

# **The Governance of Science, technology and innovation (and its gaps)**

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# Motivation

- The context of this paper: Chapter for the Oxford Handbook of Governance, OUP, edited by David Levi-Faur (forthcoming).
- During past years growing concern with long-term, strategic and convoluted socio-political problems (poverty, development, competitiveness, climate change, ageing societies).
- These socio-political problems are not fixed or given, but socially constructed: they are constantly changing/re-defined as they are embedded in cognitive and organizational parameters.
- The governance of STI is part of the equation to address those socio-political problems in an effective and legitimate way, but how?
- The main question for scholars – What are the factors/conditions for the effective & legitimate governance of STI? What factors/conditions that might contribute to the solution of those large socio-political problems in an effective and legitimate way.
- Unfortunately this question remains largely obscure in the literature. We are good at seeing the trees (individual cases, countries, areas), but not the forest....(the factors – the 'how' is STI part of the equation)
- Three sources of frustration:
  - Lack of dialogue across social sciences' disciplines dealing with these matters
  - Lots of empirical material, but very few lessons
  - 'Governance' as catch-all notion, seems everyone thinks the same, but there are several quite different theoretical frameworks about it (these differences are poorly spelled out).

# The goals of this paper

- Critical literature review, with focus on theoretical, methodological and empirical issues:
  - Theoretically: Identify the different theoretical axioms (governance approaches - based on different socio-political theories and axioms)
  - Methodologically: Identify conventional research designs and data types.
  - Empirically: Map empirical areas, and the missing ones as well
- My message =>
  - Need to look at problems: the literature has been far too descriptive-normative on structures and dynamics, but little focus on problems.
  - The next research agenda needs to focus on **effectiveness and legitimacy gaps in STI governance**
  - And in so doing, we should be able to cross disciplinary boundaries, to draw better lessons from deductive-inductive research designs, and to engage in comparative research.

- Governance:
  - Ambiguity in the concept, because it is weak on intension & strong in extension (Sartori, 1971)
  - Broad definition: the ability of a society to solve collective action problems on the basis of common agreement among members
  - Narrow definition: a particular form of political steering where public sector and private sector in conjunction are capable of providing direction and control to society & economy (Guy Peters, 2010 paper)
- 'STI governance gaps' - what are they?
  - Unsolved situations that are STI-related/based and that produce and reproduce disruption in the society & economy, and where there is an obvious limitation of STI ability to provide solutions to those general problems defined collectively. In other words, when STI is not effectively nor legitimately solving the socially-defined problems.

# General Governance gaps

- Effectiveness gaps (examples):
  - The openness-closeness gap of STI governance => open science/technologies/innovation – proprietary/confidentiality => Example: patent thickets (many patents in one field) blocking for innovative solutions in biotech areas.
  - Territorial embeddedness gap => National/Local – Regional/global dimension. Example governance gap the volcano ash crises in Europe and diverse sources of S&T / unclear role of agencies: meteorological/aviation/foreign ministries.
  - Self-organization & purposive governance: Top-down/mission/strategic/designed governance forms vs. bottom-up/unassigned/creativity based => governance gaps as government, network and market failures. => example: transition to a carbon-free economy & the future of the car.
- Legitimacy gaps (examples):
  - Between input & output legitimacy => is there a trade-off?
  - Between anticipating & reactive legitimacy : Nanotech avoiding the GMO
  - High asymmetry within and across societies when it comes to legitimacy as social acceptance & support: BSE case regulatory patterns in USA & EU pose problems for trade.

# Effective governance of science

- Traditional tension between the self-organization of science and the politics of purpose: Polany & Bernal
- Social contract since end of World War II: self-organized academic science guarantees best quality.
- Changing context:
  - Mode-2 knowledge production /new epistemic dynamics of S&T
  - New forms of university & higher education organization
  - Open science & ownership of research results
- Governance gap: the end of the old social contract is real – but is there an explicit 'new social contract'? And is this new governance effective in providing scientific solutions to social problems?

