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Information management for innovation networks—an empirical study on the "who, what and how" in networked innovation

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ABSTRACT

Innovation networks are vital in advancing new product and service development. Particularly for small and medium-sized enterprises, partnering within innovation networks allows to enlarge innovation capabilities and to reach new markets. In order to create effective innovation networks, however, firms are required to adapt to the network. To do so, they must overcome three principal challenges: they need to build partnerships, integrate the partners' value contributions, and coordinate innovation processes. We followed three innovation networks over a three-year period and examined how they successfully used information systems (IS) to respond to these challenges. On the basis of their experiences we identify IS categories and measures that support setting up an information management for networked innovation. We explicate relevant tasks for managing the aspects of "who, what and how" in networked innovation.

1. Introduction

New Product Development (NPD), or the process of bringing a novel product or service to market, can be difficult to accomplish. The assumption that one firm is able to do it on its own mostly applies to large corporations (Tushman & Anderson, 1986; Christensen, 1997). But even large corporations, to a rising degree, rely on the resources, processes and skill sets of others. Joint business developments, licensing, venturing, and spin-offs are just some of the strategies that large corporations use to bring a product or service to its fruition (Ahmed & Shepherd, 2010). Consequently, a large number of innovations reaching the market today are not introduced by one firm alone, but by a set of partners. These partners have agreed to temporarily join forces as part of an *innovation network* (Rehm, Goel, & Junglas, 2015). Particularly for small and medium-sized enterprises (SMEs) that lack the size, breadth and experience to shoulder innovation efforts on their own, innovation networks are often the only way to outdo larger competitors (Chesbrough, 2003).

The strategic benefits that an innovation network brings to an individual organization are plentiful (Davenport, Leibold, & Voelpel, 2006). Reaching and opening new markets is just one of them; another is the prospect of forming long-term partnerships that outlast several NPD projects and pave the way for future innovations (Chesbrough, Vanhaverbeke, & West, 2006). By the same token, participating in innovation networks poses significant task requirements (Pisano & Verganti, 2008; Davenport, De Long, & Beers, 1998; Popadiuk & Choo, 2006): SMEs are required to systematically seek and integrate complementary knowledge and know-how outside their own core competences along with effective cooperative innovation processes using a network of partners (Esterhuizen, Schutte, & Du Toit, 2012). The use of information systems (IS) is therefore key to innovate in networks—even if the NPD objective is still obscure at the onset of the project. As an entrepreneur of our study explained:

> "*Right now – I am not completely sure what the start of this idea is – but I am sure that, with the possibility to build a network, it is possible to develop products and services, and the (participants) are really able to exchange all information without huge problems and staying fully informed in real time.*"

1.1. Analysis scheme for an empirical study of three innovation networks

To find out how IS help to innovate in networks, we studied three innovation networks of SMEs over a three-year period. Our analysis unveiled three core challenges:

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A. Building partnerships (Who).
B. Integrating value contributions (What).
C. Coordinating innovation processes (How).

These three challenges can be understood as three basic questions that need to be answered to implement a comprehensive information management in an innovation network (see Fig. 1).

During our study, we observed that each innovation network is unique in its objective. Likewise, we learned that each innovation network is unique in the way it goes about building partnerships (addressing the question: who?), the way it integrates the distinct value contributions of partners (addressing the question: what?), and the way it coordinates innovation processes (addressing the question: how?). The right combination of these factors of Who–What–How is instrumental to the success of innovation networks (see Table 1). Since partners usually bring different capabilities and qualifications to the table, they are required to mutually adjust in order to leverage the partners' specific know-how and experience and to extend their market potential with their partners' capacities (Pavlou & El Sawy, 2006; Johannessen & Olsen, 2010). The networking partners need to get to know each other, communicate the contributions that they are able to provide, and develop a joint process to manage innovation. Hence, they need to develop a *joint information management* as a basis for their cooperation. IS act as facilitators in this respect; their technological details and implementation however, depend on the actual innovation project and its objective.

While existing enterprise application software is often utilized as IS-support in these contexts, it has not been designed with this purpose in mind. Much is known about IS supporting specific innovation activities, such as computer-aided design or manufacturing, virtual prototyping, expert systems, or project management software. However, it is less clear which IS functionalities effectively support the various steps involved in building, integrating and coordinating innovation networks.

