

**Capacities for Transformative Innovation:
a draft framework**

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Abstract

Science and innovation policies have been called to address grand societal challenges through Transformative Innovation Policies – TIP. However, little research exists about the capacities required for innovation policy efforts to become transformative. This is especially pertinent considering the governance limitations identified in the implementation of “Smart Specialisation Strategies” during the Cohesion programming period 2014-2020, especially in less developed regions of Europe. Without capacitation of the policy making community and actors participating in the transformation process, we do not know, whether new policy frames success or failure stems from the quality of the policy model or from the willingness and the policy capacity of the participant actors to actually implementing it.

The question of what policy capacities are needed to influence the system level conditions and dynamics, to expediently and purposefully ‘steer’ transformative processes and ultimately produce systemic change, remains open.

Building on recent studies from different areas with different epistemologies such as “systems thinking for social innovation”, “sustainability transitions”, “studies on transformation of urban systems towards sustainability” and existing attempts to define policy capacity associated to governance of transformative and missions oriented innovation policies, we propose a conceptual framework for analysing policy capacities, needed to design and implement Transformative Innovation Policies - TIP.

1. Introduction

In recent years science and innovation policies have been called to address societal challenges like climate change, biodiversity loss, social inequality, and economic instability. However, while most policy makers would acknowledge the need to urgently address these challenges in many cases they continue to use the common innovation policy orthodoxy — which in many cases means the use of traditional market and system failure rationales to reinforce traditional targeted R&D and innovation policy planning.

However, while alternative innovation policy proposals such as mission-oriented innovation policies (Mazzucato, 2018), Transformative Innovation Policies - TIP (Shot and Steinmuller, 2018) or partnerships for regional innovation (PRI) (Pontikakis et al., 2022) are becoming harder to ignore, their translation into effective policy practices calls for more fundamental changes. Existing innovation policy governance continues largely unaltered, sometimes adopting a “transformative” policy discourse and/or producing incremental policy changes over short-term policy cycles, thus precluding more disruptive fundamental changes (Loorbach 2014). TIP approaches can be seen as layered upon, but not fully replacing, earlier policy paradigms of linear (i.e. non-systemic) innovation policies (Schot and Steinmueller, 2018; Diercks et al. 2019).

Delivering transformative innovation for addressing grand challenges requires the adoption of novel governance modes that do not rely (only) on top-down authority but also on open-ended processes and cross-learning (Turnheim et al., 2018; Hölscher et al., 2019; Borrás and Edler, 2020).

Requires also the participation of many actors and stakeholders in multiple sectors, who need capacity to engage. Rather than focusing on a narrow group of organisations that have traditionally monopolised innovation policy attention, transformative policies are co-produced by a wider set of actors at multiple scales and levels. However, the wider and distributed nature of the new governance landscape raises questions about how to mobilise, structure and coordinate a wider more diverse set of actors and stakeholders for policy co-creation and co-implementation and for systems level change (Grillitsch et al., 2019).

While existing studies focus mostly on conceptualizing the dynamics of transformative socio-technical change (Geels, 2002; Geels and Shot 2007), little research exists about the capacities required for innovation policy efforts to become transformative. This is especially pertinent considering the governance limitations identified in the implementation of “Smart Specialisation Strategies” during the Cohesion programming period 2014-2020 especially in less developed regions of Europe (Grillitsch, 2016; Tripl, Zukauskaitė and Healy, 2020; Di Cataldo et al., 2021).

Without capacitation of the policy making community and actors participating in the transformation process, we do not know, whether new policy frames success or failure stems from the quality of the policy model or from the willingness and the policy capacity of the participant actors to actually implementing it (Andrews et al, 2017).

Even if these new policy frames are supported by policy guides, playbooks or toolkits¹ for helping with the adoption and learning of new policy models, this may be insufficient to support learning and building of new policy capacities. The question of what policy capacities are needed to influence the system level conditions and dynamics, to expediently and purposefully ‘steer’ transformative processes and ultimately produce systemic change, remains open.

