3D, Digital Twins and NMCAs – Questionnaire Findings and Perspectives

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Digital Twins...

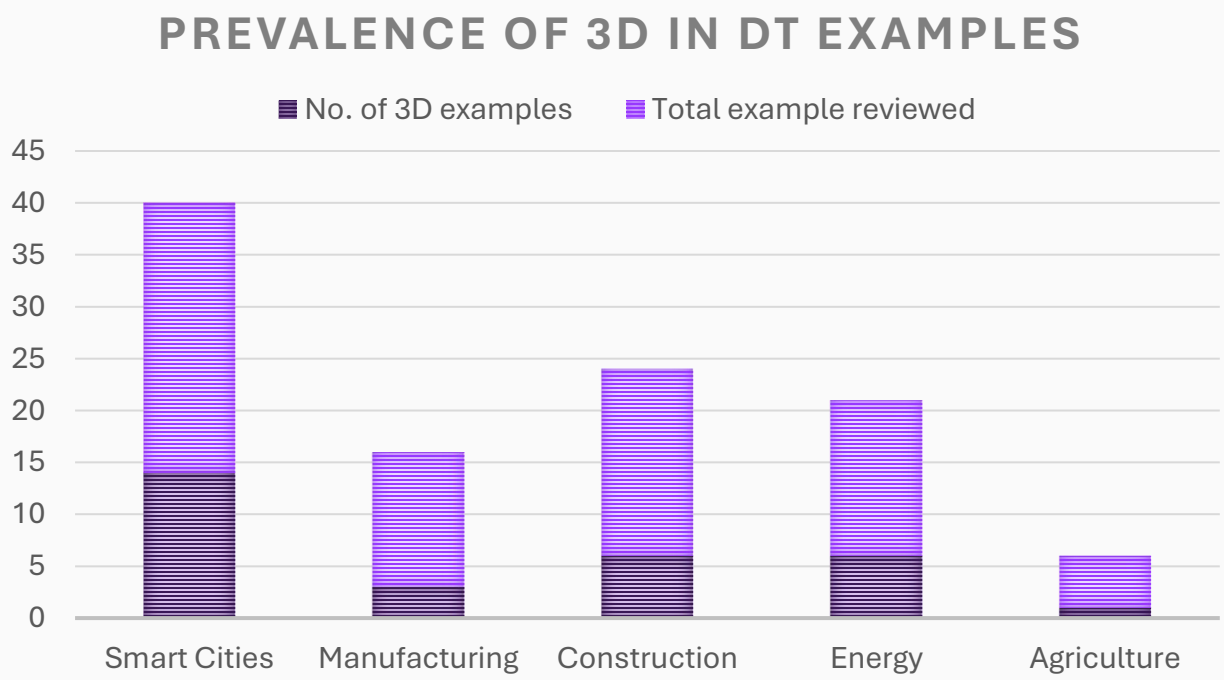
Integrate **current** data about real-world objects, systems and environments **bidirectionally** (ideally) to solve complex problems.

Enabled by...

Geospatial data, that is...

- Foundational,
- Often implicit,
- A necessary accuracy and currency for the use case, and **therefore...**

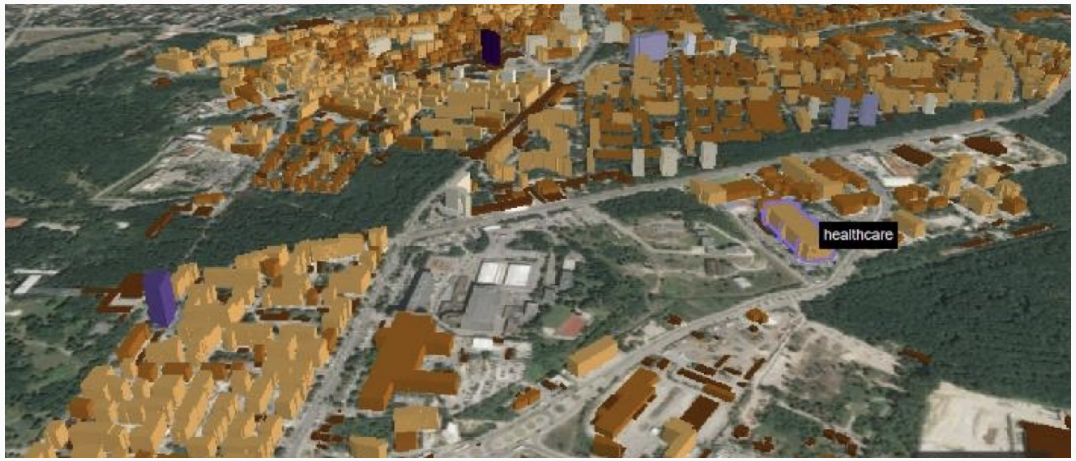
...not necessarily 3D.



