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Chapter Title	Innovation Policies (vis-à-vis Practice and Theory)	
Copyright Year	2013	
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Innovation Policies (vis-à-vis Practice and Theory)

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Synonyms

Governance; Innovation policy; Innovation practice; Innovation theory

Innovation-driven economic and social change is a significant characteristic of today's economies and a driving force for international knowledge production, competition, and trade; this holds certainly for industrialized countries, but increasingly also for a growing number of late industrializing countries. National, often also regional, governments pursue, more or less explicitly, *innovation policies*, which can be defined as "as the integral of all state initiatives regarding science, education, research, technology policy, and industrial modernization, overlapping also with industrial, environmental, labor, and social policies. Public innovation policy aims to strengthen the competitiveness of an economy or of selected sectors, in order to increase societal welfare through economic success" (Kuhlmann 2001, 954). Public innovation policies reflect the "innovation culture" of a given society, not at least characterized by the particular interrelation of economic, knowledge-producing, and policymaking actors and organizations ("Triple Helix"), at various levels of action ("multilevel innovation system").

The concept of public innovation policy is built on the assumption that "innovation" – a perceived or intended process of material, social, and often also cultural change, incremental or disruptive – can be "governed." The present entry (largely drawing on Kuhlmann 2007) offers four considerations of this supposition: First, an illustration will be presented of *why* the *governance of innovation* is an issue of concern and that there are governance routes of different character and quality. Second, three forces of the governance of innovation will be addressed: The (1) dynamics of *innovation in practice*, the (2) role of *public policy*, and (3) the role of *Innovation Studies*, as "theory in action." In order to illustrate the mutual interaction of the three forces, a metaphor will be used (following Kuhlmann 2007; Kuhlmann et al. 2010). Innovation practice, policy, and theory can be seen as "*partners on a dancing floor*," moving to the varying music and forming different configurations (see Figure 1). Taking a closer look at the dance floor, one can see two of the dancers, innovation practice and policy, arguing and negotiating about the dance and music while the third, theory – not always, but often and to an increasing extent – provides the other two partners with arguments and sometimes also with new music: Practice and policy increasingly have expectations vis-à-vis the contribution of social science-

E.G. Carayannis (ed.), *Encyclopedia of Creativity, Invention, Innovation, and Entrepreneurship*,
DOI 10.1007/978-1-4614-3858-8,

based intelligence to their dance. Hence, the third consideration: (3) *Innovation Studies*, by now a widely respected academic field of interdisciplinary knowledge and research, may experience a tension between participating in the dance and academic discourse at arm's length to practice. Yet, there is a chance that Innovation Studies can cope with this tension and, in fact, make it a source of increased *reflexivity*. The fourth consideration will (4) exemplify some ways of deliberate interaction of Innovation Studies as theory in action, taking a closer look at *"fora" for the debate of innovation issues* and the role of research-based "strategic intelligence."

First Consideration: Why "Governance of Innovation"?

A better understanding of the governance of innovation both in terms of driving forces and with respect to the room for maneuver in policymaking is a precondition of successful practical attempts at shaping the character and direction of innovation processes or even changing them.

Innovation occurs within or vis-à-vis evolving "regimes." The term *regime* was first introduced by Nelson and Winter (1977) to characterize patterns in technical and economic change such as the frameworks of engineers in an industry constituting the basis for their search activities. Van den Ende and Kemp (1999) define a technological regime "as the complex of scientific knowledge, engineering practices, production process technologies, product characteristics, user practices, skills and procedures, and institutions and infrastructures that make up the totality of a technology" (835). Rip and Kemp (1998) add to the "grammar" of a regime explicitly the policies and actions of other innovation actors including public authorities.

Regimes differ in terms of the character and quality of their *governance*. The notion of governance is used here as a heuristic, borrowed from political science, denoting the dynamic interrelation of involved (mostly organized) actors, their resources, interests and power, fora for debate and arenas for negotiation between actors, rules of the game, and policy instruments applied (e.g., Kuhlmann 2001; Benz 2006; Braun 2006). Innovation governance profiles and their quality and direction are reflected not at least in the character of public debates between stakeholders, policymakers, and experts. Think of the debates on genetically modified organism (GMO), or debates on the governance of an emerging, cross-cutting innovation field such as "nanotechnology."

