

Understanding novelty creation in exploration networks—Structural and relational embeddedness jointly considered

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Abstract

In exploration networks the key-organisational question is not how to organise a division of labour but instead how to create novelty. The aim of this paper is to develop an understanding of how such novelty in exploration networks is created. Based on an empirical analysis of the multimedia and biotechnology industries in the Netherlands, this paper shows that exploration networks face a trade-off between diversity and selection. Moreover, the findings indicate that depending on the type of exploration task, exploration networks need to make a combination of density and tie strength in such a way that diversity and selection are aligned. The paper concludes, among others, that the views of Burt, Coleman and Granovetter should not be seen as contradictory, but rather as proponents of complementary views.

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1. Introduction

The aim of this paper is to develop an understanding of how novelty is created in exploration networks. The focus of this paper is therefore on interfirm networks that engage in the exploration of novel combinations. We define exploration as a situation that can generally be characterised by breaking with an existing dominant design and a shift away from existing rules, norms, routines or activities, in view of novel combinations. Exploration is an inherent uncertain process that can hardly be planned for (March, 1991). There is growing consensus in the academic literature that in such a setting, strategic alliances can be an extremely effective organisational form as they bring together complementary actors from different technological backgrounds. In the context of learning and innovation, exploration thrives on a diversity of knowledge which yields a potential for Schumpeterian novel combinations to

emerge (Nooteboom, 2000). It is in this heterogeneity that actors are able to combine and integrate complementary knowledge and capabilities (Porter, 1990; Hamel and Prahalad, 1994; Grabher, 1993; Hagedoorn, 1993; Hagedoorn and Schakenraad, 1994; Smith Ring and van de Ven, 1994; Grandori, 1997; Spekman et al., 1995; Uzzi, 1997; Nooteboom, 1999, 2004; Ahuja, 2000; Rowley et al., 2000).

In spite of its noted importance, novelty creation forms an unaddressed topic in the innovation literature. In this literature, a distinction is made, following life-cycle theory, between two stages in the innovation process. The first initial stage is one of volatility, characterised by the creation of Schumpeterian novel combinations. The second stage is a stage of consolidation in which dominant designs emerge (Abernathy, 1978; Abernathy and Utterback, 1978; Abernathy and Clark, 1985) and in which production systems focus on efficiency, economies of scale and experience. The cycle is generally held to imply a shift from product to process innovations, as product forms settle down and competitive pressure shifts to efficient production. In other words, the literature is very clear about the change in focus from exploration to exploitation. However, the origins of exploration itself remain

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a mystery. The question of how exploitation ‘feeds’ future exploration is left unanswered (Nooteboom, 2000). This issue on ‘the origins of novelty’ forms the central question in this paper and will be studied in the context of interfirm networks engaging in exploration, further referred to as ‘exploration networks’.

This focus on exploration networks is related to the literature on innovation systems (Carlsson and Stankiewicz, 1991; Malerba, 2004) and regional economics (e.g. Bathelt et al., 2004). Although in this literature the importance of relations and interaction among heterogeneous firms and actors is clearly acknowledged (Nelson and Winter, 1982; Dosi et al., 1988; Nieto and Santamaria, 2007), an in-depth understanding of the structure and role of interfirm networks is still underdeveloped (Pavitt, 2002; Malerba, 2004). For a deeper understanding of networks we need to turn to the social network literature. Social network theory enables us to describe and measure networks of relationships in great detail, providing us with several well-developed measures and techniques to assess the structure, ties and dynamics of relational networks.

1.1. Social network theory

Networks and relations among actors are the primary object of analysis in social network theory. Before discussing this literature and some of its proponents, we can make three observations on this literature that have relevance here. One observation is that there is a strong universalistic tone on the optimality of the network structure, which abstracts from any kind of context. As we will argue in Section 3, the considerations of three influential scholars in this literature, Granovetter (1973), Coleman (1988) and Burt (1992) lead to different conclusions with respect to the optimal network structure. As we will show in this paper, the question is not who is right, but who is right under which conditions. A second observation is that in this strand of literature, there is a strong focus on the structural properties of networks. Due to this strong focus on structural elements of networks, the identification of relevant environmental conditions and how they influence this structure have generally been ignored by social network theorists (Ahuja, 2000). A third observation is that these structural properties are treated as relatively ‘stand-alone’ properties. An understanding of how these properties interact and how this interaction may affect interfirm learning is underdeveloped. This relates to the distinction between structural embeddedness and relational embeddedness (Granovetter, 1985), which have been treated as independent factors in the literature on interfirm networks thus far (Rowley et al., 2000). The claim that we submit in this paper is that the combination of structural and relational embeddedness may have a profound effect on interfirm learning. Therefore, they should be examined in joint consideration.

In doing so, we attempt to reconcile two views on organisation, namely a competence-view and a govern-

ance-view. Solely relying on a competence-view would negate the notion that firms, when cooperating in networks, also become mutually dependent. This dependency yields a risk of conflict and opportunism and may possibly influence the way firms interact, connecting with a governance perspective. The literature on competence building has neglected the governance of relational risk, and transaction cost theory has neglected issues of learning and innovation. A combination of the two perspectives should yield a more complete understanding of inter-organisational relations (Williamson, 1999; Nooteboom, 2000, 2004; Dosi and Marengo, 2000).

To summarise: two questions have remained unanswered in the literature on interfirm networks so far, namely (1) what are the origins of novelty in exploration networks and (2) how do structural and relational embeddedness combine systematically? This paper tries to fill these voids. In doing so, this paper addresses these issues by studying the following questions:

- What are ‘general’ structural properties of exploration networks?
- How does this combination of structural properties enable and constrain the creation of novelty in such networks under different environmental contexts?

This paper therefore contributes to our basic understanding of interfirm networks in two ways. One is that we treat network structural properties as dependent variables, which is largely unexplored territory in the literature. The dominant approach so far has considered network embeddedness and network structure as independent variables, which condition firms’ (economic) behaviour and its performance outcomes (Madhavan et al., 1998). In this way, firms’ behaviour and its performance are considered as dependent variables and network structural properties as independent variables. As argued above, the key finding of this approach is that networks can increasingly be seen as a viable organisational form. In this paper, we are interested in those factors that enable and constrain networks, i.e. factors that may explain the emergence of certain combinations of network structural properties. A second contribution is to develop an understanding of how these combinations of network structural properties affect the creation of novelty in exploration networks. For that we need to go inside the black box of exploration networks in order to understand some of the mechanisms that explain how novelty is created, a process that is abstracted from in the literature on interfirm networks (Kogut, 2000; Madhavan et al., 1998; Beeby and Booth, 2000; Ahuja, 2000; Rowley et al., 2000; Hagedoorn and Duysters, 2002).

In Section 2 we further discuss social network theory and focus on some key structural properties that have relevance when developing an in-depth understanding of networks from a learning and innovation perspective. Next, in Section 3, we focus on the characteristics of an exploration

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