Many examples of successful network creation exist (e.g., Chesbrough, 2009), yet one of the key problems of innovating in networks remains "the question of how to plan, organize and control the innovation processes that are distributed over several partners" (p. 138, Rese & Baier, 2011). Developing a systematic approach to sense and seize the opportunities of partnering for innovating in networks is still an open issue, in particular when it comes to selecting effective IS (Lindič, Baloh, Ribière, & Desouza, 2011).

In our study, we accompanied three SME innovation networks, situated in the medical device, textile, and automotive safety industry. Our particular focus was on networks that targeted disruptive innovations (Christensen, 2003; Popadiuk & Choo, 2006). Each of the three networks identified for this study pursues novel products and services where the base material, design or production approach presents a disruptive force in the market space (Christensen & Raynor, 2003; Gilbert, 2003).

We explored how participating SMEs built partnerships, integrated value contributions, and coordinated processes with the help of IS. More specifically, we set out to address the following questions:

1. What are the challenges SMEs face when partnering with others as part of innovation networks?
2. How do SMEs overcome these challenges, and what types of IS do they use for it? How can SMEs systematically approach IS-support for networked innovation?

We start with a discussion of our analysis scheme which consists of three major challenges: who, what and how. We structure our narrative accordingly and provide evidence for each challenge as observed in one of the innovation networks of our study. Next, we analyze the use of IS in each network in response to the challenge. Based on our analysis, we discuss how IS can help overcoming network challenges and how SMEs can create a joint approach for an information management when attempting networked innovation. We provide an overview for R&D and project managers, CIOs and other practitioners about the tasks that guide the systematic use of IS in innovation networks.

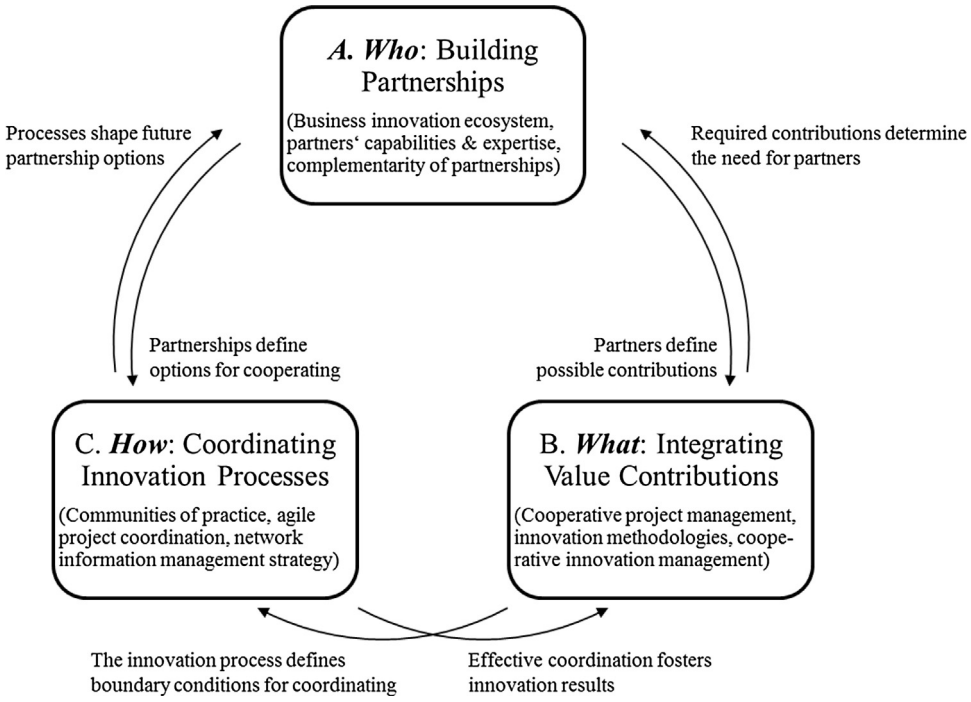

Fig. 1. Analysis scheme defining the three challenges of "who, what and how" in networked innovation.