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Innovation system foresight

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ABSTRACT

The practice and concept of foresight have developed over several decades. However, the academic literature that addresses foresight is mainly descriptive, and it is generally acknowledged that there is a gap between practice and theory in foresight. This article contributes to building the theoretical underpinnings of foresight. The article explores the co-evolution of the academic field of innovation studies and the practice and concept of foresight. The article illustrates that foresight is importing the dominant understanding of innovation from innovation studies with a time lag. Currently, foresight is in a catching-up process vis-à-vis innovation studies by gradually incorporating the implications of a systemic understanding of innovation. The latter is reflected in the current research gaps in foresight. This paper concludes that the concept of innovation system foresight (ISF) constitutes an improved integration of the contemporary understanding of innovation into foresight. Furthermore, the article explores four preliminary implications of ISF on the conceptual design of foresight, including the goal of foresight, system definition and boundary setting, participation of actors, and finally, methods for mapping the present. These four implications also constitute avenues for further research.

1. Introduction

The practice of foresight has developed over several decades, and foresight and similar approaches, such as technology forecasting, futures studies, la prospective and future-oriented technology analysis, have been used in both the private and public sectors since the mid-1940s. Foresight is also about to emerge as an academic discipline, with attributes such as dedicated international peer-reviewed journals, academic conferences and teaching at the college and university levels. However, the academic literature that addressed foresight is largely descriptive (Miles et al., 2008), and it is generally acknowledged that there is a gap between practice and theory in foresight (Hideg, 2007; Barré and Keenan, 2008). In recent years, this has led to a discussion of the possible 'theoretical underpinnings' of foresight (Fuller and Loogma, 2009; Öner, 2010). Such theoretical underpinnings are a requirement for further theory testing, theory building, and the development of a coherent framework to guide foresight practice. A murky theoretical underpinning makes it difficult for foresight to be carried out systematically—i.e., coherently—with a theoretical framework to support decisions made before, during and after the foresight process. For example, there does not seem to be any theoretically driven reasoning behind the delimitation of areas of interest, selection of participants, and criteria/design for understanding and analysing the present.

Moreover, both as a field of practice and as an academic field, foresight seems to be experiencing a 'systems turn', as it is gradually, albeit not always explicitly, implementing the systemic, contextual and evolutionary understanding of innovation that is dominant in the academic field of innovation studies (Dosi, 1988). The latter is reflected by two current research gaps in foresight. First, it has been increasingly recognised that

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foresight is highly context dependent (Cariola and Rolfo, 2004; Barré, 2002). Therefore, foresight must be able to systematically and coherently include context to conclude anything sensible about innovation. Despite its importance, such work is currently limited (Schoen et al., 2011). Additionally, foresight exercises often do not take sufficient notice of the demand for knowledge, existing competences, and reality and wishes of firms and policy makers (Smits et al., 2010). The lack of a (demonstrable) impact of foresight has led to an increased focus on the demand-side of the innovation process within foresight (Smits and Kuhlmann, 2004). The argument is that more seriously including demand will increase the impact (Georghiou and Cassingena Harper, 2011).

We suggest that the innovation system (IS) framework can address these two research gaps. Our key proposition is that explicitly taking the IS framework as the theoretical underpinning of foresight can simultaneously accommodate the need for underpinnings and associated problems and the research challenges related to context and demand for knowledge. This specific type of foresight we denote as innovation system foresight (ISF). Our proposition complements and contributes to several recent developments in foresight research. First, the nexus between foresight and ISs have been tentatively explored by others, but they have mainly focused on how foresight can contribute to IS analysis (Cagnin et al., 2012; Martin and Johnston, 1999; Alkemade et al., 2007; Weber et al., 2009); there seems to be very limited—or no—studies on how the IS framework can contribute to foresight.

Second, others have explored the practical applications of an integration of IS analysis and foresight at a sector level (Dachs and Weber, 2010; Weber et al., 2009), but these studies were descriptive, application oriented, and not occupied with the conceptual integration between IS research and foresight.

