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Path creation by public agencies — The case of desirable futures of genomics

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ABSTRACT

Public agencies are central actors in the emergence of technologies. They use their cognitive resources and instruments (regulation, public procurement) to deal with new technologies, against the backdrop of institutional frames and particular responsibilities in serving the 'public good'. How these public agencies anticipate emerging sociotechnical futures has so far remained underexplored. This article aims to explore public agencies' anticipatory role as a 'knowledgeable actor'. A conceptual model is proposed that builds on path creation and mindful deviation literature. This conceptualization is explored for the case of genomics in health care insurance in the Netherlands by making an innovative link between a retrospective study on the integration of genomics in public health insurance with prospective scenarios of possible futures for genomics and insurance. Our findings show that policy agents enter anticipatory exercises in a tentative way, carefully drafting next steps, taking into account current boundaries, positions and historical institutional contexts. Their 'local' approach to emerging technologies can, however, influence 'global' technological and institutional developments. In this context, path creation scenarios can contribute to anticipatory governance that serves societal interests by early-stage identification of moments of potential intervention.

1. Introduction

A wide range of uncertainties regarding their further development and social effects commonly surrounds emerging and breakthrough technological innovations. Therefore there are apparent reasons for prospecting emerging innovations, e.g., companies might want to prepare for future opportunities and public agencies have a need for anticipation on societal impacts of new technologies. Yet, new technologies always emerge in the context of socio-institutionally and historically preconfigured selection environments. On the one hand, the variety in development paths of technologies is augmented by changes in this selection environment, which has been recognized in CTA (Robinson, 2009) and transition literature (Geels and Schot, 2007). At the same time, the selection environment restricts variety; possibilities are bounded by historical contingencies, such as the economic environment, technological paradigms and regimes, and institutions. In anticipating and steering the pathways of technological innovation, it is therefore crucial to recognize the implications of historical sociotechnical developments. Analytically, this might imply a need for linking retrospective studies of technological development, uncovering the non-linear innovation journeys, with prospective studies. Such prospective perspective should take into account restrictions laid out by historical contingencies but also leave room for flexibility in defining different pathways into the future and in perceiving the selection environment as prone to change.

While literature on anticipating technological change and its social consequences promotes sensitivity to the institutional and historical circumstances that shape innovation journeys, less explicit attention is given to the role of *public agencies* in shaping innovation pathways. Of course there are public organizations whose dedicated task is to conduct technology assessment. In this article we focus on public agencies that have a role as regulators, purchasers and/or users of new technologies in a particular policy domain, such as healthcare. They are often explicitly assigned the task to consider collective interests and social implications of new technologies in terms of the public good, like maintaining quality, affordability and accessibility of medical care, but conducting technology assessments normally falls outside their remit and capabilities.

The socio-technical character of emerging technologies and the large role of public institutions in defining domains of application thus suggest that intervention by these institutions towards the public goals they are supposed to serve should be possible. In this regard, it is assumed that public agencies are central to anticipatory governance of new technologies that have the potential to serve public goals. This paper therefore proposes how public agencies can explore sociotechnical futures, taking developments in incorporating genomics in health care insurance as a case.

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Conceptually, we build on path creation literature that suggests that proactive stakeholders should "meaningfully navigate a flow of events even as they constitute them" (Garud and Karnoe, 2001, p. 2). These actors investigate possible ways forward without losing sight of existing structures and boundaries, thereby pursuing 'mindful deviation'. This article aims to add to current literature by studying path creation and mindful deviation (e.g., Djelic and Quack, 2007; Garud and Karnoe, 2001) focusing on public bodies, anticipating the development and consequences of emerging technologies. Most literature on anticipation of future technologies by public agencies has focused on policy making and policy instruments (Borrás and Edquist, 2013) or public agencies participating in wider consultation. Instead we focus on public agencies as central figures in path creation and explore to what extent these actors use their cognitive resources and instruments (regulation, public procurement) to deal with new technologies, against the backdrop of institutional frames and particular responsibilities in serving the 'public good'. At the same time, public agencies are not operating in isolation. We therefore also consider the role of public institutions in their wider social and historical context, addressing questions about how historically developed configurations facilitate and restrict actions by public institutions to influence innovation, and how interventions by specific organizations can be scaled up to wider technological regimes. To this end, we conceptualized and operationalized mindful deviation in such a way to include the co-evolution of historical contingencies, the selection environment and technology development as proposed by Robinson (2009), explicitly linking past and future development of technology as recently suggested by Breukers et al. (2014).

