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Managing open innovation projects with science-based and market-based partners

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ABSTRACT

This paper examines the relationship between (outside-in) open innovation and the financial performance of R&D projects, drawing on a unique dataset that contains information on the open innovation practices, management and performance of 489 R&D projects of a large European multinational firm. We introduce two types of open innovation partnerships – science-based and market-based partnerships – and examine their relationships with project financial performance. In addition, we investigate whether the open innovation—project performance relationships are influenced by the way how R&D projects are managed. Our results show that R&D projects with open innovation partnerships are associated with a better financial performance providing that they are managed in the most suitable way. Market-based partnerships are positively correlated with project performance if a formal project management process is used; however these partnerships are associated with a lower performance for loosely managed projects. In contrast, science-based partnerships are associated with higher project revenues for loosely managed projects only.

1. Introduction

Open innovation has triggered considerable attention in recent years. Open innovation is advocated to lead to a number of benefits such as better adaptation to dynamic market needs, shared resources and risks among partners, and higher commercial returns (Chesbrough, 2003; Chesbrough et al., 2006). As such, open innovation is contended to be an imperative for innovative firms, and an increasing number of companies have embraced open innovation strategies in the innovation process (Huston and Sakkab, 2006; Kirschbaum, 2005; Van Den Biesen, 2008; Hagedoorn, 2002; Roijakkers and Hagedoorn, 2006).

Yet, despite its popularity, the relationship between open innovation and performance is not well understood. Existing research on the openness-performance relationship has generated mixed results: some authors found a positive relationship (e.g. Laursen and Salter, 2006); while others found no relation, or even negative relationships (e.g. Campbell and Cooper, 1999; Lhuillery and Pfister, 2009; Un et al., 2010).

A possible reason for the mixed research findings on open innovation is that most studies are conducted at the firm level, comparing the performance of firms that differ in terms of their overall openness to external partners. However, innovation activities in firms are typically conducted via R&D projects (Sydow et al., 2004; Cassiman et al., 2010) and increasingly organisations adopt project-based forms of innovation (Hobday, 2000). R&D projects, even those conducted within the same firm, can differ in many respects, such as the type of technologies that are being developed, the resources that are available, and the way projects are managed. To determine the performance of open innovation approaches, it is important to control for the peculiarities of R&D projects, which, in turn, calls for a switch of the unit of analysis from the firm to R&D projects. Responding to the call of Chesbrough et al. (2006, p. 287), that 'neither the practice of nor the research on open innovation is limited to the level of the firm', and that 'the sub firm level of analysis is particularly salient in understanding the sources of innovation', this paper is among the first contributions that examines open innovation at a sub-firm level, namely, the R&D project level[1].

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[1] Contributions in the new product development literature have discussed the role of collaborations with suppliers and customers in R&D projects, but paid less

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More specifically, in this paper we examine the relationship between (outside-in) open innovation practices and the financial performance of R&D projects. R&D projects may interact with different types of knowledge sources and each of these knowledge sources may impact differently on project performance (Baum et al., 2000). Following prior literature (e.g. Danneels, 2002; Faems et al., 2005), we distinguish between two types of open innovation partnerships – *science-based partnerships* (universities and knowledge institutions[2]) and *market-based partnerships* (customers and suppliers) – and we examine their distinctive relationships with the financial performance of R&D projects.

Switching the unit of analysis from the firm to the R&D project level enables a more precise estimation of the open innovation-performance relationship, as well as an opportunity to identify and study a new set of factors, which are only available at the project level, that moderate this relationship. *Project management*, as characterized by the process and management tools to plan, monitor, and control the execution of R&D projects (Clark and Wheelwright, 1993; Cooper and Kleinschmidt, 1995), lies at the heart of implementing corporate innovation strategies (Brown and Eisenhardt, 1995). In the new product development (NPD) literature, a formal 'stage-gate' monitoring process, with an up-front development plan and regular reviews has been put forward as the 'golden rule' of project management (Slevin and Pinto, 1986; Cooper, 1990; Barczak et al., 2009; Cooper and Edgett, 2008; Griffin, 1997; Kahn et al., 2006). However, most findings on project management are distilled from studying closed innovation projects, and it is unclear to what extent these insights can be generalised to open innovation projects (Gronlund et al., 2010).