# Effective governance of technology

- Regulating new technologies:
  - Technical interdependency/interoperability and high levels of network externalities.
  - Balance between opportunities of economies of scale & potential problem of technological lock-ins
- Regulation areas:
  - Vertical regulation of specific industrial sectors, like telecoms, or other utilities => creating/preventing/shaping competition dynamics & generation of public service.
  - Horizontal regulation => cross-cutting regulation of technology: mandatory standards (in health and consumer areas), Intellectual property rights, fito-sanitary codes, etc.
- Real life governance forms: Combinations of markets-networks-hierarchies in experimental instrumentation.
- There are several governance gaps: the economic literature identifies market failures, and there are also government failures and network failures. There are still important gaps in teh governance of technology.

# Effective governance of innovation

- Innovation process is a social process embedded in a complex institutional context (socio-technical & innovation systems)
- Innovation entails S&T as well as non-S&T processes of knowledge production and diffusion in the society and economy. It also entails organisational change.
- There are several theoretical approaches to effective governance (and its gaps): their starting point is the nature of socio-technical change and innovation systems' own dynamics of change. (see table below)

# Socio-technical/innovation system's change processes & theoretical views on effective governance

	Market-society driven	Knowledge-dynamics driven
<p>Agency-organisation centred</p>	<p>Selection-adaptation processes &amp; Robust designs by strong networked actors  <u>Effective governance as (bounded) rational design &amp; adaptation</u>                      (Hargadon &amp; Douglas, 2001)</p>	<p>Strategic niches – cumulative processes by social, economic and policy entrepreneurs  <u>Effective governance as a cumulative process</u>                      (Kemp, Rip &amp; Shot, 2001)</p>
<p>Institutional centred</p>	<p>Functionalist approach                      Varieties of Capitalism                      institutional complementarities  <u>Effective governance as meta-coordination of institutions' performance</u>                      (Bergek, Jacobsson et al. 2008)</p>	<p>Transition-management &amp; institutional arrangements  <u>Effective governance as managed coordination</u>                      (Kern &amp; Howlett, 2009)</p>

# Legitimate governance of STI

- Legitimacy:
  - Normative approach: Democratic legitimacy => Ideal yardsticks defined by normative theories of democracy
  - Positive approach: legitimacy is the political support of the political community to a political system: diffuse or general support: David Easton tradition
- Democratic legitimacy: 2 questions:
  - Democracy as procedure – different views
  - Question of citizens & experts/scientists

## Alternative normative theories of democracy & their (very different) views on the democratic legitimacy of STI

	Empowering citizens	Empowering experts
Representative democracy	Improving the public understanding of science for an informed public debate. (Miller 2001)	Ensuring “sound science” in agencies with effective problem solving-capacity. (Majone 2010)
Participatory democracy	Actively participating “science citizens” generating deliberation. (Hagendijk & Irwin, 2006)	Participation of wide range of experts producing “socially robust knowledge”. (Nowotny, 2003)

# A new research agenda

- **Methodologically:**
  - Need expanding the methodology frontier by using mixed-methods (quantitatively & qualitatively) and of combined approaches (there is too little deduction, and limited induction)
- **Theoretically**
  - Acknowledge axiomatic differences & set different theories against each other – perhaps “testing” them in their different analytical capacity to explain when, how and why (not) STI has been effectively mobilised to address socially-constructed problems/ is (not) democratically legitimate.
  - Bringing actors back in in governance: institutions as opportunity structures and acknowledging that actors follow consequential & appropriate behaviour we need to look at motivational factors behind actors’ role in STI governance (and its gaps)

# And perhaps most important for the new agenda....

- **Empirically:** Look at governance gaps (too much focus on what works, we also need to look at what does not work!)
  - Need for more 'lesson drawing' – What works, when and how?
  - Need of more comparative studies (cross areas & cross countries).
  - Need for a positive/descriptive turn in the study of legitimate governance of STI focusing in degrees and forms of actual popular support
- **Normatively:** Put forward a normative agenda for the institutional design of effective and legitimate STI governance, particularly in transnational and international context given the growing internationalisation of the governance of STI.