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The Organizational Innovation System: A systemic framework for radical innovation at the organizational level



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ABSTRACT

Most research on innovation management at the organizational level has typically been focused on one specific innovation project phase or innovation management concept. This has resulted in many valuable insights, though scattered in different (innovation) research fields and studies. With the development of the Organizational Innovation System (OIS), we bring together important insights from the Innovation Systems, Open Innovation and other related fields into a guiding concept useful for both innovation managers developing (radical) innovations and innovation scholars. In this paper, we define the OIS and its key structural components, and discuss the identified functions and categories of potential imperfections. With the OIS, we provide a holistic, hands-on concept currently lacking in the open innovation approach. From the conceptualization, a framework for analysis is put forward which provides structure to the study of ongoing and finished innovation processes. Additionally, the development of the OIS is a first step in the development of a currently underdeveloped micro-level within the innovation systems perspective. The insights in OISs and the future insights derived from analytical efforts, will not only be beneficial for the performance of innovating organizations and organizational innovation systems but also for the performance of the higher, interconnected system levels.

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1. Introduction

Innovation is widely considered to be a key factor behind economic development and competitiveness for firms, regions, and nations (Frambach and Schilewaert, 2002; Reinders et al., 2010; Tödting and Trippel, 2005). Furthermore, answering the rising demand for a transition towards an economy with more resource-efficient and sustainable production systems, fueled by global issues such as the increasing resource scarcity, the growing world population, land scarcity and global warming, requires numerous innovations of different magnitude. Minor changes to existing technologies or products, i.e. incremental innovations, are one piece of the puzzle, but the most important driver in this transition are more radical innovations, i.e. new-to-the-world concepts. Successfully implementing these new concepts involves

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alterations to the core dimensions of the existing socio-technical-system, i.e. the stable configuration of linked and aligned dimensions: technology, user practices and markets, industries, infrastructure, policy, and techno-scientific knowledge, as well as alterations to the linkages between these dimensions (Farla et al., 2010; Geels, 2002, 2005, 2006; Kirchen, 2012; Van Humbeek, 2003). Consequently, these complex radical innovations have to be developed using innovation processes that take into account these multi-dimensional aspects (Bruns et al., 2010; Kroon et al., 2008).

However, the mindset of many (innovation) managers, researchers, policy makers and the general public is still dominated by innovation models stemming from approaches that either focus on a single dimension (the *push* and *pull* approaches) or on a very limited number of dimensions (the *coupled* approach) (Berkhout et al., 2010; Caetano and Amaral, 2011; Kroon et al. 2008; Rothwell, 1994; Tödting and Trippel, 2005). These approaches and their uni-disciplinary models with closed boundaries and inflexible, linear trajectories without feedback (for an elaborate description of the approaches, see Rothwell, 1994) are ineffective and no longer sufficient to systematically succeed in cost-efficiently delivering (radical) innovations (Bigliardi et al., 2012; Han et al., 2012).

One approach that is well suited as a theoretical background for the development of complex radical innovations is the *innovation systems (IS)* perspective because of its dynamic approach and holistic view on innovation (Budde et al., 2012). The innovation system construct has been developed to capture and understand the relations between producers, users, governments and institutions, and by doing so, helps to identify system failures and deadlocks, rather than mere market failures as reasons behind innovation failure (Faber and Hoppe, 2013). Consequently, within this paradigm, innovation is viewed as an evolutionary, non-linear and iterative learning process, which requires intense communication and collaboration between different actors in order to take into account the multi-dimensional aspects of innovation (Budde et al., 2012; Tödtling and Trippl, 2005; West and Bogers, 2013). Currently, research on innovation systems is mainly oriented towards the macro level (national innovation systems, NIS (e.g. Carlsson et al., 2002; Freeman, 1995)) and the meso level (regional innovation systems, RIS (e.g. Asheim et al., 2011; Cooke et al., 1997) and sectoral innovation systems, SIS (e.g. Faber and Hoppe, 2013; Malerba, 2002)). Another body of IS-research focusses on the system surrounding a particular technology (technological innovation system, TIS (e.g. Bergek et al., 2008; Carlsson, 1997)). Moreover, due to the globalizing economy, the international or global innovation system (IIS or GIS) is increasingly receiving attention (Balzat and Hanusch, 2004; Chung, 2002; Freeman, 2002; Fromhold-Eisebith, 2007; Walshok et al., 2014). The micro-level however, that of the innovating organization, has received very little attention within the innovation system perspective. As a result, micro-level innovation managers are in need of hands-on models for innovation development (Berkhout et al., 2010) that bring together the many valuable insights currently scattered in different studies and different (innovation) research fields (Alänge, 2013).

