



Non-technological innovation research: evaluating the intellectual structure and prospects of an emerging field



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ABSTRACT

This paper is aimed at enhancing our understanding of theoretical origins, intellectual structure and outlook of non-technological innovation research with the purpose of facilitating further development of an emerging research field. We perform a co-citation analysis of 482 articles addressing non-technological innovation published since 1975 and examine more than 11,000 sources that they drew on to identify key areas of research within the literature. By using a co-citation tie between articles as the unit of analysis, we dynamically trace and visualize the evolution of the intellectual structure of the non-technological innovation research. Based on our findings, we conclude that the prospects for further development of the (emerging) field lie in: (1) bridging the creativity and innovation literatures at the individual level and addressing employee-based non-technological innovations; (2) strengthening the microfoundations and a multi-level (bottom-up) approach; (3) identifying potential avenues for positioning non-technological innovation vis-a-vis the innovation management field and further building connections and; (4) consolidating the relationship between management innovation as the dominant stream of research and non-technological innovation as the umbrella concept.

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1. Introduction

Non-technological innovation is becoming increasingly recognized as a previously overlooked factor with a strong potential to contribute to organizational performance (Damanpour, 2014; Damanpour & Aravind, 2012; Volberda, Van Den Bosch, & Mihalache, 2014). It has been proposed as an important antecedent and facilitator of product and process innovations as the success of these more tangible and visible innovations largely depends on how the organizational structures and processes co-evolve with new technologies (Armbruster, Bikfalvi, Kinkel, & Lay, 2008). Furthermore, non-technological innovations exhibit significant direct effects on business performance by affecting productivity, lead times, quality, and business flexibility (Goldman, Nagel, & Preiss, 1995; Womack, Jones, & Roos, 2007), so that they also represent an immediate source of competitive advantage.

Along with the increasing recognition and relevance of non-technological innovation comes the observation that the literature addressing it is fraught with fragmentation and conceptual ambiguity (cf. Damanpour & Aravind, 2012). Some scholars even

argue that innovation types may be artificial distinctions and are conceptually and operationally alike (Edquist, Hommen, & McKelvey, 2001). There is no single coherent framework of non-technological innovation. On the contrary, due to the loosely coupled literatures addressing non-technological innovation, and subsequent proliferation of concepts, researchers are unlikely to see the entire conceptual landscape and fully understand the relations between different types of non-technological innovation.

In a recent narrative review of management innovation, which represents currently the most influential conceptualization of non-technological innovation, Damanpour and Aravind (2012) have already started describing and discussing particular forms of non-technological innovation. However, they have done so only for a part of the non-technological innovation landscape that is founded on managerial innovation literature. They also acknowledged that many confusing typologies and conceptualizations of non-technological innovation make it difficult to determine the whole knowledge domain landscape on which the (emerging) field is built. Volberda et al. (2014) also addressed the fragmentation issue by proposing a co-evolutionary framework of management innovation, which integrates the generation, diffusion, adoption, and adaptation phases of the management innovation process. Again, the focus has been on different phases and levels of management innovation, while other types of non-technological

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innovation and their knowledge bases (e.g., marketing innovation, strategic innovation, open innovation) have been left aside.

The fragmentation of the literature and proliferation of concepts are problematic because a number of different terms are used for what could be labelled as non-technological innovation. Although researchers examine similar phenomena, they frequently use different concepts as they refer to different knowledge bases and represent different research communities. The consequence is inefficiency of science: researchers address similar phenomena using different concepts, which results in lack of connections between research streams, insufficient validation of ideas due to conceptual misunderstandings, and lack of a holistic overview needed to understand phenomena and mechanisms that would span different domains, theoretical paradigms, and levels of analysis. This, in effect, impedes the consolidation of the non-technological innovation field and slows down its progress (Crossan & Apaydin, 2010; Lam, 2004).

The present study focuses on overcoming the fragmentation of the emerging field of non-technological innovation, both conceptually and methodologically. We do so by implementing a bibliometric co-citation analysis technique (White, 2003). Our aim is to help facilitate the consolidation and further development of the field. Building on and complementing two influential narrative reviews of management innovation research by Damanpour and Aravind (2012) and Volberda et al. (2014), we consider non-technological innovation even more broadly (i.e., as all innovation that includes a non-technical component), in an attempt to shed light onto the emerging research area using a relatively objective and quantifiable approach. By using co-citation ties between scientific contributions as the basic unit of analysis, we are able to identify the most important clusters of related publications. At the same time, incorporating all citations that are included in the ISI Web of Science, we are able to trace the evolution of the intellectual structure of the non-technological innovation research during the 1975–2011 period and discuss prospects for further development of this emerging field. Using bibliometric methods, we avoid many of the potential subjective biases. However, we also triangulate our findings with those of existing narrative reviews as well as our own qualitative review of the literature to strengthen the confidence in our findings.

