Computers in Human Behavior 64 (2016) 285–298

Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

Full length article

The value for innovation of inter-firm networks and forming alliances: A meta-analytic model of indirect effects

Angel Salazar [a, *], Jose Manuel Hurtado Gonzalez [b], Geert Duysters [c], Anna Sabidussi [c], Mike Allen [d]

[a] Manchester Metropolitan University, Manchester, United Kingdom
[b] University of University of Pablo de Olavide, Sevilla, Spain
[c] Tilberg University, Tilburg, Netherlands
[d] University of Wisconsin-Milwaukee, Milwaukee, WI, USA

ARTICLE INFO

Article history:
Received 7 December 2015
Received in revised form
5 May 2016
Accepted 26 May 2016
Available online 14 July 2016

Keywords:
Innovation
Networks
Alliance capability
Firm performance
Meta-analysis
Bootstrapping
Indirect effects

ABSTRACT

In the past few decades, we have seen strong growth in the number of publications on the role of alliances and networking on innovative performance and, more generally, firm performance. The empirical results of these studies are, however, often debated, and there seems to be little consensus in the academic literature. We therefore focus our meta-analytical model test on the accumulated direction and magnitude of the indirect relationships reported in the literature between innovation, networking, alliances, and firm performance. Our meta-analysis is based on 517 correlations, 156 studies, and a total sample size of 93,048 firms. We compare the findings of our meta-analysis to the results of a bootstrapping analysis. Our results corroborate the bulk of studies, which suggests that networks and alliance experience play an important role in generating rents from innovation resources through both direct and indirect effects. The practical implication is that firms need to engage in networks and also develop strong alliance management capabilities to be able to increase the contribution innovation resources can make to their performance.

1. Introduction

A central question in strategic management is that of what drives corporate performance. Of the many potential drivers, innovation has been widely cited as a main determinant of not only firms' prosperity, but also their survival (Cefis & Marsili, 2006). The literature also points out that a firm's networks and alliances can be seen as a relevant driver of performance (Dyer & Singh, 1998). In recent years, therefore, the particular role that innovation and networking play, as well as the function of alliance experience, has attracted considerable attention from management scholars. Social capital and social network theory suggests that a firm's external network can be viewed as a major contributor to its performance by enabling it to transact with suppliers and other partners to acquire complementary resources. Meanwhile, from the academic discourse in strategic management studies, we learn that firms can be conceived of as repositories of capabilities that are essential for performance. Specifically, in order to fully benefit from external networks, firms need to be able to build alliances that enable them to manage their myriad of collaborative relationships successfully (Heimeriks & Duysters, 2007; Kale, Dyer, & Singh, 2002;; Kale & Singh, 2007).

The importance of strategic alliances and networks for innovation has increasingly been demonstrated and has become the cornerstone for the Open Innovation field (Chesbrough, 2003; Chesbrough, Vanhaveberke, & West, 2006). Authors in the open innovation tradition argue that successful innovation increasingly depends on the ability of firms to manage external relationships. Strategic alliances with competent partners have become key strategic weapons in the hands of firms embracing "open innovation". However there does not seem to be a linear positive relationship between the mere number of alliances and innovative performance. Competency in alliance management is increasingly mentioned as a requisite for being successful in alliances and networks (Heimeriks & Duysters, 2007). Failure rates of alliance of up-

* Corresponding author.
E-mail addresses: a.salazar@mmu.ac.uk (A. Salazar), jmhurgon@upo.es (J.M. Hurtado Gonzalez), gduysters@uvt.nl (G. Duysters), a.sabidussi@tias.edu (A. Sabidussi), a.sabidussi@tias.edu (M. Allen).

http://dx.doi.org/10.1016/j.chb.2016.05.073
0747-5632/

to 60% have been reported in the academic literature (Arino & de la Torre, 1998; Medcof, 1997). Raising alliance performance is argued to be dependent on two fundamental aspects; alliance experience and alliance capabilities. At first, authors explored the positive relationship between experience and alliance success. However, very soon, authors would find out that experience in itself was insufficient and needed to be accompanied by alliance capabilities to really make an impact (e.g., Anand & Khanna, 2000; Simonin, 1997).

Despite the attention dedicated in the academic literature to the performance implications of innovation, networks, and alliance experience, the accumulated research offers only limited insights. Empirical findings remain ambiguous and fragmented: ambiguous because opinions often vary greatly amongst studies as to the direction and magnitude of the effects (see Singh & Mitchell, 2005) and fragmented because individual empirical studies focus on a very narrow set of constructs and causal relationships in order to ensure model parsimony. To expand our understanding of the performance implications of resources and capabilities, therefore, we need to perform a systematic and comprehensive examination of the extant literature.