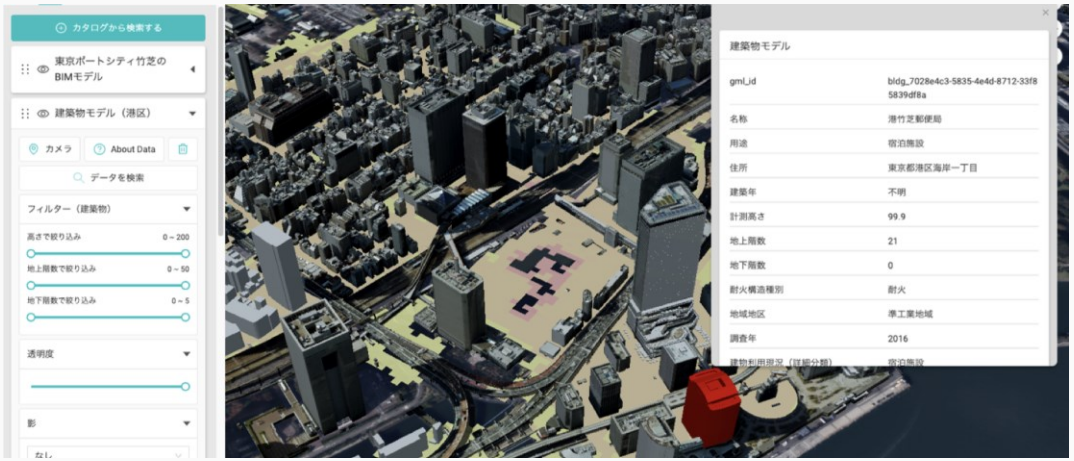
- 3D value is conditional on use case needs and cost-utility trade-off (Dimitrov and Petrova-Antonova, 2021).
- 3D is valuable when it changes decisions or reduces process costs, rather than having intrinsic value (Coote et al. 2017)

3D Geospatial Data is foundational in urban DTs.

DTs are about integrating heterogenous datasets and the geospatial foundation is one of the core means for doing this.



Urban DT of Sofia City, Bulgaria (Dimitrov and Petrova-Antonova, 2021)



Project PLATEAU, Japan (Seto et al., 2023)

NMCAs...