Building on recent studies from different areas with different epistemologies such as “systems thinking for social innovation”, “sustainability transitions”, “studies on transformation of urban systems towards sustainability” and existing attempts to define policy capacity associated to governance of transformative and missions oriented innovation policies, we propose a conceptual framework for analysing policy capacities, needed to design and implement Transformative Innovation Policies - TIP. Our overview of these different streams of literature is by definition limited and biased. Therefore the article is also biased in that it is largely based on the authors’ understanding and perception of the rapidly expanding field of transformative policies and of the gap in connecting these to the question of “policy capacity”. Nevertheless, the framework proposed aims to help policy makers to better understand the

¹ For policy guides and toolkits see for example the Transitions-Hub Publications from EIT Climate-KIC such as Matti et al., (2020) amongst other <https://transitionshub.climate-kic.org/knowledge-library/publications/>. See also the PRI Playbook (Pontikakis et al., 2022). In addition see the TIP Consortium resource lab <https://www.tipconsortium.net/resource-lab/>

different concepts around capacity for transformative innovation policy in a way that is meaningful for policy practice.

While section 2 revises the literature on policy capacity, in section 3 we draft our proposed framework for policy capacity and in section 4 we present our conclusion and outlook for further research.

2. Capacities for transformation

According to Katel and Mazzucato (2018) there is a need to discuss what “policy capacity” is needed for transformative mission oriented policies. Traditionally policy capacity has been defined as a static concept - “a set of skills and resources – or competencies and capabilities – necessary to perform policy functions” (Wu, Ramesh and Howlett, 2018, p.3; Andrews et al. 2017). However, these skills and resources need to be taken as the building blocks of organisational dynamic capabilities needed to develop, implement and evaluate missions properly (Kattel and Mazzucato 2018). These organisational capabilities reside only in government organisations (including its agencies and intermediaries for public service) but are manifest in all actores (public and private), who need to engage in the transformation process.

We are aware that amongst the epistemologies revised there is considerable variety regarding the exact subject addressed (whose capacity?) and the purpose targeted (capacity for what?). In the selective literature revision that follows we define the subject as the capacity of government and stakeholder organisations and purpose as the capacity to undertake systems level change. Our objective is to find common components or dimensions (what constitutes policy capacity?) in these different streams of literature

Social innovation

Social Innovation provides valuable insights with regards different kinds of policy capacities needed to solve complex social problems. In particular the use of systems thinking for social innovation policy (Stroh, 2015) suggests that identifying possible stakeholders and designing strategies to engage them individually and collectively is one key aspect. Establish common ground or common intent by creating an initial shared vision of the ideal outcomes and an overview of what is currently not working also helps. Another fundamental skill is the

capacity of “actors” to collaborate with each other. This involves developing abilities to think systemically, deep listening and holding productive conversations around difficult issues, as well as the capacity to take responsibility for the current state of affairs (Stroh, 2015).

Building on the recent Transformative Social Innovation (TSI) theory Strasser, Craker and Kemp (2019), propose a conceptual framework for better understanding transformative impact and transformative capacity. The authors propose a broad definition of transformative capacity as “the ability to turn transformative potential into transformative impact” and define three dimensions of transformative impact and capacity.

First, widening capacity defined as how widely influential ways of doing, organizing, framing, and knowing (DOFK) are across different geographic and cultural contexts, or societal sub-sectors. Transformation can take place at different levels of scale or in different contexts. What may be transformational within a certain context or level of scale (e.g., an individual or organization) may not be transformative at a different level (e.g., the economy as a whole).

Second, deepening capacity defined as how deeply ways of doing, organizing, framing, and knowing (DOFK) are embedded in formal structures like policies, incentive mechanisms, legal codes, as well as cultural values, mental models, and worldviews. Social change can take place at different degrees of depth, in terms of incremental, reformative, or transformative change. Transformation is the most fundamental type of change, where deeply embedded rules or assumptions are changed.

Third, lengthening capacity defined as how persistently ways of doing, organizing, framing, and knowing (DOFK) are reproduced over long periods of time, while evolving to adapt to changing conditions. Some changes are temporary or easily reversed.

Finally, in their study case of the J.W. McConnell Family Foundation, Moore et al. (2015) suggest that one important policy capacity is the ability to accelerate and scale promising initiatives to achieve social positive impact and systemic change. The authors suggest different scaling mechanisms or strategies for social innovations: replicating and adapting social innovations in new settings; influencing cultural values, narratives and beliefs; and changing broader laws and policies.