A few observations suggest that formal management processes may not work well for all types of projects. First, Griffin (1997) and Barczak et al. (2009) found that, although increasingly more companies have formalised their project management process, the failure rate of R&D projects remains high and has stagnated over recent years. Second, Munns and Bjeirmi (1996) provided examples of highly successful projects that were managed in a less formal way. Third, scholars have argued that there are differences across R&D projects and that the standard, formal project management approach may not be applicable to all projects (Adams et al., 2006; Benner and Tushman, 2003; Shenhar and Dvir, 1996). In this paper, we explore how project management, and more specifically the use of a formal process, moderates the effectiveness of open innovation partnerships with science-based and market-based partners. As such, our work fits into the contingency literature of open innovation (Laursen and Salter, 2006; Tsai, 2009; Sofka and Grimpe, 2010).

To empirically examine the open innovation-performance relationship, we rely on a unique cross-sectional dataset of 489 R&D projects from a European multinational firm, active in multiple industries and annual R&D budgets of more than one billion euros. Our results show that R&D projects with open innovation partnerships are associated with a better financial performance providing that they are managed in the most suitable way. Market-based partnerships are positively associated with R&D project performance if a formal project management process is used, while they are negatively associated with financial performance for loosely managed R&D projects. In contrast, partnerships with science-based partners are associated with higher project revenues for loosely managed projects only.

The remainder of the paper is organised as follows. First, we provide a literature review on open innovation and the management of R&D projects. We then develop our research hypotheses. Section four describes the data and methods, and section five reports the empirical findings. In the final section, we discuss the main findings and draw several conclusions and implications for both academics and innovation practitioners.

2. Prior literature

2.1. R&D projects and open innovation partnerships

R&D projects and project management are at the heart of implementing corporate innovation strategies (Brown and Eisenhardt, 1995). R&D projects can be considered as temporary entities that conduct a series of complex and interrelated activities with predefined goals (Clark and Wheelwright, 1993; Cleland and Kerzner, 1985; Grabher, 2004; Pinto and Prescott, 1988). Knowledge creation and dissemination happens at the interface between projects and the environment in which they operate (Grabher, 2004).

One possible way to infuse R&D projects with new knowledge and to improve their performance, as suggested in the open innovation literature, is to open up and establish R&D partnerships (Chesbrough, 2003; Hagedoorn et al., 2000). R&D partnerships have been primarily studied at the firm level, where it is argued that they help organisations to access and leverage external complementary resources (Eisenhardt and Schoonhoven, 1996; Grant and Baden-Fuller, 2004; Tether, 2002; Miotti and Sachwald, 2003), reduce innovation costs and risks (Belderbos et al., 2004; Hagedoorn, 1993; Leten et al., 2013), adapt to dynamic environments (Eisenhardt and Martin, 2000; Dittrich and Duysters, 2007) and generate higher revenues (Faems et al., 2005). Prior studies have emphasized that science-based partners and market-based partners provide organisations access to diverse types of knowledge (Baum et al., 2000; Danneels, 2002; Faems et al., 2005). Although there are debates over which type of knowledge is more beneficial, prior studies have shown that both science-based and market-based knowledge play significant but different roles in R&D activities (Danneels, 2002; Faems et al., 2005; Hoang and Rothaermel, 2005).

2.2. R&D projects and science-based partnerships

Scientific research conducted at universities and knowledge institutes is an important input for industrial innovation (Jaffe, 1989; Mansfield, 1995, 1998; Klevorick et al., 1995; Cockburn and Henderson, 1998; Narin et al., 1997). By collaborating with science-based partners, R&D project teams gain access not only to tacit scientific knowledge (Cockburn and Henderson, 1998). but also to (unpublished) codified knowledge, enabling them to quickly build on the latest research findings (Fabrizio, 2009). Scientific knowledge functions as a map for applied research (Rosenberg, 1990; Fleming and Sorenson, 2004) by equipping R&D project teams with a better understanding of the technological space in which they search for solutions for the technical problems they are addressing.

Because of escalating R&D expenditures in many industries (Mowery, 1998), science-based partnerships are increasingly seen as an inexpensive and low risk source of specialist knowledge (Tether, 2002). Science-based partnerships have been growing in scale and scope over time (Hagedoorn, 2002; Liebeskind et al., 1996) partially stimulated by government policies to promote translational research and public-private research partnerships (Perkmann and Walsh, 2007; Link and Siegel, 2005; Leten et al., 2013). Firms rely on science-based partnerships to experiment

attention to science-based partners (with Cassiman et al. (2009, 2010), Salge et al. (2013) as noticeable exceptions). Our study contributes to the extant literature by examining the distinctive relationships of both market-based and science-based partnerships (in relationship with project management formality) with the financial performance of projects.

[2] Knowledge institutions encompass public and private research institutions, universities, and technical colleges.