In a report of a European Expert Group on "Science and Governance" (Felt et al. 2007), two basic types of what the authors call "regimes" of innovation were identified:

- The regime of "*economics of technoscientific promise*": Promises to industry and society, often far reaching, are a general feature of technological change and innovation, particularly visible in the mode of governance of emerging technosciences: biotechnologies and genomics, nanotechnologies, neurosciences, or ambient intelligence, all with typical characteristics: They require the creation of a fictitious, uncertain future in order to attract resources and political attention. They come along with a diagnosis that "we" are in a world competition and that "we" (Europe, the USA, etc.) will not be able to afford "our" social model if "we" don't participate in the race and become leaders in understanding, fuelling, and exploiting the potential of technosciences. The regime "works with a specific governance assumption: a division of labour between technology promoters and enactors, and civil society. Let us (= promoters) work on the promises without too much interference from civil society, so that you can be happy customers as well as citizens profiting from the European social model" (Felt et al. 2007, 25). Under this regime of technoeconomic promises, politics, science, and industry take the lead, while the innovation needs and expectations represented in the society appear to remain in a rather passive consumer role.

- The second regime, "*economics and sociopolitics of collective experimentation*," is characterized by emerging or created situations which allow to try out things and to learn from them. The main difference with the other regime is that "experimentation does not derive from promoting a particular technological promise, but from goals constructed around matters of concerns and that may be achieved at the collective level. Such goals will often be further articulated in the course of the experimentation" (Felt et al. 2007, 26f). This regime requires a specific division of labor in terms of participation of a variety of actors, investing because they are concerned about a specific issue (see also Callon 2005). "Users matter" in innovation (e.g., Oudshoorn and Pinch 2003). Examples of such demand- and user-driven innovation regimes include the information and communication sector (where the distinction between developers and users is not sharp), or the involvement of patient associations in health research (e.g., Boon et al. 2008). The concept of "open innovation," debated around the user-driven development of non-patented Open Source software, and more generally in Chesbrough's influential book (2003), is largely overlapping with the collective experimentation concept. The governance of such regimes is precarious since they require long-term commitment of actors who are not always equipped with strong organizational and other relevant means, and there is always some room for opportunistic behavior. Nevertheless, the promise is innovation with sustainable effects.

In other words, the governance of innovation and related policies are neither neutral nor innocent. The precarious governance of the experimentation regime or the missing emphasis on stakeholder inclusion and demand-orientation indicate that strategists and policymakers may run the risk of missing valuable opportunities offered through variety and experimentation in the development of innovation processes. This leads to the second consideration.

Second Consideration: Three Interrelated Forces of Innovation Governance and Their Dance

An analysis of the governance of innovation has to cope with at least *three major forces*:

First force: While since the 1950s in economics and sociology "*science*," "*technology*," *and* "*innovation*" processes were plotted as a sequence of activities of institutionally and organizationally distinct units ("linear approach"; Bush 1945), this has changed in the course of the 1980s and 1990s. Today science, technological development, and innovation are conceived by most scholars as *overlapping fields of social practice*, forming a shared "space" of interactivity, driven by knowledge dynamics, economic forces, and framed by inherited institutions. Most concepts emphasize the interactive character of idea generation, scientific research, development, and introduction of innovative products and processes into markets or other areas of use – take as a simplifying tag the pervasive concept of an alleged new "mode 2" of knowledge production suggested by M. Gibbons et al. (1994). Eventually, the mode 2 perspective on knowledge production and innovation is building on a long strand of studies into the relation of science and technology (e.g., Zilsel 2003; Rip 1992) and, at least implicitly, alluding to older, more systemic concepts (e.g., List 1856). The evolutionary approach of Nelson and Winter (1977), the innovation system tradition as inspired by Freeman (1987) and developed further by many others (e.g., Lundvall 1992; Edquist 1997; Hekkert et al. 2007), take on board an interactive, holistic understanding. Also studies into the social construction of technology (Bijker et al. 1987), "system transitions" in socio-technical landscapes, related regimes, "innovation journeys" and niche management (see e.g., Geels and Schot 2007; Van de Ven et al. 1999), technology assessment and its "constructive" turn (Rip et al. 1995), understand science, technological development, and innovation as a an interactive social continuum.