Sustainability Transitions

Sustainability transition studies have expanded rapidly in last decade or so (Köhler et al., 2019). Drawing on evolutionary economics and sociology of innovation, scholars in this field argue that current social and environmental challenges cannot be addressed by incremental improvements and technological fixes and require radical shifts to new kinds of socio-technical systems (Grin et al., 2010). Valuable insights from this literature which includes the Multi-Level Perspective - MLP, Strategic Niche Management - SNM *and* Transition Management – TM, are associated to the idea that “transitions” require fundamental changes in the knowledge of individuals and in the organisational and governance capacities, implying shifts in skills, methods, processes and cultures.

First, one important issue is understanding transitions as multidimensional struggles between emerging niche-innovations and established regime systems, against the backdrop of exogenous “landscape” developments (Geels and Turnheim, 2022). In addition, transitions are collective processes that span across the entire production-consumption chains.

Second, triggering transition processes requires capacity for destabilization of the current regime (Turnheim and Geels, 2012; Geels, 2014). Technological, cognitive and institutional lock-in mechanisms contribute to stabilize existing systems, constrain incumbent actors and orient their activities towards incremental rather than radical change, and therefore need to be dismantled (Geels and Turnheim, 2022).

Third, it also involves co-creation of visions regarding future socio-technical systems (Kemp et al., 1998). Hence involves capacities for promoting the co-creation of these visions across a wide number of diverse stakeholders (actors in general) in multiple sectors, including final consumers and citizens.

Fourth, collaboration possibly formalised in partnerships is needed not only to define visions and pathways for long term transformation, but also to broaden the problem and the solution spaces, enabling to develop radical innovations through entrepreneurial experimentation, which is the seed of transitions (Kemp et al., 1998; Loorbach, 2015).

Fifth, niches of radical innovations (technical, grassroots, and business model innovations) need, however, to be sheltered from mainstream market selection pressures so that they can grow and compete (eventually replace) existing solutions in terms of techno-economic performance, and in the long term contribute to wider changes in the socio-technical systems. Diffusion often follows a pattern of “niche-accumulation” (Geels, 2002) patterns, by which an emerging radical innovation moves from small market niche or application domains into larger mainstream markets. Upscaling of new promising radical innovations, often requires the capacity to change regulations and/or using of policy instruments such as capital grants, interest-free loans or procurement policies and information campaigns in a smarter, more directional way.

Finally, sustainability transition studies also point out that the dynamics of socio-technical systems change require different policy governance capacities. For example, while Ehnert, et al. (2018) point out that efficient multi-level governance is crucial to orient sustainability transitions towards desirable directions, integration and coordination of a wider array of different policy areas is also crucial to avoid policy fragmentation (Weber and Rohracher, 2012; Turnheim et al., 2018). In addition, because transition processes have unintended consequences and trade-offs between social, economic and environmental sustainability outcomes, there is a need to continuously identify and evaluate risks. Hence, there is a need to develop capacity for decision-making in situations of high risks and uncertainty using participatory approaches and adaptive governance (Chaffin et al., 2014) or “tentative governance” (Khulmann et al., 2019) based on iterative cycles of policy design, implementing, evaluating and adjusting.

Public sector agencies and intermediaries may have a most important role developing policy capacity and practices associated to these different governance approaches. For example their role is essential in not only in promoting circulation of information, aggregating processes, mediating conflicts and balancing changes in the balance of power (Kivimaa, 2014), but also in promoting entrepreneurial discovery and experimentation. In addition public sector agencies have a fundamental role in promoting coherence and consistency in policy goals and instruments (Rogge and Reichardt, 2016) and in promoting collective reflexivity based on monitoring of system change (Kivimaa et al., 2017).

Urban studies

The urban studies literature often refers to “governance capacity” for transforming urban systems towards sustainability and provides some indication of specific capacities for transformative policies. For example, Hölscher et al. (2019) categorises urban policy capacities for systems change across scales and sectors, using 4 different capacity types: Stewarding capacity - the capacity for anticipating, protecting and recovering from uncertainty and risk; unlocking capacity - recognising and dismantling unsustainable path-dependencies; transformative capacity - enabling, diffusing and embedding radical innovations, and; orchestrating capacity - the capacity to coordinate multi-actor governance processes

Likewise Wolfram (2016) suggested an integrated framework that maps out 10 interdependent key components of “transformative capacity” and identified requirements for their development – Table 1.

