

Title

Discontinuation Governance as a Neglected Dimension in STI Studies

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Keywords

Discontinuation Governance, Governance of problems, Socio-technical systems

Introduction

Abandonment of socio-technical systems occurs more often, then one might expect at first. Companies cancel the development or production of devices, technologies and systems we were used to (e.g., in 2011 exited from building nuclear power plants); a state agency like the NASA has a long track of stopping systems before or after start-up (e.g., the Space Shuttle system programme 1972–2011, or the Project Apollo 1961–72 after years of usage, whereas the permanent moon base, aka ‘Lunar outpost’ was halted in 2010 after four years before being taken into use). The governance of the discontinuation of socio-technical systems is an issue recently put on the agenda by researchers in several countries. Point of departure for this new research focus was the observation that the governance of socio-technical systems has preferentially been associated with advancement and innovation. On the one hand, this may have to do with a bias for progress and continuity in innovation policy and the study of it. On the other hand, for this or other reasons potentials for the inclusion of abandonment, dismantling, decrease, termination, exit moves in policy-making and governance in general have not been far developed, so far.

This paper aims at a theoretical analysis and navigation through some of the key theories used in the context of STI studies for junctions and gaps from which the ‘governance of the discontinuation of socio-technical systems’ can be further developed. It seeks to identify general potentials and concrete conceptual offers for a more in-depth formulation of a ‘discontinuation governance’ concept. One problem with existing theory and studies is that the specific focus on the purposeful, active or reactive discontinuation of socio-technical systems has been often absent. It was primarily looked at the dynamics of technologies, and the political or regime dimension has only been seen as a side-condition. Here, we take it central instead.

Thematic fit of the paper

The paper might fit into *Theme 5 “Societal challenges” and innovation policies*, for it sheds light on conceptual tools and political realities of innovation policies that are confronted with a new, or rarely voiced, kind of governance task, the discontinuation; if necessary, also into *Theme 6 Breaking the boundaries*, for the acceleration of businesses may lead to shorter life times and quicker substitution/abandonment of technologies, and the globalisation of R&D policy effects, like the Fukushima Daiichi nuclear disaster in Spring 2011 for the German and European, are obviously not restricted to national or continental boundaries, nor to direct physical-geographical impacts—the political fall-out of the nuclear disaster in Japan is, in parts, debordering simple cause-and-effect schemes.

From the discontinuity narrative to the focus on ‘discontinuation governance’

The following short analysis may indicate the aforementioned diagnosis. For clarification, the notion of ‘socio-technical system’, as we use it and to which we often use, refers to particular assemblages, seamless webs, of technologies, devices, infrastructures, actors, organisations, social institutions, practices, and the linkages between all these with related functions, histories, and discourses, underlying changes of use, meaning, and valuation, and framed by or inscribed with relations of power and interest (cf. Hughes 1987, 1986; Ropohl 1999; Geels 2004: 900; Geels/Kemp 2007; Withworth 2006; Trist 1981).

The patterns of development of socio-technical systems have been studied broadly (cf., e.g., Mayntz/Hughes 1988), in particular concerning the growth and the governance of large technical systems (Coutard 1999, Schneider/Bauer 2009), issues of path dependency (Garud/Karnøe 2001, Meyer/Schubert 2007) or the transformation of established systems, e.g., by regime change (Geels 2007; Geels/Schot 2007; Markard/Truffer 2006; Konrad et al. 2012). However, the success of a new technology goes hand in hand with the hybridisation, fading out, marginalisation, or failure of existing technologies. The number of studies addressing this kind of development is rather small.

Latour (2002) tells the story of an ambitious transport technology system called “Aramis” that was ceased politically after some years of intensive research and development at the height of the investment activities, but before the new transport technology could be brought into use. Here, the old systems survive and new ones are developed in the continuity of the old. Utterback (2003), while describing the role of technological evolution and innovation, also narrates how the U.S. harvested ice industry demised as the result of the technical feasibility and economic success of first machine made ice and later electric refrigerators. In this case, an established and highly profit-yielding product and system has been driven out of the market. Its place was taken—sometimes abruptly, sometimes gradually—by other technologies and products still offering ice and refrigeration, but by other means. Utterback suggests:

“Generally, in any product market there are periods of continuity, when the rate of innovation is incremental and major changes are infrequent, and periods of discontinuity, when major product or process changes occur. Radical changes create a new business and transform or destroy exiting ones.” (2003: 84)

This summarising observation focuses on the level of markets for technologies and their innovations. Three dimensions inform the analytical framework: ‘discontinuity’ pertaining to a product or a process; a product substitution or a broadened market; for established industry, competence-enhancement or competence-destruction (2003: 89). A deeper elaboration has recently been suggested by Turnheim & Geels, emphasising a “neglected aspect of the transitions literature: the destabilisation of existing regimes and industries” (2012: 1). Reviewing and integrating various literatures, they consider “industry destabilisation is best seen as a longitudinal process that involves both external pressures (...) and endogenous enactment (...)” (ibid.: 3) across several stages, such as disruptive innovations causing the decline of existing industries, as an economic decline process, driven by economic performance problems and shrinking financial resources, as a de-legitimisation process (ibid.: 2-3). Abandonment of sociotechnical systems occurs more often, then one might expect at first. Companies cancel devices, technologies and systems; a state agency like the NASA has a long track of stopping systems before or after start-up.

