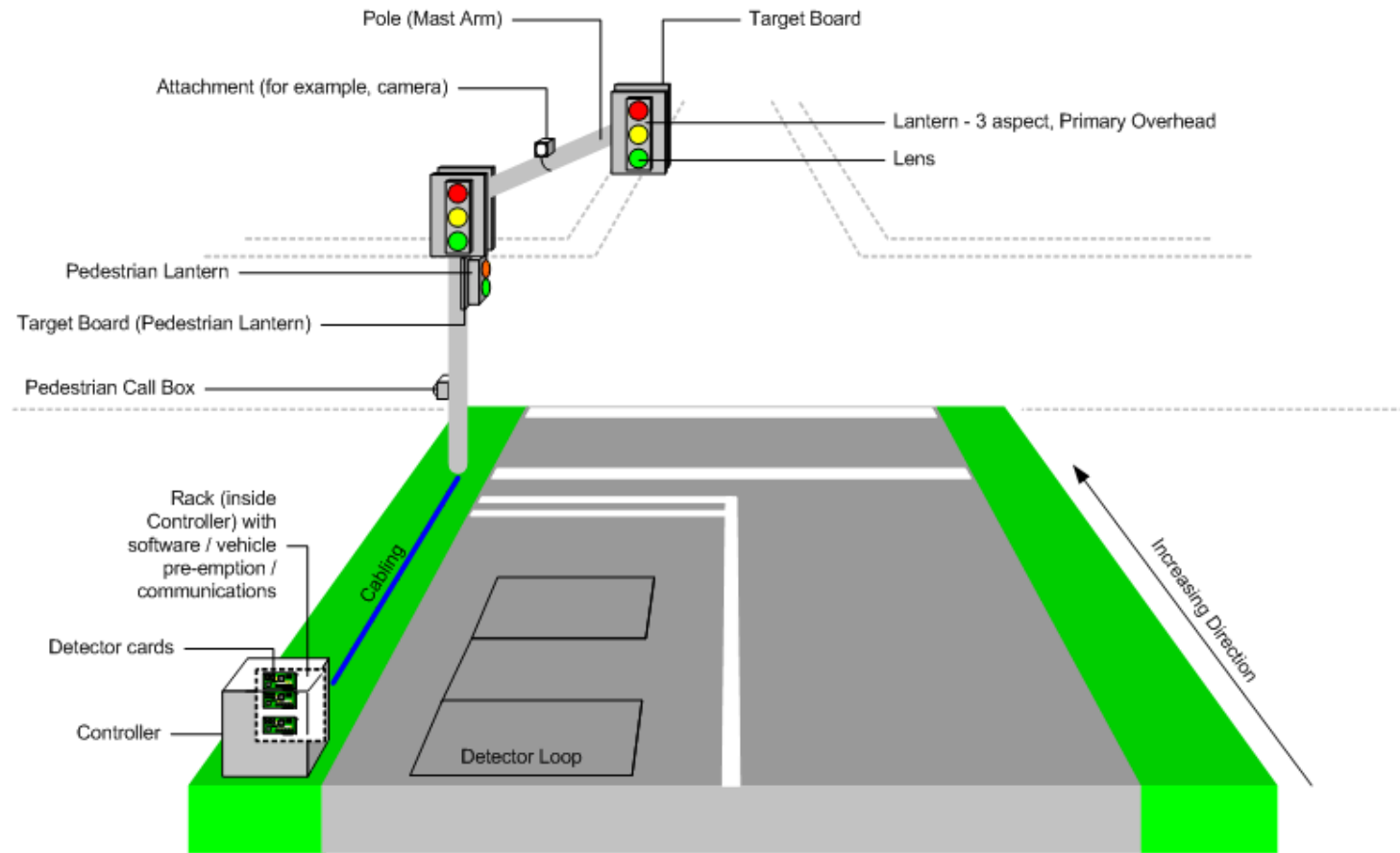
This can be at every level of scale …

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Could be a whole city

Tianjin Eco city

Or traffic lights

Note: Not to scale. Lanterns are shown without visors.

2. The Processes

- A smart city can be described as one where the processes within the city have been optimised through the use of data and technology.
- It is the processes that are important – not the technology!
- How easy is it for me as a citizen, to make a journey, to find a home, to get treatment for my sickness …
- How easy is it for me as a manager, to know how well my service is performing, to know what options I have to improve it, how easy to be able to implement those options ….
- How easy is it for me as a service planner, to get evidence as to how demands for services are likely to change over the next few years, to review options to meet those demands …