Second force: If the dynamics of science, technological development, and innovation are

interwoven in practice, then "*policy*" and "*governance*" in a given innovation field will reflect this heterogeneity. Today, innovation policy is characterized by an "increasing 'sophistication' of policy instruments" (Boekholt 2010, 334). Concepts on innovation policy have evolved from a linear model to a more systemic and even "holistic" model of innovation policy (e.g., Smits and Kuhlmann 2004). Consequently, the scope and variety of involved organized actors (such as science organizations, industries, governmental agencies, parliaments, nongovernmental organizations) has become broad and heterogeneous. Actors have different interests, resources, and power, and they negotiate in various interlinked arenas on all kinds of rules and policy instruments. Political science studies have shown that the patterns of policy governance for science, technology, and innovation develop mostly in an incremental and only rarely radical way (Bozeman 2000; Larédo and Mustar 2001; Biegelbauer and Borrás 2003; Edler 2003). The organizations involved in policymaking and the arenas for the negotiation of options and decisions are mostly characterized by institutional inertia. They evolve to path dependence, interwoven with historical innovation regimes. One can analytically distinguish between two types of policy rationales in the context of science and innovation (EPOM 2007): "*Knowledge production policy rationales*," on the one hand, are built on causal beliefs, often derived from Innovation Studies' insights, about the production of knowledge, providing a theoretical framework for the type of policy proposed, especially with socioeconomic arguments. An advanced production rationale is characterized by the fact that knowledge is often tacit, partial, scattered and collectively distributed, and built through collective processes of creation, sharing, access, diffusion of knowledge, and more generally through learning processes. "*Governance policy rationales*," on the other hand, reflect general causal beliefs in the political system about how the state should govern (EPOM 2007). An advanced governance policy rationale is offered by a "decentralized multi-space model, with a growing importance of a large variety of public and scientific interest groups (public opinion, consumers, patients, NGO, etc.) willing to be associated into the policy design, with a high heterogeneity among them (in terms of level of knowledge, means of expression, financial resources, representativity, etc.)" (EPOM 2007). Following this rationale, the actual policy choice and mixes depend on negotiation and learning processes in the development of a given regime: Whether the future governance of nanotechnologies, for example, will be driven mainly by technoeconomic promises or by socio-political collective experimentation hinges not at least on the way how the involved heterogeneous actors in multi-space articulation processes will interpret the production rationales associated to nanotech.

Third aspect: Social science research, in particular Innovation Studies, can turn into "*theory in action*." Given the variety and potential complexity of governance in the practice of innovation as well as in related policymaking, actors tend to develop assumptions or "folk theories" on governance, simplifying, guiding, and stabilizing their action: Innovators and policymakers develop rules of thumb based on experience, own analysis, or prejudice – or they refer to and utilize expertise based on Innovation Studies. Take, for example, the utilization of the "System of Innovation" approach: This analytical concept, a heuristic developed by economists and innovation researchers since the late 1980s, has been increasingly utilized by policymakers around the world. Innovation systems have been conceptualized as the "biotopes" of all those institutions which are engaged in scientific research and the accumulation and diffusion of knowledge, which educate and train the working population, develop technology, produce innovative products and processes, and distribute them; to this belong the relevant regulative bodies (standards, norms, laws), as well as the state investments in appropriate infrastructures. Innovation systems would extend over schools, universities, research institutions, industrial enterprises, the politico-administrative and intermediary authorities, as well as the formal and informal networks of the actors of these institutions (Kuhlmann 2001).

The innovation system concept turned out to appeal to policymakers a lot, not at least because the systemic perspective provided an argument for a broadened scope and reach of public innovation policy (Smits and Kuhlmann 2004). Many used it as a sort of programmatic device: Since a number of years, for example, the Swedish state office for innovation policy calls itself "Governmental Agency for Innovation Systems." Actually, when taking a closer look, it turns out that the very concept of innovation systems while being designed by innovation researchers had at the same time been inspired and strongly supported by Scandinavian policymakers (see Carlsson et al. 2010) and by the Organisation for Economic Cooperation and Development (OECD) (Lundvall 2007) – the concept became "theory in action." Scholars could have tried to maintain academic distance to the lifting of their concepts and findings by policymakers or practitioners in innovation – but they chose to offer the policymakers information, heuristics, analysis, and theory, longing further than their "folk theories." In other words, they danced with innovation practice and policy and even jointly composed new melodies.