In what follows, we present the development of the research area (by identifying the literature this emerging field drew knowledge from) and visualize the most important knowledge domains that non-technological innovation is built upon. Thus, the main intended contribution of our research is to overcome the ambiguity in the field by classifying the key concepts and clarifying their theoretical origins. We evaluate how the field has been evolving through time by relating it to fields from which it drew from during its development (i.e., organizational theory, psychology, sociology, etc.). By providing a more accurate and objective portrayal of the theoretical origin and intellectual structure of non-technological innovation, our work will help researchers towards a better understanding of the roots, evolution, and outlook for the non-technological innovation research area. In doing so, we present the prospects of this research area and discuss whether or not the non-technological innovation research can already be considered as a self-standing “research field” by comparing it to the broader field of innovation management.

2. Research time frame and types and forms of non-technological innovation

While the starting point of any systemic literature review is somewhat arbitrary (Cascio & Aguinis, 2008), our starting date (1975) was dictated by the year of publication of two important articles for the development of this research area: an

Administrative Science Quarterly (ASQ) article by Baldrige and Burnham (1975) and an article in *Omega* by Utterback and Abernathy (1975). Although there was some literature that we could relate to administrative or organizational innovation even before this year (e.g., Aiken & Hage, 1966; Evan, 1966), literature on theoretical origins of organizational and technological change, and our benchmark reviews (Damanpour & Aravind, 2012; Volberda et al., 2014) have also set the point of departure around 1975. This is so because the two articles from 1975 conceptualized for the first time what we now refer to as non-technological innovation and announced it as a crucial aspect of the innovative endeavor in companies. Before this time point, the literature mostly discussed innovation in general, as a driver of business and new ventures, and the antecedents of (technological) change. From a methodological point of view, it is important to note that quantitative literature review is robust to a change in the starting year. Co-citation analysis is a good choice in this respect because this method builds on secondary (cited) papers and is less sensitive to starting year of the analysis, especially for the early years. All influential foundational work that was published before 1975 was thus also incorporated in the analysis since it was (co) cited from in scholarly output from 1975 on.

Baldrige and Burnham (1975) build on previous individual-level work on innovative behavior to shift this view and include organizational and environmental factors that shape innovation. This study, although not explicitly discussing non-technological innovation, adopts the view of innovative individuals who both complement technological breakthroughs and present a form of innovation themselves. This view was later adopted by management innovation scholars and thus can be considered as one of the “seed” ideas in this line of research (e.g., Birkinshaw, Hamel, & Mol, 2008). Utterback and Abernathy (1975), on the other hand, delineate between product and process innovation, allowing for a non-technological aspect of process innovations. Although their work was strongly influenced by economics (it can be classified as work in the field of technological innovation or innovation in general), the idea that non-technological innovation is a stand-alone phenomenon has been adopted by many scholars examining organizational innovation (e.g., Daft, 1978; Kimberly & Evanisko, 1981).

In order to systematically address the forms of non-technological innovation and identify relevant concepts – keywords in our analysis – we first revisited different innovation ontologies. According to Han, Kim and Srivastava (1998), there are numerous typologies of innovation. However, the most frequently used ones distinguish between product and process innovation, incremental and radical, and technical and administrative innovations (Gopalakrishnan & Damanpour, 1997). We took a broad perspective on non-technological innovation and scanned the innovation literature for articles that focus on any types and/or forms of innovation that are *not* purely technological (i.e., dealing with technical solutions for new products/services or processes). We summarize the most common concepts for addressing different types of non-technological innovation and their meaning, along with authors who have adopted them, in Table 1.

The main content that we build our paper upon is derived from the management field (as a subfield of business administration), where most articles on different types of non-technological innovations have been published. However, not exclusively as non-technological innovation can also be observed in many of the subfields of business administration, as portrayed in Table 1. *Product and process innovation* are often called technological innovations (Schmidt & Rammer, 2007), even if process innovation also consists of a non-technological component (Dodgson, Gann, & Salter, 2008). Lee and Souder (2000) identifies three innovation types: product or service innovation, process innovation, and

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