In this paper, we develop this innovation systems micro-level, the *Organizational Innovation System (OIS)*, and develop a framework to analyze different organizational innovation systems. With the OIS, we aim to give a more holistic, comprehensive overview of important issues during a radical innovation project – from idea development to commercialization – based primarily on the innovation systems literature and open innovation literature, supplemented with insights from other related literature. Consequently, the organizational innovation system contributes to the innovation literature and practice in four important ways. First, the OIS provides the innovation systems perspective with a micro-level that is currently underdeveloped. Second, the OIS-concept provides innovation managers with a more comprehensive guiding model for the development of complex radical innovations within the multidimensional, multistakeholder innovation systems context. These types of models are currently lacking in both the innovation systems and open innovation perspective (Giannopoulou et al., 2011). Third, by developing a framework for analysis, innovation managers and scholars can study and compare OISs, potentially leading to further valuable insights to increase innovation efficiency and efficacy of innovation organizations. The importance of improving efficacy and efficiency of innovation processes will only increase due to shortening product life cycles, increasing research and development costs, continuously decreasing innovation times and technology becoming increasingly complex (Drechsler and Natter, 2012; Holl and Rama, 2012; Ritter and Gemünden, 2004; Van Haverbeke and Cloodt, 2006). Fourth, improved innovation performance on the organizational level will have a direct positive effect on the performance of related higher system levels, thus increasing growth of the related regions and nations. This is due to the interconnectedness and interdependence of the different system levels (Walshok et al., 2014) (Fig. 1).

An OIS is related to innovation systems at other levels in different ways. A TIS often cuts across several sectors, may have a geographical dimension but is often international in nature

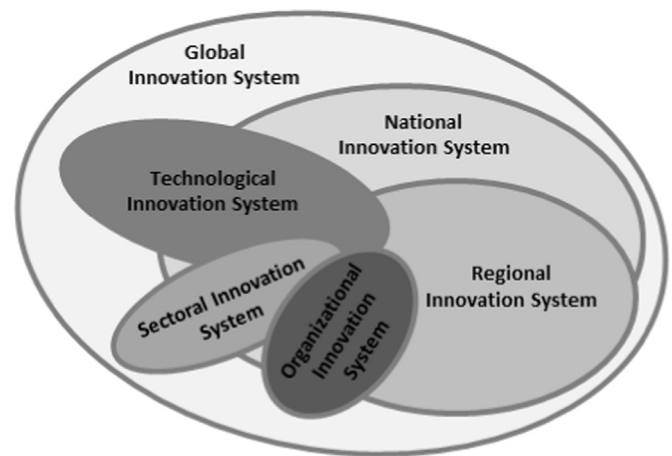


Fig. 1. Relationship between innovation systems levels (Adapted from Asheim et al. (2011)).

(Bergek, et al., 2008). A sectoral system is embedded in one or more RISs and the regional innovation system is a sub-system of one or more national innovation systems (Asheim et al., 2011; Chung, 2002). An OIS is part of one or more SIS, which can have regional or national bounds, but it can just as well be international.

The paper continues in Section 2 by defining the organizational innovation system and explaining how the OIS-concept is further conceptualized. Next, in Section 3, the OIS is further developed by elaborating on its main structural components. In Section 4, we define seven supporting functions of an OIS and in Section 5, ten groups of potential system imperfections are developed. Based on these different OIS elements, the framework for analysis is formulated in Section 6. The paper ends with a discussion on the implications of the OIS to theory and practice, potential paths for further research in Section 7 and concluding remarks.

2. Defining the Organizational Innovation System

In order to define the Organizational Innovation System, we examined how the innovation system is conceptualized at the higher system levels. A NIS is shaped by the interaction between various agents within a nation, bound by nation-specified institutions and policies that influence a nation's capability to generate, produce and diffuse innovation (Fromhold-Eisebith, 2007; Groenewegen and van der Steen, 2006; Wang et al., 2012). The regional innovation system can be defined as an interrelationship of innovation actors and institutions in a particular region that enables the generation, diffusion, and appropriation of innovation (Andersson, 2013; Chung, 2002; Fromhold-Eisebith, 2007). The SIS is conceptualized as a network of agents interacting in a specific economic or industrial area under a particular institutional infrastructure, which are involved in the generation, diffusion and utilization of innovation (Coenen and Diaz Lopez, 2010; Malerba, 2002). A technological innovation system (TIS) is a network of agents in a particular area of technology that, within the boundaries of institutions, generate, diffuse and utilize technology (Bergek et al., 2008; Carlsson, 1997).

These definitions across the different analytical levels have four communalities, allowing us to give a general definition of an innovation system: (i) a complex of diverse innovation actors (ii) that work in collaboration (iii) on the generation, development and utilization of innovation, (iv) shaped by a number of institutions (Bergek et al. 2008; Carlsson et al., 2002; Coenen and Diaz Lopez, 2010; Guan and Chen, 2012). In line with this general definition of an innovation system, the organizational innovation

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