Table 1 - Interdependent components of urban transformative capacity

C1	Inclusive and multi form urban governance
C2	Transformative leadership
C3	Empowering CoP
C4	Systems awareness
C5	Sustainability foresight
C6	CoP experiments
C7	Innovation embedding
C8	Learning and reflexivity
C9	Agency levels – individual, household, group, organization, institutions
C10	Site, neighborhood, district, city, region, nation, transnational

Source: Wolfram, 2016

Social learning practices and methods (C8) are a vital component required to feed the outcomes of components (C4–7) that include using systems analysis to understand change dynamics and path dependencies. These learning feed back into governance, leadership, and community empowerment (C1–3), e.g., through collective reflexivity and monitoring system change. Most importantly, the urban transformative capacity framework proposed by

Wolfram (2016) also accounts for critical relational dimensions, i.e., the scale levels (local to global—C9) and agency levels (individual, household, organization, association—C10) associated to system change.

Capacity for transformative innovation policy

In the “Transformative Innovation Policies – TIP” literature there are few systematic efforts to define and operationalise policy capacity for transformative innovation policies. Existing concerns with policy capacity usually focus the role of governmental agencies (or other intermediary bodies) and their ability to devise and implement transformative missions and directional innovation and as well as the abilities to manage programme funding to facilitate transformation.

For example, Breznit et al. (2018) identified distinctive patterns of learning, adjustment, and experimentation in innovation agencies around the world and proposed a typology of innovation agencies. Maclaren and Kattel (2022, p.6) in their study of the UKRI (the primary agency for public investment in science, research and innovation in the UK), define three types of policy capacities for organisations involved in promoting transformative innovation policies, namely: navigation and dynamic portfolio management; connecting and coordinating, learning and reflexivity. On another study focusing United Kingdom’s Government Digital Service (GDS) Kattel and Takala (2021) illustrate how dynamic capabilities in public services form and how they evolve over time.

However, Kattel and Mazzucato (2018) suggested that in order to engender mission-oriented policies, public sector organisations need a different set of dynamic capabilities.

First, they need capabilities to establish public-private partnerships that are not constrained by the prevailing notion that PPPs can only be used as market fixing mechanisms.

Second, they argue that public sector organisations need capabilities for leadership and engagement. Because missions can easily become either just fashionable labels on ‘business-as-usual’ practices or too rigid top-down targeted R&D plans, there is a need to encourage bottom-up engagement as well as contestation and adaptability.

Third, Kattel and Mazzucato (2018) argue that the ability to find coherent policy mixes (instruments and funding) is a key capacity. Likewise Edmondson, et al (2018) and Roge and

Reichart (2016) also argue that capacity to understand the association between policy mixes and systems change dynamics is a key aspect of transformative policies.

Finally, capabilities for coordination are fundamental to the success of mission-oriented policies. As today's missions are not just about technological solutions but include strong socio-political aspects, experimentation capabilities matter perhaps more than before. Equally important are evaluation capabilities that integrate user research, social experiments and system-level reflection (See also Rip, 2006).

3. Conceptualising capacities for transformative innovation policies; a draft framework

For conceptualizing the components of policy capacity needed for transformative innovation policies we use and extend elements from the diverse approaches revised in the previous section.

Because we understand transformation as a collective process, where different organisational actors need capacities to engage, the framework proposed refers to organisational resources and capabilities of participant actors, including those of public sector organisations who may have the role to facilitate and stimulate the transformation process. In addition, we see these capacities not just as an attribute of the participant organisations, but also resulting from their interactions and relationships in a given institutional setting. These different kinds of capacities will be needed at different points in time during the transformative process. For example capacities to unlock the system will probably precede capacities to scale-up i.e. to achieve social and institutional change of the system itself.

Table 2, shows how our proposed draft framework of policy capacities for transformative innovation policies is supported by different streams of literature.