Considering innovation practice, policy, and theory as "partners on a dancing floor," moving to varying music and exposing different configurations, one can interpret the "regimes" of innovation and their evolution from the perspective of learning. The ideas, rationales, and instruments – finally the governance – of innovation and related policy emerge as a result of interactive learning between actors involved in innovation practice, intervention strategies and policies, and Innovation Studies and theory. Figure 1 (above) represented an attempt to characterize the dance of the three groups. Practice, policy, and theory can be conceived as dancing partners in a performance setting. The dancers observe each other and react on the partners' movements: They copy, comment, complement, counteract, neglect, learn, and thereby create and change configurations. Sometimes innovation practice is the driving force in a configuration, sometimes theory, sometimes public, or private policy.

Learning on the innovation policy dance floor may occur as first-order or as second-order learning. According to Argyris and Schön (1978), *first-order learning* links outcomes of action to organizational strategies and assumptions which are modified so as to keep organizational performance within the range set by accepted organizational norms. The norms themselves remain unchanged. *Second-order learning* concerns inquiries which resolve incompatible organizational norms by setting new priorities and relevance of norms, or by restructuring the norms themselves together with associated strategies and assumptions, hence escaping tunnel vision and crossing borders. In other words, while first-order learning would help to improve the expression, harmony or elegance of an otherwise unchanged dance (or make an innovation regime more effective), second-order learning would help to change the melody and the dance (or introduce new directions and modes of governance).

Third Consideration: The Potential of Innovation Studies as a Dancing Partner

Today, Innovation Studies are a respected academic field of interdisciplinary knowledge and research, loosely interlinked with Science and Technology Studies (STS; Hackett et al. 2007). In short, most of the enormous scope of topics covered by Innovation Studies and STS can be subsumed within two very general rubrics (Silbey 2006, 538): First, the institutionalization, reception, and appropriation of science and innovation and, second, the production of science and innovation as a social process. The first perspective is interested in the working of institutions, organizations, policies (expectations, rules, regulation, funding), strategy-making and planning, the assessment of potential developments and impacts of science and innovation, and their constructive shaping (Constructive Technology Assessment, CTA). The other, second perspective of studies adopts an anthropological view on the working of scientists, engineers, or users trying to reveal the intrinsic organization,

culture, and epistemology of social groups. The ambition is to understand innovation not as a completely distinct realm of social action but like other social settings ruled by habits, rules, conflict, compromise, constructions, and narratives (Silbey 2006, 539). Consequently, this perspective concentrated rather on innovation as social practice than on policy. This approach, nevertheless, has an important impact on policy concepts: It helps to understand that modeling the governance of "innovation in the making" would fall too short if practice were conceptualized mainly in terms of functional and normative requisites, suggesting rather mechanistic designs of public policy ("mode 1"). Applying the constructivist approach to technological development and innovation as fields of social practice, strategists and policymakers developed more and more sophisticated policy designs ("mode 2"). The above-sketched "production governance rationale" can be understood as a result of this new perspective.

In short, one can state that Innovation Studies contributed a lot to a better understanding of the driving forces of each of the two other dancers, innovation in practice and policy, and became to some extent interwoven with them – sometimes very tightly, sometimes at some academic distance. Innovation Studies cope with this tension and even make it a source of increased reflexivity and enlightenment for their own purposes. The reflexive potential of Innovation Studies arises from the combined perspective of the interaction of practice, policy, and theory: Observing the dance and getting involved into it, Innovation Studies hardly can avoid adopting a *constructivist* position and *reflecting* upon their own impact on the dance and the evolution of images and beliefs of the other partners. And – one step further – Innovation Studies cannot escape questioning the origins and dynamics of their own beliefs. To which extend are they driven by concerns of practice and policy? Could such a drift be pictured as second-order learning, or are Innovation Studies scholars' beliefs sometimes also echoing the trends or fashions of their dancing partners or of the surrounding societal and cultural movement?