A general, non-specific, notion for what is at issue here is ‘regime change’. A ‘socio-technical regime’ (Geels 2002: 14; Geels 2007: 399-400)—the extended concept of Nelson and Winter’s (1982) ‘technological regime’—can be defined as a socio-technical configuration that fulfils a societal function, such as energy provision, transport, or housing (cf. Konrad/Markard/Truffer 2006: 2). This alignment and the interrelations of actors, institutions, activities and structures is a key for the stabilisation of the whole complex. Nevertheless, it can also give direction to change, making certain changes more likely than others, and “incremental changes more likely than radical changes” (Konrad/Markard/Truffer 2006: 2). To round off the picture of regimes, the surrounding macro-level socio-technical landscape, external to the regime, needs to be taken into account (Geels & Schot 2007: 400).

Regime change, as understood by Smith et al. (2005), is the interaction of two processes: (a) shifting (economic, legal, political, cultural) selection pressures on the regime, and (b) the coordination of resources available inside and outside the regime to adapt to these pressures (cf. Geels & Schot 2007: 400-1). This model is realistic in so far as it includes both external and internal factors, factors of interrelation and factors of influence, as well as the agency dimension (transition trajectories enacted by social groups; structuration of activities in local practices; strategies and strategic interactions of involved actors; intended plans and unintended behaviour) (Geels 2011: 29-31; Geels/Schot 2007: 402). Although policy discourses often superficially encourage such interpretations, it is a mistake for analysis to assume transitions to be self-evident, technical and deterministic processes, coordinated unambiguously and ex ante from the outset in explicit, centralised ways. In reality, also the coordination of discontinuity is an emergent, distributed and intrinsically ambiguous political phenomenon, unfolding in real time over the course of the transition itself (cf. Geels & Schot 2007: 400, 402).

Discontinuation can be interpreted as one kind of regime change. In the light of the technological substitution pathway described by Geels & Schot (2007: 410) discontinuation can be thought of as the case when a technology drops off the present sociotechnical regime as the result of (or at least associated with) a specific moment of shock in the broader political-cultural landscape:

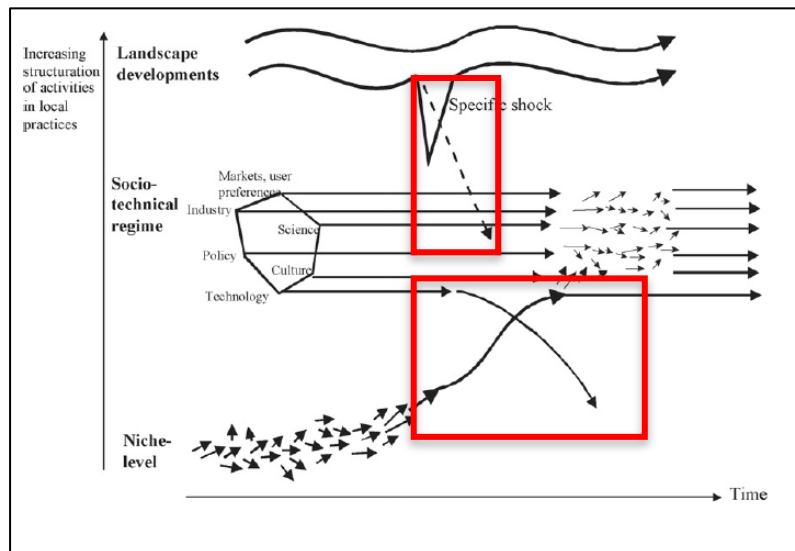


Figure 1: Adapted (emphasis added) from Geels/Schot (2007: 410)

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This may indeed hold true for the abandonment of nuclear energy right after the 1986 Chernobyl and 2011 Fukushima-Daiichi disasters. The shock hypothesis does, however, obviously not apply to such abandoned socio-technical systems and technologies as the Incandescent light bulb, DDT, and stuttering phase-out of the combustion car engine. Rather it seems that more diffuse, less abrupt changes in the landscape and the offer of alternative technologies from niches (like energy-saving lamps and related technologies, less dangerous pesticides, and alternative car engine technologies) can be associated with boosting discontinuation in these areas, in combination with policies and political initiatives pertinent for changes.