We present here a meta-analytical model used to test the accumulated direction and magnitude of the direct and indirect relationships between innovation, networks, alliances, and firm performance found in the relevant literature. More specifically, our understanding of these issues would not be complete without elucidating the interplay between the above constructs in affecting performance. For example, networks have a direct impact on performance, but also indirectly on performance by influencing firm innovation. The sources of innovation do not reside exclusively within firms, but are instead found externally – indeed, external sources can be vital to major innovation development. Thus, if a firm wants to increase its ability to innovate, it should identify and exploit the synergies from partners that hold complementary resources and try to internalize these external resources available through their network (Phene, Fladmoe-Lindquist, & Marsh, 2006). Networks are therefore generally found to have *a positive impact on* firm innovation.

There is increasing evidence in the academic literature that merely entering into network relationships does not increase innovation indefinitely, however: in fact, large, complex networks can easily overstress the cognitive limitations of the managerial mind. Recent studies have shown that companies must learn to deal with network complexity by capturing alliance experience. Thus, increased alliance management capabilities also enhance firm innovation, by facilitating the leveraging of its networks. Firm performance is therefore increasingly determined by the interplay between networks, firm innovation, and alliance experience.

The main contribution of our study resides in clearly establishing the key indirect relationships in the literature by calculating the average effects and performing a Sobel mediation test, which we compare to the results of a bootstrapping analysis. It is worth mentioning here that the main focus of our mediational analysis is to clarify the causal paths between (1) networks, firm innovation (e.g., patents), and firm performance and (2) alliance capability, firm innovation, and firm performance. By making the direct and indirect effects explicit and distinguishing between them, we can help provide a reference framework for understanding the current body of knowledge in this important field.

This paper is structured as follows. In the next section, we frame the theoretical background of our study in the context of the existing literature, focusing on the interplay between innovation, networks, alliances, and firm performance, and identify the key relationships our work will focus on. Next, in the methodology section, we present the procedures on which our meta-analysis is based. Our meta-analysis considers correlations found in studies covering a total sample of 93,048 firms and includes procedures for combining studies with multiple effect sizes, taking into account possible intercorrelations between multiple variables. We also apply a Sobel test to determine the degree of mediation (i.e., mediated indirect effects) amongst constructs and present the results of our bootstrapping test. Finally, we compare and summarize the results of our study and, in the last section, reflect on the contribution to the literature and the paths for future research.

2. Conceptual framework and hypotheses formulation

While clarifying the direct impact of innovation, networks, and alliance experience on performance is essential, it is not entirely sufficient for advancing our understanding of how these factors contribute to firm success. To achieve a more comprehensive picture of a firm's success drivers, we must scrutinize more complex relationships. In particular, we argue that there are indirect links between innovation, networks, and alliance experience that ultimately also help foster performance. For example, we argue that while networks contribute to performance, they also foster innovation, which, in turn, enhances performance.

Although the relevance of these connections has been recognized in the literature, they have been assessed in isolation. We propose, instead, that they represent indirect effects that need to be embedded in our conceptual model. In the next section, we focus on these indirect effects. We discuss how networks enhance innovation, how networks are related to alliance experience, and how alliance experience influences innovation.

2.1. Networks and innovation

Innovation involves the creation of more effective products and processes through the application of new knowledge (Cho & Pucik, 2005; Drucker, 1993). Authors such as Cowan and Jonard (2009) have defined the concept as the discovery of knowledge not known by others. This new knowledge generates new products and processes. Firms race to secure patents in order to capture and protect the value of their R&D investments and new knowledge. Patenting allows them to protect their innovation investments by securing their intellectual property rights to any new products and enabling future transfers to other firms, which could generate additional profits (Serrano, 2010). Patents provide significant protection for product innovations, in particular. They can also be used as a deterrent and to sue competitors for alleged infringement. In addition, patents enable firms to profit from licensing their discoveries to other partners in their collaboration network (Markman, Espina, & Phan, 2004; Agarwal & Hsu, 2009; Serrano, 2010).

The literature has made clear that the network of partners a company is embedded in has an influence on its innovation outcomes (e.g., Ahuja, 2000b). Firms that can identify and exploit synergies with partners that control complementary resources and capabilities may obtain a competitive advantage over other firms (Durand, Bruyaka, & Mangematin, 2008). Access to unique and valuable knowledge obtained through partner networks can be leveraged to benefit in-house innovation and also enable the redesign of working practices, development of new products, and even reconfiguration of business models (Durand et al., 2008; Leiponen & Helfat, 2010). In addition, participation in inter-firm networks provides firms with important informational advantages in terms of access, timing, and learning (Gulati, 1999; Zhang & Li, 2010). As firms increase and improve their access to networks (i.e., number and quality of ties), their competitive position often improves as their search costs for new knowledge are reduced and