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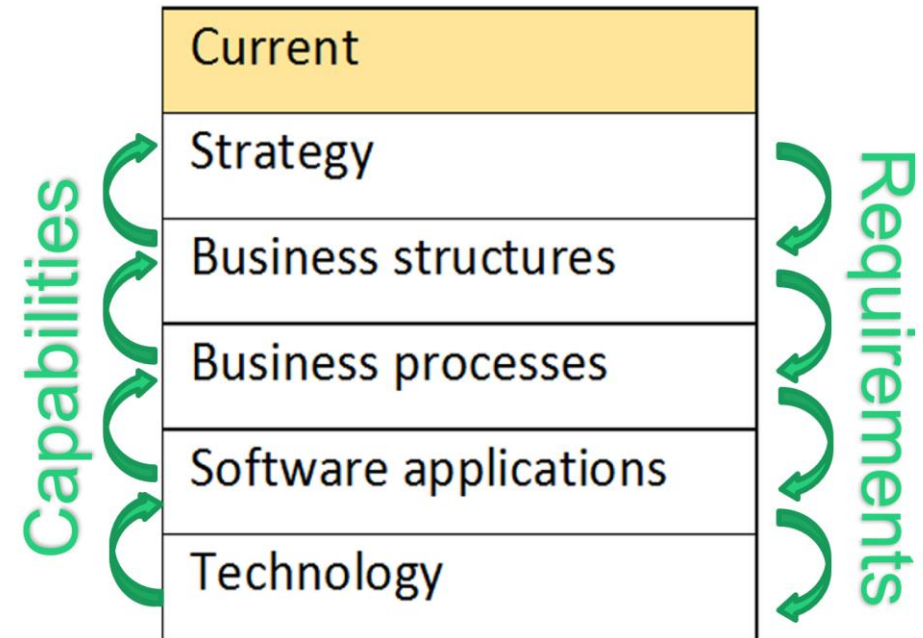# Digital Twin of Organisations and Processes

It is important to:

- Map how the city organisations are structured and the processes that are used now
- Identify where they are not working properly
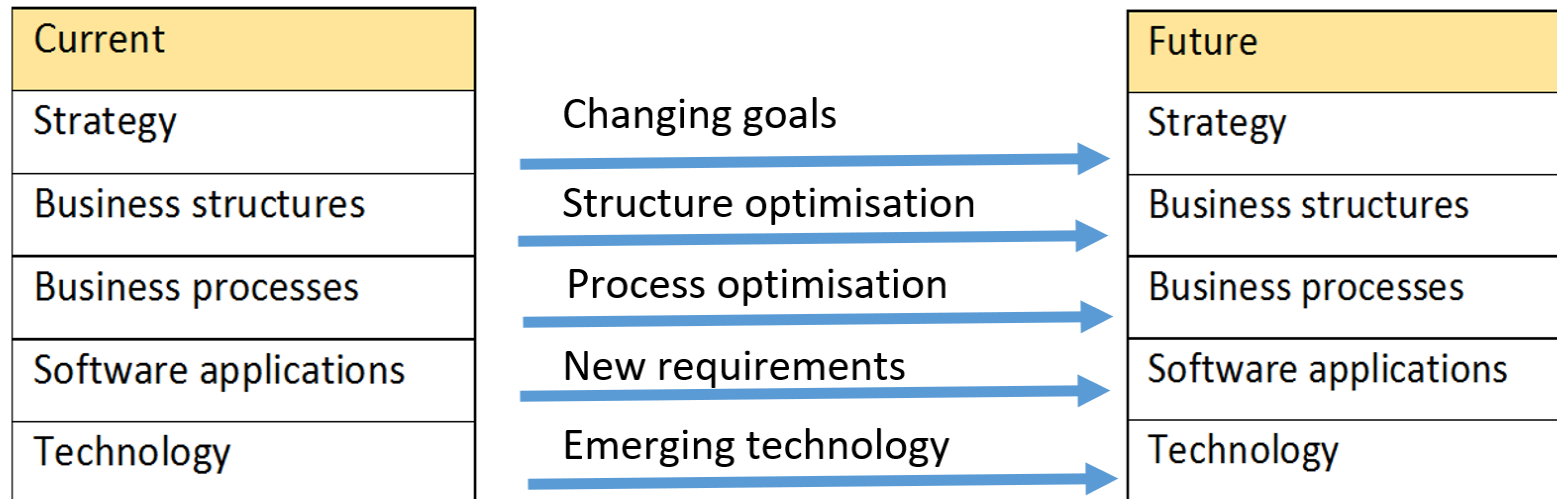- Then make changes as necessary

Processes – Enterprise Architecture

The definition of an enterprise from the combined viewpoint of its strategy, business structure, business processes, information systems and technology.

Enterprise Architecture

Optimising for today and planning for the future

Current		Future
Strategy	Changing goals →	Strategy
Business structures	Structure optimisation →	Business structures
Business processes	Process optimisation →	Business processes
Software applications	New requirements →	Software applications
Technology	Emerging technology →	Technology

3. The People

- How well do I understand the different types of resident and visitor in my city and what they want and need?
- How can I be sure that the city is functioning well for all the different types of resident and visitor?
- Amazon has developed digital twins of nearly 200 customer types and focuses on learning about the behaviours of each of them.

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Imagine a flood

Places Digital Twin

- Which areas of the city would be flooded first and how long would it take
- Which roads and other routes would become unusable and when
- Which parts of the city would provide safe havens, how could people get to them, and which buildings might provide shelter
- Which areas of the city might experience power cuts
- Where might be good places to store sandbags and other equipment

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Organisations and processes Digital Twin

- Which organisations are best able to provide help
- Who manages key buildings that might provide shelter
- What information do different agencies need and how best to provide it
- Which agencies have staff located in key positions and how can they be supported to help manage the emergency

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People Digital Twin

- Which people are most vulnerable and where are they located
- Which kind of people respond best to different communications channels
- At any time, which people are likely to be at work and which are likely to be at home

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What we are doing in the IEC

- Use case collection and analysis on City Information Modelling

- Held two day virtual seminar on CIM and Urban Digital Twins and soon publishing in depth report

- Discussing possible collaboration with JTC1 SC 41 (IOT and Digital Twins) ISO TC211 on Geographic Information and the Open Geospatial Consortium

This is a key area for cities – and therefore for us as SDOs

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