Obviously, Innovation Studies are not made up of one dominant theory; rather they appear as an assemblage of quite diverse intellectual strands, sometimes converging, sometimes diverting. Accordingly, innovation practice might prefer dances with other theory than public policy would like. In sum, there is no single recipe for coping with the ambiguity of being involved in the dance with practice and policy. Innovation Studies scholars moving with some passion on the dancing floor can only try to keep a precarious balance, based on some distance through reflection.

Fourth Consideration: Dance in Practice (Fora and Strategic Intelligence)

For a number of reasons, the governance of innovation and related policy has become ever more complex: Innovation processes themselves are subject of multiple forces and have become more uncertain; the number and heterogeneity of actors involved has grown, hence also the plurality of interests and values; and the borders between public and private spheres have become blurred. In order to cope with these challenges, actors seek to base their policy initiatives on increased interactivity, and often also on more evidence of actual or potential conditions, cost, impacts, etc. Interaction may be formally institutionalized and regulated, while in early phases, interactivity may occur in emerging spaces and semi-institutionalized platforms, where policymakers, public researchers, and industry as well as experts meet, articulate their views, provide intelligence in order to inform the process, and make attempts to set the scene. One means of organizing a policy-oriented discourse in semi-institutional environments are "fora," defined as *institutionalised spaces specifically designed for deliberation or other interaction between heterogeneous actors* with the purpose of informing and conditioning the form and direction of strategic social choices in the governance of science and technology (see Figure 2, and Edler et al. 2006).

Fora can be seen as a dancing floor, a meeting place for innovation practice, theory, and policy with two related effects: (1) Interactive learning of policy analysts, policymakers, and relevant stakeholders and (2) improving the functioning of science and innovation policy and strategy. Fora can adopt several governance functions on the dance floor: They can offer a general, nondirected policy discourse, or offer policy information on specific issues, or prepare policy planning and development (visions, agenda, implementation), or facilitate the resolution of conflict and the building of consensus, or they can improve the provision and application of policy intelligence (e.g., see Edler et al. 2006).

In practice, there are manifold variations of fora. A specific characteristic of the sort of forum I am alluding to is the prominent role played by "*strategic intelligence*" (*SI*). SI has been defined as a set of sources of information and explorative as well as analytical (theoretical, heuristic, methodological) tools – often distributed across organizations and countries – employed to produce useful insight in the actual or potential costs and effects of public or private policy and management. Strategic intelligence is "injected" and "digested" in fora, with the potential of enlightening the debate (Kuhlmann et al. 1999).

SI can draw on semipublic intelligence services (such as statistical agencies), on "folk" intelligence provided by practitioners, and in particular on Innovation Studies. Meanwhile, a number of formalized methodologies, based on the arsenal of social and economic sciences, have been introduced and developed which attempt to analyze past behavior ("Evaluation"; e.g., Shapira and Kuhlmann 2003), review technological options for the future ("Foresight"; e.g., Martin 1995), and assess the implications of adopting particular options ("Technology Assessment"; e.g., Rip et al. 1995). Also, other intelligence tools such as comparative studies of the national, regional, or sectoral "innovation performance" were developed and used (e.g., the European "Community Innovation Surveys (CIS))".

Providers of SI play a number of roles in fora, often in combination: as a facilitator or moderator taking advantage of methodological capabilities, as an enabler or teacher supporting critical analysis and self-reflection (bird's eye view), as provider of issue expertise, or as entrepreneur using fora for advancing SI application in policymaking and for disseminating results (Edler et al. 2006).

Conclusion and Future Directions: "Strategic Intelligence" and New "Spaces" and New Models for Innovation Initiatives

Arenas of innovation policy have become more complex and sometimes unclear during the last two decades. Next to national governments, semi-independent regional and transnational institutions and agencies entered the arenas, partly as cooperation partners and partly as competitors. At the same time, public policymakers are confronted with multinational companies developing their innovation projects across the globe, drawing on public policy support wherever easily available, irrespective of the location of exploitation of innovation returns. National innovation policy will remain relevant, but actors will be urged to change their perspectives and policy designs: Hierarchical, fragmented, or stubborn strategies will fail in this complex environment.