Another aspect to be studied further is the fact that in some of the cases possibly no immediate technological alternatives are available, e.g. in the case of nuclear energy: while power plants in theory may be substituted by all kinds of non-nuclear energy generating systems, the grid infrastructure in Germany, in particular, is not yet ready to distribute large amounts of renewable energy across the country. The size, shape, and realisation of an appropriate grid is still furiously disputed among ministries (controlled by members of different parties) and local citizens' initiatives are taking a stand against wind turbines and transmission lines. Here, the politically intended destabilisation of the regime seems to lead into a vacuum, which cannot immediately be filled by the "emergence of *multiple* embryonic niche-innovations" (Geels/Schot 2007: 408) as perhaps in the other three cases. The de-alignment is thus sometimes decoupled from re-alignment (as the stabilisation of new actor networks, technologies and systems, regimes and policies), substitution and reconfiguration delays and the transformation romps around in a rather inconsistent state.

Moreover, it remains to be seen how far the transition pathway (Elzen/Geels/Green 2004; Markard et al. 2012) and destabilisation (Turnheim/Geels 2012) perspectives of existing regime change theory can be used, adapted, or substituted. The discontinuation topos also needs to be discussed against the background of alternative innovation regime theory (Rip 1992; Schot 1992; van Lente 1993). We review the literature also from a management and organisational studies point of view in order to reconstruct patterns and knowledge about their exit strategies. How to grasp innovation 'setback', 'failure', or 'exit' instead? More recent management studies, for instance, conceive of exit rather as naturally being part of the overall strategy of a firm (cf. Cefis/Marsili 2007; Graebner/Eisenhardt, 2004; Villalonga/McGahan, 2005). Exit, from this point of view, does not necessarily equate with failure, as the decision to exit can mean to increase efficiency or realise profits (Cefis/Marsili 2007: 1). In business management and civil law one speaks of 'termination', 'liquidation', 'exit strategies from investments' (Beckert 2007) with regards to contracts, programs, and agreements. The challenge here is to translate the concept of 'exit' from management to the governance of socio-technical regimes (Hirsch-Kreinsen 2011; Dosi 1990; Bayer 2009). We revisit also more general theoretical approaches, such as neo-institutionalism (e.g., Scott 1995; Di-

Maggio/Powell 1991; Jepperson 1991) and institutional economics (e.g., Nelson, 1994, 1995; Hodgson 1998; Freeman and Louça, 2001). Of course, discontinuation is often one aspect of broader innovation processes, or at least seen as such. So, a theory of discontinuation needs to take the existence of and the missing alternatives and complementaries systematically into account.

Discontinuation as a de facto problem of de facto governance

In contrast to, for instance, ‘discontinuity’ as market phenomenon (Utterback) and ‘destabilisation’ as a regime transition phenomenon (Turnheim & Geels), our attention is firmly focused on the hitherto somewhat neglected issue of explicit, deliberate, dedicated governance measures for the discontinuation of established socio-technical systems and their associated regimes—in other words, on ‘discontinuation’ as purposeful governance action *sui generis*. The core question can be formulated in a terminology that asks what discontinuation means as a *problem of action* for policy-makers. From this point of view, continuity and breaks can be investigated as ‘governance of problems’ (Hoppe 2010): the concept of ‘discontinuation governance’ becomes recognizable as effects of social action and tangible as for systematic empirical investigation.

We combine the theoretical framework provided by actor-centred institutionalism with an agency perspective that allows for an integrated view on structures and actors (Mayntz/Scharpf 1995; Scharpf 2000; Berger/Luckmann 1967). The focus is on relevant (hard, soft) institutions, actors, and their relations and negotiations. The (boundedly rational) actors and institutions are analysed in terms of how they relate and interact in networks aiming to achieve discontinuation. This may include cabinet decisions and company strategic acts as much as public-private collaborations, public debate, regulation, and media as actors as well as more or less organised citizens’ groups.

Since discontinuation *governance* is the entry point for our analysis, an adequate governance concept is needed. So far, Policy termination is an issue in policy studies, or better a side issue (van de Graaf & Hoppe 1996: 221-227; see also Bardach 1976; de Leon 1978; Behn 1978; Brewer 1978; Sato 2002; Sato/Frantz 2005; Bauer 2009). Just as it is logical to think about discontinuation as a complementary process to continuing or inventing a technology or socio-technical regime, it is only logical to explore the termination of governance besides the starting of a governance process. Van de Graaf & Hoppe (1996: 22) define ‘policy termination’ as to discontinue a particular way of solving a policy problem. Termination may both result of a changed formulation or perception of a policy problem as well as of a changed formulation or perception of a policy solution (Hogwood & Gunn 1984: 250-254). Drawing upon the latter terminology, ‘policy dismantling’ has recently been introduced by Bauer et al. as analytical notion for “a distinctive form of policy change, which involves the cutting, reduction, diminution or complete removal of existing policies” (Bauer et al. 2012: 31).

We suggest to think all this further in terms of a ‘governance of termination’, which not necessarily means the termination of a policy/governance only, but rather also the governance and policies that accompany the ending and the aftercare of what cannot be fully dismantled (like nuclear waste, DDT for vector control which is still allowed for use after DDT worldwide ban for agricultural use under the Stockholm convention in 2004).

(Literature references for the extended abstract will be provided on request.)

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