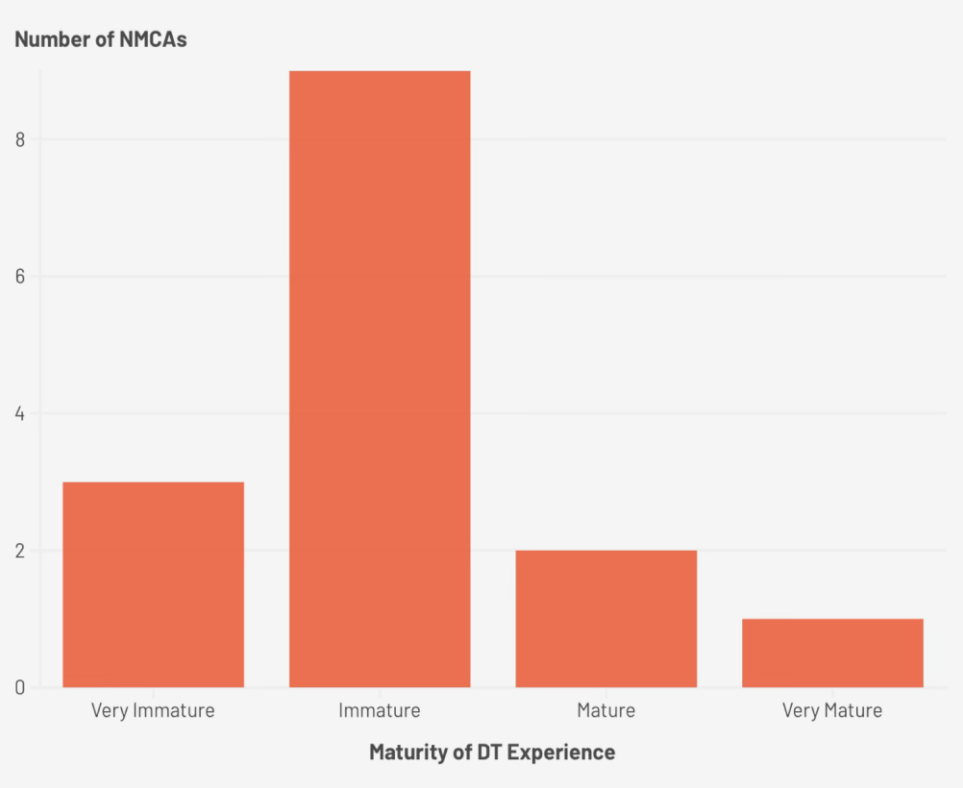
provide the authoritative, foundational and current national geospatial database, which, in some cases, is increasingly in 3D.

Therefore, through a questionnaire, we wanted to know:

- How are NMCAs currently engaging with DTs?
- What do NMCAs think about DTs?
- Is there some degree of consensus on DTs?

15 full responses received out of the 20 NMCA EuroSDR members.

1. DT experience is generally considered to be immature, yet a minority have formalised strategies, and the majority are contributing to a DT initiative.



Why?

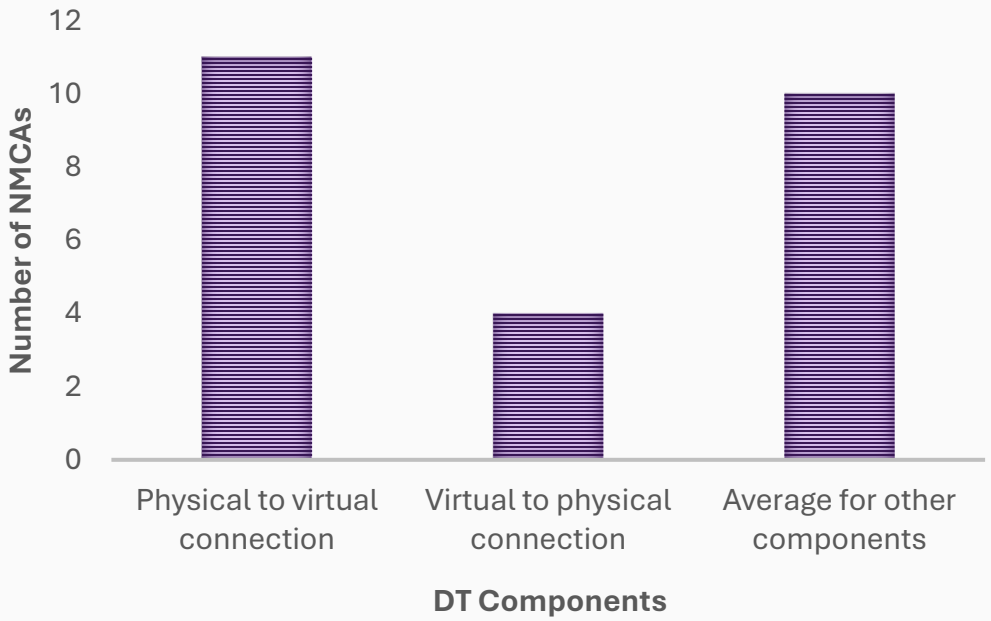
DTs require authoritative geospatial foundations now (hence why many NMCAs are contributing to a DT initiative).