Furthermore, many late industrializing countries have started to develop own innovation policy approaches, many of them drawing on the model of western industrialized countries. Yet, there are also more radical views, arguing that innovation policies are inspired on the wrong models, aiming at solving the wrong policy problems, too narrowly defined, too poorly managed and implemented, and/or lack the necessary supportive conditions from society due to historical, cultural, and political reasons (e.g., Rennkamp 2011). In particular, another concept of "innovation" will be required, beyond the presently prevailing business orientation, including aspects of social novelty and development, new ideas improving quality or quantity of life, not

necessarily linked with economic profits. "The ultimate end of social innovation is to help create better futures" (Pol and Ville 2009, 884).

Hence, it will be crucial to systematically understand the diverging perspectives and interests of competing actors, to make them transparent and debatable – not aiming at weak compromises but stimulating learning capacity. This will require new interinstitutional and also international "spaces," fora where heterogeneous actors from different arenas meet and interact. "Strategic intelligence" can provide background information and alternative scenarios of potential future challenges for reflection. Otherwise, innovation policymakers will be reminded of the limits of an instrumentalist understanding and see "how great expectations in Washington are dashed in Oakland" (Pressman and Wildavsky 1973).

Cross-References

- ▶ Innovation Policy Learning
- ▶ Multilevel Systems of Innovation
- ▶ Political Leadership and Innovation
- ▶ Social Innovation

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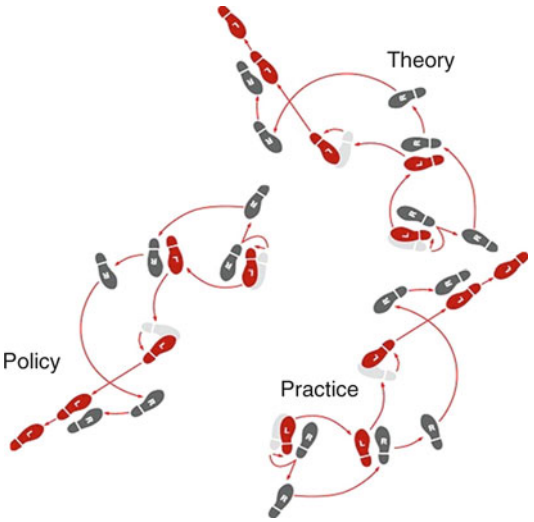
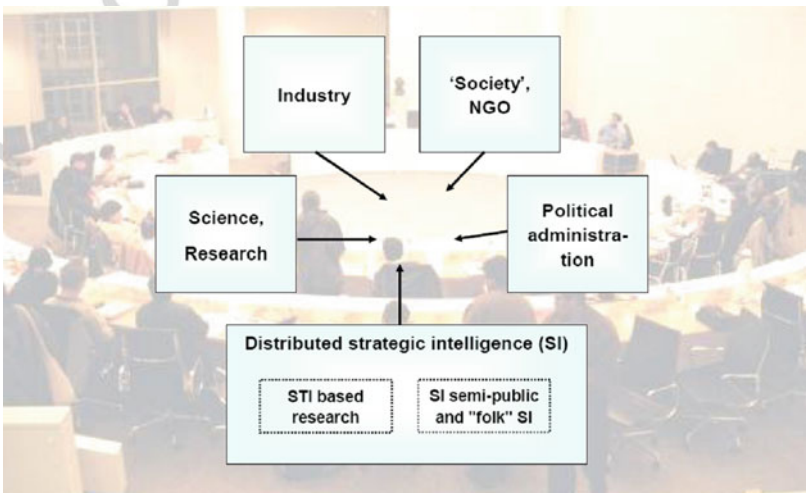


Innovation Policies (vis-à-vis Practice and Theory), Figure 1 Innovation practice, theory, and policy as dancing partners (Source: Kuhlmann 2007, 5)



Innovation Policies (vis-à-vis Practice and Theory), Figure 2 Forum for debates of science, technology, and innovation issues (Source: Kuhlmann 2007, 17)