Table 2. Conceptualizing Policy Capacities for transformative innovation

	Social innovation	Sustainability transitions	Urban studies	Transformative Innovation Policy
Systems thinking capacity	(Stroh, 2015) build capacity to think systemically (Strasser et al 2020) Deepening			
Land scape reading capacity		(Kemp et al. 1998) visions regarding future socio-technical systems should be developed collaboratively	(Hölscher et al. 2019) Stewarding, anticipating and responding to risk and uncertainty	(Schot and Steinmueller, 2018) making social choices over alternative pathways of development (Mazzucato, 2018) Missions should be broad enough to engage the public and attract cross-sectoral investment
Systems awareness capacity	(Stroh 2015) capacity to feel and take responsibility for the current system state; system analysis (Wolfram, 2016) system awareness		(Hölscher et al. 2019) Stewarding, anticipating and responding to risk and uncertainty	
Unlocking capacity	(Stroh, 2015) establish common ground; identify quick fixes for early positive feedback; identify the costs of changing - investment deemed necessary (Stresser at al 2020) Lengthening capacity	(Geels 2014) destabilization and decline of fossil fuel regimes (Turnheim and Geels 2012) regime destabilisation	(Hölscher et al. 2019) unlocking, recognising and dismantling unsustainable path dependencies	

	Social innovation	Sustainability transitions	Urban studies	Transformative Innovation Policy
Discovery and experimentation capacity	(Stroh 2015) identify and scale what works (more resources) (Moore et al. 2015) scaling mechanisms for social innovations	(Loorbach 2015) niche formation through experimentation (Kemp et al 1998) niche formation (Turnheim et al. 2018) overcome the current fragmentation of initiatives (Geels and Shot 2007)	(Hölscher et al. 2019) transformative capacity, creating and embedding novelties	(Maclaren and Katel, 2022) Navigation and Portfolio Management (Schot and Steinmueller, 2018) open-ended processes that encourages experimentation and diversity
Relational governance and communication capacity	(Stroh 2015) organise implementation – roadmapping; engage and build capacity to collaborate and hold productive conversations; establish a process for continuous learning; monitoring and regular evaluation for revising the implementation (Strasser et al 2020) widening	(Kivimaa, 2014) role of agencies as intermediary actors in circulation and aggregation processes (Rogge and Reichardt 2016) need for coherence and consistency in policy goals and instruments (Ehnert et al., 2018) MLG is crucial to orient sustainability transitions in desirable directions and to enable faster transitions (Chaffin et al 2014) adaptive governance (Kivimaa et al., 2017) combination of both quantitative measurement and qualitative or semi qualitative stakeholder-based evaluations, using reflexive and realistic evaluations of transition experiments	(Hölscher et al., 2019) orchestrating, coordinating multi-actor processes (Wolfram 2016) reflexivity and learning	Maclaren and Katel (2022) Learning and reflexivity

Systems thinking capacity

One first capacity relates to the need to have knowledge about processes of “system dynamics” i.e. the dynamics of systems change. This includes knowledge about systems theory, complex adaptive systems (see Holland, 2006) and system change dynamics across scales. David Stroh (2015) argues that the use of systems thinking is key to understand societal problems and to envision intended social innovation. On the other hand Schot and Steinmuller (2018) argue that systems level change should be taken as a new policy rationale - the logic of state intervention needs to shift from measures to overcome market failure and promote economic growth, towards a broader focus on promoting systems level transformation.

Landscape reading capacity

Second, capacity to identify and interpret long term trends is also referred in different streams of literature, in particular in the MLP sustainability transitions literature (Geels and Turheim, 2022), as one essential capacity that actors involved in systems level change must have. This capacity appears to be associated to the need to become aware of which gaps will form, or are already forming, if the predicted landscape impacts are not attended. This capacity to anticipate and understand “gap formation” is also key to feed the formulation of missions (Mazzucato, 2018) or for making choices over alternative pathways of development (Schot and Steinmueller, 2018). Knowledge generation mechanisms like foresight, roadmapping etc., may help to recognise and anticipate landscape impacts and collaborative develop visions regarding future socio-technical systems. In urban transformations studies, Hölscher et al., (2019), has also proposed “stewarding capacity” as the capacity to anticipate and respond to risk and uncertainty.

System awareness capacity

Third, capacity to understand your system, how well it is connected and in particular what actors dominate, what are their vested interests and networks of power, appears to be an important capacity (Wolfram, 2016). This includes sensing the system (not just understand the system) which requires the ability to see and feel the system from an outside-in perspective i.e. from its borders.