However, formalized strategies and experience has not yet caught up.

So what?

NMCAs are in a transition from early engagement with DTs to strategic commitment.

2. NMCAs define DTs based on the physical-to-virtual component of DTs.



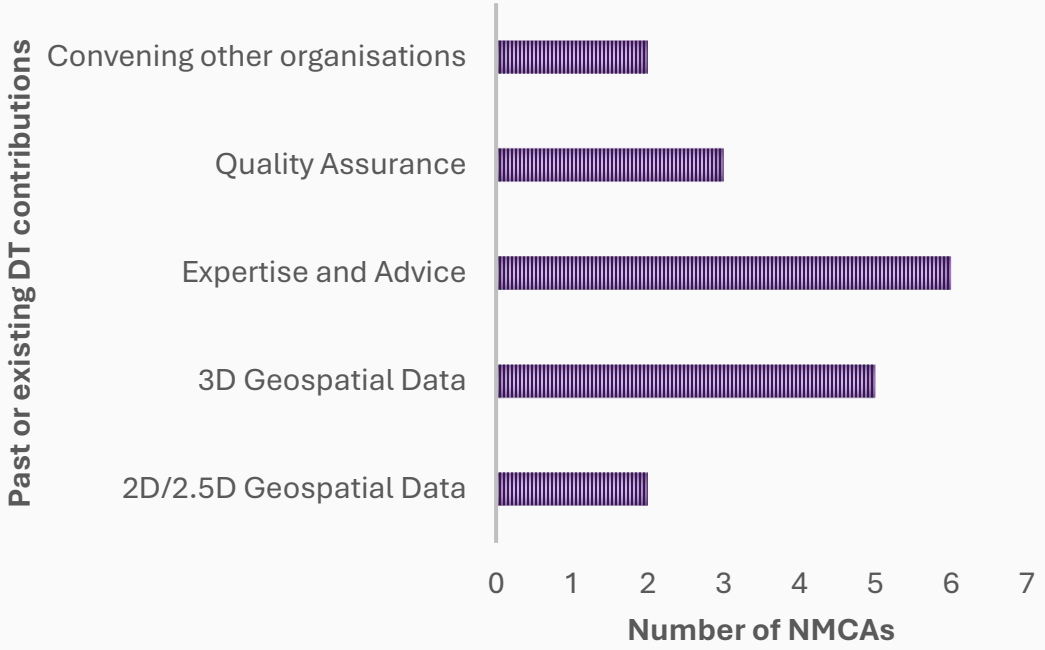
Why?

NMCAs' geospatial expertise is in representing reality, not controlling it. Virtual-to-physical requires different expertise (actuators, feedback loops, decision systems etc.)

So what?

NMCAs are focused on providing the reference system for DTs. Idealised virtual-to-physical connections must come from elsewhere.

3. NMCAs are contributing more than just data to DT initiatives.



There are more NMCAs providing expertise and advice to DTs than 3D geospatial data.

Why?