We explore the role of public institutions in anticipating emerging sociotechnical futures for the case of genomics in health care insurance in the Netherlands. Human genome research is considered to be laying the foundations for the future of medicine. Increasing insight into the structure and functions of human DNA as well as interactions with lifestyle and environmental influences are supposed to contribute to a radically improved understanding of the mechanisms of disease (Malik and Khan, 2010; Nightingale and Martin, 2004; PriceWaterhouseCoopers, 2005; Royal Society, 2005). Among the medical benefits expected to emerge from human genome research are an improved understanding of the course of diseases, the development of predictive and preventive approaches in health care and better tailored development and prescription of drugs (Ashley et al., 2010; Belsky et al., 2013; Khatri et al., 2012). Despite these potential benefits to health care, questions and concerns are still surrounding this kind of research. Part of these concerns relate to the predictive capacities of genetic information and its potential misuse leading to the exclusion of genetically predisposed individuals from various social goods and services (Macdonald, 2003; Mc Gleenan et al., 1999; Nelkin and Tancredi, 1994). A pressing question for public organizations developing health care policies is thus how to produce advances in medical technologies that are socially productive and reflect societal underlying values, such as solidarity.

Section two develops a framework for analyzing path creation concentrating on the co-evolution of technology and socio-institutional boundaries, taking public agencies and their tasks and desirable sociotechnical futures as the focal point of study, at the same time positioning these organizations in a wider environment. This framework is useful for making an explicit case for investigating possibilities for public policy intervention in the emergence of new technologies in future scenarios. The third section elaborates how to identify possibilities for public policy intervention by describing the methodological approaches to the studies of contemporary health care governance and future scenarios. One of these studies investigates the recent integration of genetic technologies in health care in the Netherlands and elsewhere. On the basis of that study, section four describes a number of potential intervention moments where public authorities have influenced the trajectory of emerging genetic technologies into health care. The second study comprises a scenario exercise with policy makers at the Dutch Health Care Insurance Board (*College voor Zorgverzekeringen*, hereafter CVZ), aimed at identifying likely and desirable futures for genomics in health care. Section five describes these scenarios more fully and maps the moments of intervention onto the scenarios, indicating mindful deviation and opening up room for intervention to promote the interests of widely accessible and affordable health care. In the concluding section, we address the value and limitations of our combined retrospective and prospective approach to study path creation activities by public agencies.

2. Theoretical framework

The emergence of a new technology is perceived as a co-evolution of technological dimensions and socio-institutional embedding (cf. Nelson and Winter, 1982). Following the literature on constructive technology assessment (CTA), the co-evolution of technology and society can be made more reflexive by stimulating deliberative interactions between design, development, implementation and use phases (Rip et al., 1995). Recently, CTA scholars conceptualized the emergence of new technologies as a path that consists of moments marking irreversible courses of development, creating the possibility to steer and modulate technology development in real time (Robinson and Propp, 2008). With this, they aligned with the growing literature on path creation. Path creation connects the notion of path dependence, i.e., the process of small events and differences leading to one technology becoming dominant through increasing returns and network externalities (Arthur, 1990; David, 1985), with distinguishing different possible routes for technology development (Garud and Karnoe, 2001). The process of path creation includes deliberate reflection on possibilities to divert from existing paths. This "mindfulness implies an ability to disembed from existing structures [that define] relevance and also an ability to mobilize a collective despite resistance and inertia that path creation efforts are likely to encounter" (Garud and Karnoe, 2001). Besides the focus on historical embedding and 'mindful deviation', path creation underlines that actions of actors have consequences for the paths that are in the making. In this way, actors influence path creation in a real-time and enterprising manner.

Path creation thus aims to connect past contingencies with future possibilities. To explore this connection and treat these paths as emergent, flexible, distributed but also in need of guideposts, we employ two concepts: moments and visions. In our discussion here, we understand such *moments* to be the points where societal actors intervene in innovation pathways to steer or constrain applications of new technologies in morally-desired directions. Our analysis of such moments is inspired by Jasanoff's concept of '(bio-)constitutional moments' (Jasanoff, 2003, 2011). With this concept, she draws attention to the way technologies and basic categories of social organization are jointly defined and produced. The moments we thus analyze below shape the normative choices public bodies make at various points in the incorporation of technologies in their processes, thereby reconfiguring the pathways of innovation.

The second concept used to forecast the path that technology development and the societal embedding of that technology will take, is by actively shaping *visions* of the future (Grin and Grunwald, 2000; Roelofsen et al., 2008). Thinking in terms of such desirable sociotechnical futures plays a significant role in path creation. Underlying these visions are expectations that, on the one hand, are based on historical legacy in the sense that innovators reflexively engage with future expectations, identifying earlier failures, considering potential barriers for innovation (Tutton, 2011) and renouncing particular visions as unrealistic (Selin, 2007). On the other hand, expectations are also dictating future developments: expectations, once they are part of a shared agenda, become requirements for action in the present (Brown and Michael, 2003; van Lente and Rip, 1998).

Fig. 1 shows the connection between moments and visions. The history-dependent moments and future-oriented visions articulate implicit or explicit institutions and normative imaginations. Together