System analyses e.g. systems mapping, helps to understand system boundaries, system networks and rules as well as recognising system gaps, problem-failures, mal-functions or mal-adaptations. It also helps to recognise institutions, technologies and behaviours that are perpetuating mal-functions. This capacity is important because dominant structures, practices or regimes need to be strategically phased-out. Usually this involves breaking their control, and withdrawing or diminishing existing public support. Note that systems awareness is not just the capacity to sense and understand the system and its systemic problems at the initial stages of a transformation process but also the capacity to sense the system throughout the whole transformation journey i.e. the capacity to sense and respond to unforeseeable effects of the on-going change process.

Unlocking capacity

Unlocking refers to the ability to destabilise, dismantl or phase-out of existing unsustainable regimes that create path-dependencies, “traps”, i.e. lock-in situations involving technologies, social values, individual behaviours, vested interests and market incentive (Turnheim and Geels 2012; Westley et al. 2011). Unlocking capacity enables to recognise the need to stop the unsustainable and design actions for destabilisation.

Sustainability transition scholars theorise how existing regimes can be destabilised by putting incumbents under pressure, undermining vested interests and reduce existing incentive structures, hence effectively diminishing their comparative advantage based on unsustainable business-as-usual practices (Kivimaa and Kern, 2016).

This involves openly challenging and questioning existing narratives and assumptions, withdrawing societal and political support for business-as-usual (financial, regulatory, political, etc.) and even penalising unsustainable regime technologies, cultures and practices (Geels, 2014; Kivimaa and Kern, 2016). It is also necessary to deliberately divest away from current human and financial capitals and dismantle the power networks that tend to favour the status quo of dominant actors and hold the systems in its current traps. In addition it is necessary to support the creation of a critical mass of actors with a common perception of the problems and a willingness to change.

However, the capacity to confront social and cognitive fixations with counterintuitive interventions, framing unsustainable technologies and practices as obsolete and at the same time creating opportunities and awareness for alternatives often requires formal mediation processes, taken up by public authorities and agencies at regional and national levels (Turnheim and Geels 2012).

The role of governments mediating partnerships, clustering niches and brokering information is therefore a fundamental one (Frantzeskaki et al. 2014). In addition, because the long-term focus of transformations is often at odds with the ways societies make decisions, which are based on addressing short-term (in particular short-term low cost needs) (Loorbach 2009), public authorities need also to play an essential role in keeping the focus on the longer term goals.

Discovery and experimentation capacity

Another important policy capacity component associated to “unblocking” is the capacity to develop alternatives to the current unsustainable regime. This requires capacity to search, discover and experiment with radical alternatives that provide new ways of doing, thinking, consuming and organising as well as capacity to fuel rapid diffusion (scale up) through social, technological and governance innovations.

Discovery starts with definition of new "pathways" i.e. new directions for transformative change. However, definition of long term goals and fruitful pathways for niche formation is undertaken through intense collaboration and co-creation. Therefore requires engagement, participation of a wider and diverse set of actors.

Another aspect is the capacity to provide abundant resources for experimentation, prototyping and testing. These niche formation processes are supported by entrepreneurial frontrunners who recognise opportunities and take up leadership for change by championing new narratives and mobilising financial and social capital. However, for radical promising innovations to result in more enduring systemic change, and get translated into new structures, cultures and practices, there is a need to scale-up, gain traction and wider support from new networks and alliances, enabling to connect more and more actors to on-going processes, and to increase visibility and acceptance further encouraging wider uptake.

Transitions scholars in this context highlight the roles of intermediaries, knowledge brokers and boundary spanners that create, mostly informal, convening spaces for face-to-face contact, and collaboration networks to instigate learning and discovery processes by gathering, processing, combining and distributing knowledge (Kivimaa, 2014). Beyond Public Authorities these roles can be taken up by diverse types of actors. For example private, non-profit organisations, enterprise and cluster associations that provide and distribute information and services, may help to articulate expectations and visions and build social networks (Kivimaa, 2014).

Often the role of Public Authorities is therefore facilitate this process ensuring that all interests are heard, increasing ownership and safeguard against conflicts of interest (Loorbach et al., 2015). Public authorities may also in some cases to provide a protected space (e.g. in terms of regulatory support, subsidies and research grants) that encourages safe-to-fail experimentations and thus critically facilitate the emergence of radical innovations.