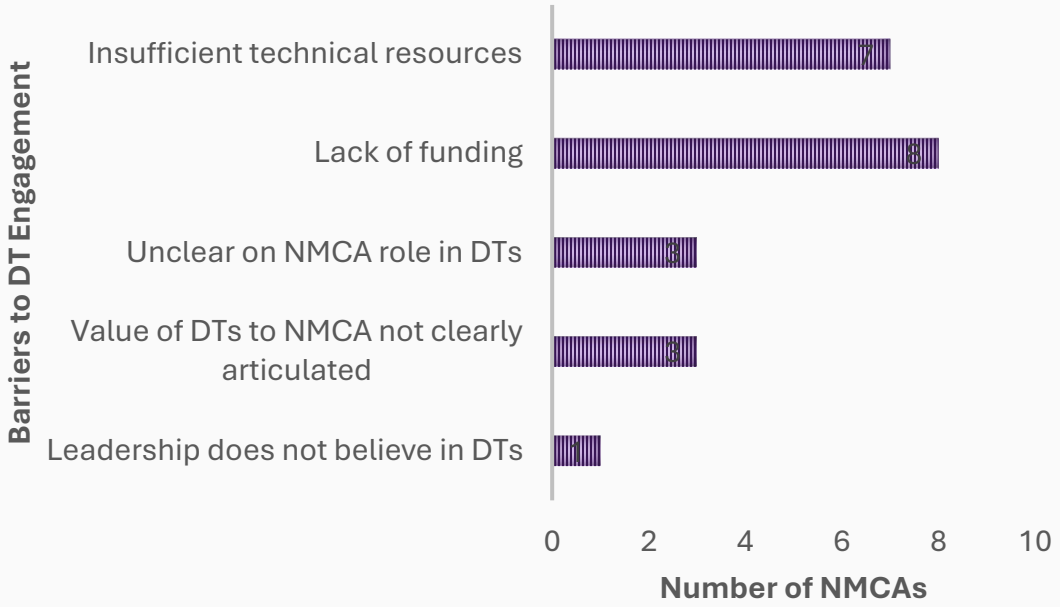
NMCAs have longstanding expertise in bringing together data from different organisations, applying rigorous quality and conducting stakeholder engagement.

So what?

The NMCA role in DTs is multi-dimensional.

NMCAs are DT ecosystem orchestrators, providing foundational data, quality assurance, and convening power.

4. Lack of funding and insufficient technical resources are the primary barriers to DT engagement.



NMCAs know they have an important role to play in DTs but don't have the money and resources to successfully do this.

Why?

NMCA business models have not yet adapted to their role in DTs or value proposition is not being articulated well enough.

So what?

If the majority of NMCAs buy into DTs and understand the value from them, why is the value proposition not being articulated to unlock investment?

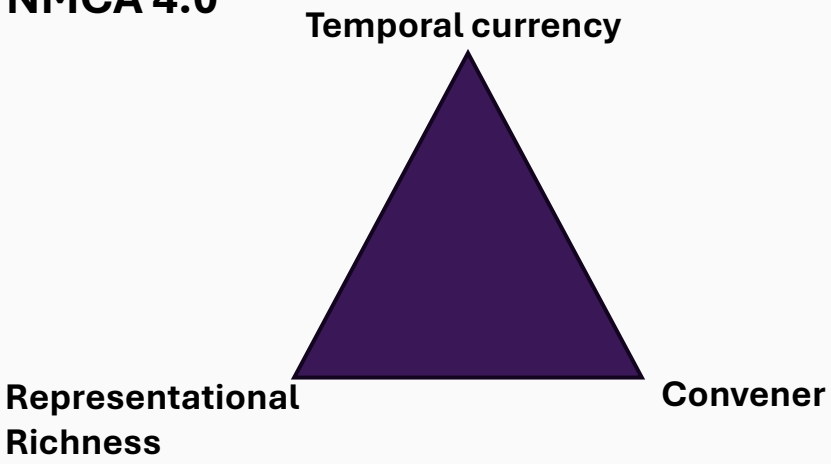
5. NMCAs primarily see DTs as an opportunity to improve environmental outcomes and digitalise to the next level.

NMCA 1.0 (Paper Maps, 1800s-1990s) – added accuracy and authority in geographic representation

NMCA 2.0 (Digital Maps, 1990s-2000s) – added computational capability.

NMCA 3.0 (Spatial Data Infrastructure, 2000s-2015) – added standardisation and interoperability

NMCA 4.0



Why?

DTs, as the ultimate integration system, will have the ability to help address complex system-of-systems environmental challenges.

DTs demand more from NMCAs as foundational infrastructure providers and they must adapt to meet this need.

So what?

Improved currency, representational richness, and developing an ecosystem role all have operational implications and require a strategy.

To Conclude

- With DTs requiring representational richness of the physical world, 3D has become foundational for many use cases.

- NMCAs are on a journey towards NMCA 4.0, characterised by their critical role in DTs.

But what does this all mean for individual NMCAs?

Look out for an upcoming webinar where I will present the results of the NMCA typology.

Questions?

Let’s continue the discussion:
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