Third, a systems approach to foresight is not unique. Recently, an explicit systems approach to foresight seems to have emerged (Saritas, 2011; Öner and Saritas, 2005; Saritas and Öner, 2004); however, the work of (Saritas, 2011), although profound, is mainly about complex systems in general and is not focused on innovation dynamics. Our work adds an innovation focus to this line of work. Despite obvious overlaps, according to (Smits et al., 2010), there is little communication between IS research and foresight, and the linkages between them remain embryonic.

Our contribution is an attempt to address these three recent developments in foresight research. The aim is to contribute to theory-building in foresight in the direction of developing a systemic approach that has innovation dynamics at its core. Consequently, this paper is conceptually explorative.

In Section 2, we qualify our choice of systems approach by reviewing key parts of the literature within innovation studies and foresight. This review indicates that foresight has coevolved with innovation studies. The review explicates the conceptual linkages between the two fields, allowing us to systematise and explore them further. The latter reveals that foresight is 'misaligned' with innovation studies in its conceptualisation of innovation, preparing the ground for ISF. In Section 3, we present and elaborate on the content of ISF. In Section 4, we demonstrate how ISF addresses the research frontiers mentioned above, and we explore the potential implications for foresight (mainly in the pre-foresight phase) of accepting the IS framework as an explicit theoretical basis. Section 5 contains concluding remarks and future perspectives.

2. The co-evolution of foresight and innovation studies

Describing the historical development of the understanding and use of foresight is complicated by the fact that foresight is often considered to be an area of practice based on three more established traditions: technology forecasting, futures studies and technology assessment. Technology forecasting emerged in the aftermath of World War II, when the American military needed a systematic method for making informed judgments of rapid technological developments (Jantsch, 1967). Foresight is also rooted in a European tradition of futures studies that was established in the 1960s and 1970s (Miles, 2010; Bell, 2003). Futures studies are sometimes characterised as an art involving creative and imaginative thinking and acting (Martin, 1995). Early futures studies had a pessimistic and critical view of the future and technology. Compared to early technology forecasting, futures studies were more focused on stimulating public debate, whereas forecasting was an instrument for decision making (Miles, 2010). According to Ian Miles, the technology criticism by futures studies seems to have formed the basis for a third tradition: technology assessment (Miles, 2010; Miles, 2008), which involves a systematic assessment of the consequences for society of introducing and using new technology. Technology assessment has especially contributed to foresight with participatory methods in the form of the broad inclusion of citizens in the assessment process. In the early 1980s, Irvine and Martin introduced the term 'foresight' as a strategic, forward-looking technology analysis to be used as a public policy tool for priority setting in science and technology (Irvine and Martin, 1984). It was defined in opposition to 'hindsight'—which was understood as the analysis of the historical origins of technological innovations. Since the 1980s, foresight has established itself as a field of practice in both public policy making and corporate strategic planning and, more recently, as a scientific discipline (Norwegian Research Council, 2010).

In the following, we will not further distinguish between forecasting, futures studies and foresight. We will consider these traditions to be elements in the same continuum under the label of foresight. Moreover, we will focus on foresight in the context of public policy for science, technology and innovation (STI). Hence, the essential rationale and motivation for (public policy) foresight are ultimately to link STI policy more effectively to social and economic development, with innovation as the main lever (Cagnin et al., 2012).

Despite early and distinguished contributions, innovation studies[1] did not emerge as a research field until approximately 1960 (Fagerberg et al., 2012). Since then, the field has

[1] It is not obvious where the boundaries of innovation studies should be located. A useful definition for this paper, which has recently been used by (Martin, 2012), is given by the journal 'Research Policy'. Here, it is defined as studies "devoted to analysing, understanding and effectively responding to the economic, policy, management, organizational, environmental and other challenges posed by innovation, technology, R&D and science. This includes a number of related activities concerned with the creation of knowledge (through research), the diffusion and acquisition of knowledge (e.g. through organizational learning), and its exploitation in the form of new or improved products, processes or services".