Relational governance and communication capacity

In all of the streams of literature revised in section 3 some kind of distributed agency capacity – which we name “relational governance and communication capacity”, was oftentimes referred.

In our view this capacity includes the ability to coordinate/steer multi-actor governance processes, foster synergies, trade-offs and minimise conflicts. As pointed out by Chaffin et al. (2016), without some form of formal or informal coordination that connects system functions and promotes networks, emerging alternative ideas and solutions, the transformation process may stall or fall apart. However, because socio technical transformation is a non-linear uncertain processes, this agency capacity is best accomplished not through top-down hierarchical structures, but instead through processes of facilitation, mediation and negotiation.

Hence, in situations where knowledge is incomplete, surprise is likely and adaptation to non-anticipated consequences will be needed, relational and communication skills are key for this governing capacity. The concepts of adaptative governance or “tentative governance” (Kuhlmann et al., 2019) are useful to understand what type of governance is more adequate to transformation processes.

These processes, therefore, require advanced skills in communication and relationship building. Identifying and communicating sources of uncertainty, studying and communicating how the change process, as it unfolds, is affecting needs and interest groups appears to be a key issue. On the other hand, effective communication is strongly associated to active listening skills (or the so called non-violent communication skills).

In addition, associated to this relational governance and communication capacity is the need for monitoring system changes as the process unfolds. Monitoring (and evaluation) involves the ability to register the experiences and progresses being made with the system, (collective memory of the system evolution) and using these learnings to constantly revise the assumptions and the objectives of the undergoing system change i.e. monitoring is important as an input for reflexivity, and learning enabling to adapt objectives and practices to changing situations in line with new information (Mollas-Gallart et al., 2021). However, this involves not just the usual ability to gather KPIs and multiple indicators but also practices of participatory monitoring and exercises that attempt to use collective social memory for linking past experiences with what we know in the present and expect from the future.

4. Conclusions and outlook

Based on an initial literature revision, we asked what capacities are needed for Transformative Innovation Policy – TIP i.e. policies that promote radical new innovations and their diffusion inducing broad social ecological and technological transformation. Our limited literature review of relevant policy capacities, suggests that theoretically there is a variety of different capacities needed for the generation and uptake of transformative innovations and that these capacities are much different from existing ones tailored to deal with older generation non-systemic innovation policies.

Policy capacity for transformation is different from simply knowing what to do. It means to be able to act and behave in a given context, making sense of existing knowledge available, being aware of different values, interests and perspectives at stake, and being able to manage relationships with all actors. Policy capacity for transformative innovation is therefore a combination of knowledge, skills and attitudes, mobilised in action in a given context.

While the framework is only a sketch of what capacities are needed to govern transformative innovation and therefore being far from complete, we hope it may help to identify what are these resources and skills that governments and other stakeholders require for propelling sustainability advancing transformations. However, we would like to stress that these capacities do not reside only on public organisations, innovation agencies or foundations, usually acting as policy intermediaries concerned with particular policy instruments, or in other kind of policy making intermediaries. They must reside in all other actors who participate in the transformation processes.

The draft conceptual framework proposed suggests that the different policy capacities needed for transformative innovation are deeply interconnected and interact with each other. In addition policy capacities are dynamic i.e. they can be further developed with every new exercise i.e. from accumulated experience. One conclusion we may advance is that existing formal innovation policy education and training programmes are seldom designed to provide competencies for transformative innovation policy. Curricula have mostly been designed under traditional paradigms of problem-solving, linear causality discipline-based analysis and planning.

As a next step, we intend to propose an empirical mixed methods case study on innovation policy capacity at regional level. The study will consist on the operationalizing of the conceptual framework in a questionnaire targeted towards public authorities, policy intermediaries and beneficiaries engaged in innovation initiatives with transformative potentiation. The questionnaire will ask if the policy capacities identified from the literature are present or would be needed, and if empirically other capacities can be found. Finally, we will bring together the literature-based framework and empirical parts to develop a more elaborated conceptual framework of policy capacities necessary for transformative innovations, with the aim of deriving recommendations for a more bottom-up style of governance for transitions.

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