The Digital as a Complex Ecology

Reframing the Ontological Status of Data

Dr **Stefano Calzati** – Independent scholar

Data Migration and Mobilities Workshop
8-9 April 2026, TalTech

From givens to emergencies

Classical understanding of data

- **Status:** data as atomistic (Newtonian) points
- **Use:** data moving across a Cartesian space
- **Effects:** global networkedness; objective knowledge
- **Underpinning logic**: Aristotelian principle of excluded middle

→Personal vs public data; open vs closed data; good vs bad use of data; etc.

The digital as a complex ecology

- "**An ecology has effects, but not causes** in the ordinary sense of a direct relationship between cause and effect." (Calzati & de Kerckhove 2024)

→ **complex system** showing emergent behaviours

- Complexity is an issue of framing, "**a way of observing systems**, not an absolute class of systems." (Gershenson & Heylighen 2003)

→ Complexity is a (qubit-based) **observer-observed co-determination**. (Calzati 2026)

Beyond a classical understanding of data

Informational side
(non-rivalrous,
non-excludable,
virtually global)

Technical side
(rivalrous, excludable,
materially local)
(cf. Hess & Ostrom 2007)

→ Data as **Janus-faced infotechnical artefacts** repeatedly **shift their ontological status** depending on and **tangling with** collection procedures, (re)uses, and sharing strategies (agent- and scale-agnostic co-determination).

Data mobility as onto-epistemological emergence

"Every entity involves **an indefinite array of perspectives.** But any one finite perspective **does not enable an entity to shake off its essential connection with totality**." (Whitehead 1948)

→ **No God-like standpoint** (Calzati 2025)

→The **knowledge** that data contribute to create **through** their ontological shifting **cannot be posited in a Newtonian-Cartesian way**: it is **emergent and approachable from multiple entry points at once**.

Practical implications

Law and policy

- One can claim control over data without ownership (and vice versa), stressing either the **informational** (e.g., European legal doctrine) or the **technical** (e.g., US legal doctrine) facet of data. (Floridi 2020)

- "The distinction between the data that is personally identifiable and non-identifiable **is collapsing** (…) **data sometimes act as personal data and at other times as non-personal data**." (Purtova 2017)

→Data's status **cannot be framed once and for all**.

Effects of data uses

- "The ends to which [data] openness is being driven by different social actors have become more **complex** and **contested**. For some advocates, **this emerging complexity has been framed in terms of the 'unintended consequences'**." (Bates 2014)

→Data's uses and effects **cannot be predetermined** (cf. AI chatbots as "limited risk" but producing some dramatic consequences)

Values

- Beyond **axiomatic** (good vs bad) & **normative** (dos vs don’ts) data ethics.

→Data uses **always** produce **value-laden entanglements** (good **&** bad) and **uncertain consequences** (intended **&** unintended).

→Systemic inconsistencies: from “**problem solving**” to “**problem opening**”. (Calzati & Ploeger 2024)

Quantum-inspired approach to data mobilities

- **Operationalisation of quantum principles and phenomena** – e.g., uncertainty, entanglement, nonlocality, complementarity – to **overcome linear and deterministic extrapolations with/through data**.

- How can we work with/through data foregrounding **fundamental uncertainty** and **value entanglements** (e.g., beyond ex-ante risk-based approaches)?

- How can we accommodate **complementary scenarios and effects** (e.g., nonlocal trade-offs across scales) coming out of data uses?

Bridging data mobilities and data migrations

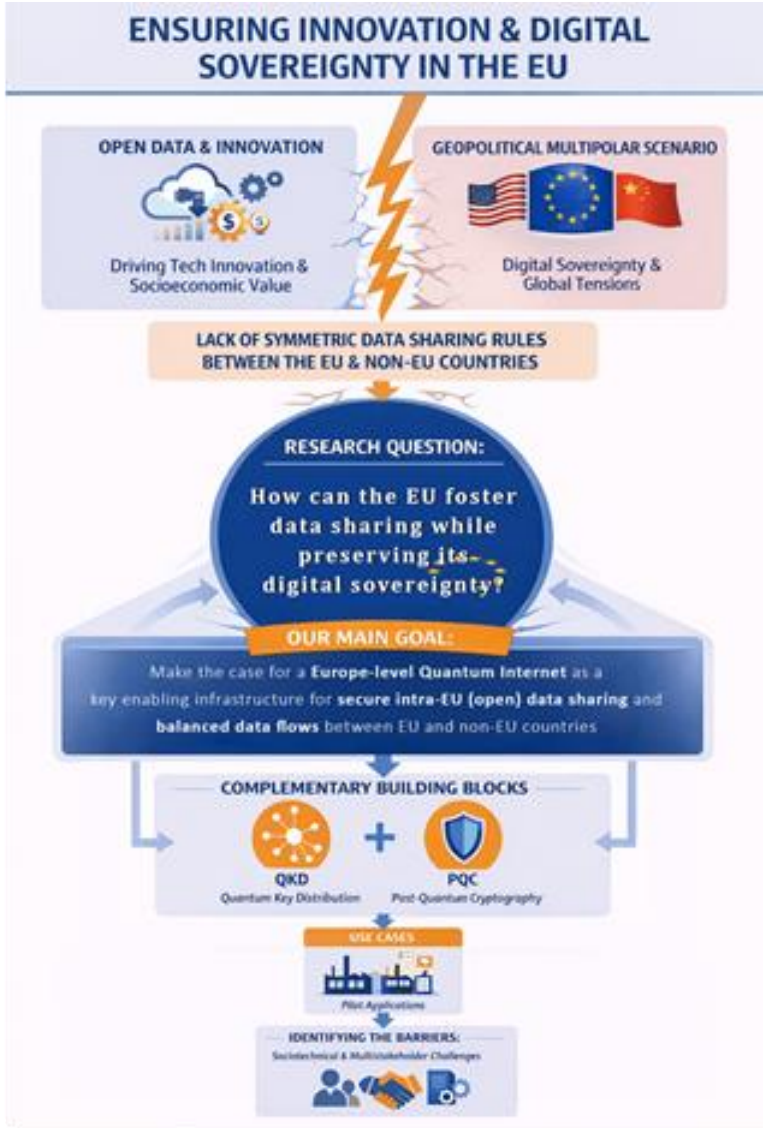
Data migrations in a geopolitical setting

- **Data sharing** is key to boost **technological innovation** and to create **socioeconomic value**

- However, data sharing face challenges within today's **multipolar geopolitical scenario**.

- Currently, **we miss symmetric cross-border data sharing frameworks** between the EU and non-EU countries (Voss & Pernot-Lepay 2023)

→How can the EU keep enacting **internal informational data sharing**, while also preserving its **outward technical data sovereignty**?



EU quantum internet for fair data migrations

A **Europe-level Quantum Internet** as the sociotechnical infrastructure establishing the **boundaries of a European data polity**. (Calzati et al forthcoming)

Challenges:

→Multistakeholder cooperation across sectors and **supra-national governance**.

→Multidisciplinary cooperation to **ensure the sustainability of a EU-level QI** (e.g., mitigation of dependencies along the supply chain).

Thank you!

https://stefanocalzati.com

Digital Society Topical Collection

Untangling the Quantum Ecology:
Charting the Impact of Quantum Theory and Quantum Technologies on Technoscience and the Digital Transformation

(Mi Lin, book cover's artist, Milandia 瀰瀾之域)