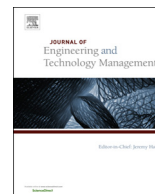




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Open innovation and firm performance: Evidence from the Chinese mechanical manufacturing industry

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ABSTRACT

This paper studies how human capital can affect the relationship between open innovation and the financial performance of firms. The results demonstrate that there is an inverted U-shape relationship between open innovation and firm profitability. We also indicate how human capital (both quality and structure) will differently moderate above relationship: generally, higher the education level of employees will amplify the positive effect of open innovation, but for production-oriented firms, such argument does not hold; in technology-oriented firms, as the ratio of technical staff to production staff increases, the financial performance of firms improves as a result of the implementation of an open innovation strategy. However, in production-oriented firms, the moderating role is negative.

1. Introduction

Chesbrough (2003) first introduced the concept of “open innovation” to contrast with what is called “closed innovation.” Open innovation emphasizes that companies that “generate their own ideas, develop them, build them, market them, distribute them, service them, finance them and support them on their own” should take advantage of external ideas, resources, and market channels to advance technology and provide new products. It enhances firms’ technological capabilities, as well as their overall competitiveness, by combining internal and external ideas in innovative activities.

The direct or indirect impact of open innovation activities on a firm’s performance have been extensively studied by researchers, most of which are related to firms’ innovation performance, including R&D cost effectiveness (Caloghirou et al., 2004), the production of patent (Rothaermel and Alexandre, 2009), and the proportion of new products (Grimpe & Sofka, 2009; Laursen & Salter, 2006; Atuahene-Gima, 2005). Researchers have reached something of a consensus that open innovation enhances firm innovation performance (Miotti & Sachwald, 2003; Pisano, 1990), though some have suggested that excessive dependence on external knowledge may not benefit a firm’s innovativeness (Laursen & Salter, 2006; Koput, 1997; Ocasio, 1997).

According to research on the process of open innovation (West & Bogers, 2014; Chesbrough & Appleyard 2007), value creation through innovation and value capture through commercialization are regarded as two important processes for the success of open innovation. However, we noticed that above researchers focus on value creation, with an emphasis on innovation outcomes from openness, but less on value capture, i.e. the commercialization of innovation. In the view of Chesbrough and Appleyard (2007),

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“effective open strategy should balance value capture and value creation, instead of losing sight of value capture during the pursuit of innovation.”

Value capture is highly related to the sustainability of open strategy, and it calls for a strategic perspective of trade-off between the benefits and cost of open innovation. This draws our attention to the profitability of open innovation, which is usually taken as the reflection of value capture in open innovation (Rothaermel & Alexandre, 2009; West & Bogers, 2014). It is a complementary and further-step research to the often studied relationship between openness and innovation performance.

While firms often adopt open strategies for better competitive advantages, they differ in their ability and context characteristics to capture value in open innovation. (Chesbrough, 2006; Chesbrough & Appleyard 2007). Therefore, the next core question becomes the conditions under which open innovation can contribute positively to firm profitability.

Researchers have used the lens of absorptive capacity to understand the contingency of open innovation on firm performance. The results have been well-documented (Bapuji et al., 2011; Lichtenthaler, 2009). Absorptive capacity is generally regarded as a by-product of R&D investment (Cohen & Levinthal, 1990) and proxied by R&D intensity (e.g. Kafouros & Forsans, 2012). However, some argue absorptive capacity should be more complex in nature. Firms require relevant knowledge foundation and a compatible cognitive structure to assimilate and transform external knowledge. They must build new cognitive structures and cope with path dependency when new knowledge is incompatible (Todorova and Durisin, 2007). Such process is highly dependent on firm’s human resource, therefore, some researchers (Mowery & Oxley, 1995) proposed that human capital is an important but overlooked component of absorptive capacity.

This paper explores this new and potentially overlooked element and investigates how firms should align their human capital with their open innovation practices to ensure profitability of open innovation.

The specific questions this paper aims to answer include: a) What is the connection between open innovation and firm profitability? b) What is the role of human capital in the relationship between open innovation and firm performance?

The paper is organised as follows: In the second part, theories and relevant research related to open innovation, firm performance, and human capital are reviewed. In the third part, models building on the relationships between open innovation and firm performance are proposed. These models suggest that there is an inverted U-shape relationship between the two in China’s mechanical manufacturing industry. In the fourth part, human capital is added to the model as a moderating factor to examine its contingent effect on open innovation. Based on the results, practical recommendations to firms regarding HR structures are provided in the final session.

2. Theoretical background and hypotheses

2.1. Open innovation

After Schumpeter’s first introduction of innovation concept, it was long taken for granted that innovation refers only to activities that occurred within a firm or within an R&D department, which therefore made creativity and innovation important strategic resources guarded by careful management and legislative protections. This is now classified as “closed innovation,” in which each step in the innovation process is dependent on a firm’s own capabilities (Chesbrough, 2003). Toward the end of the twentieth century, this closed innovation model was gradually disrupted as a result of the increased mobility of skilled workers, more rapid technological change and increased technological complexity, and the prevalence of venture capital. Under this new paradigm, sources of knowledge and transfer of technology can be external to firms. Skilled and educated workers lie in the centre of the identification, acquisition, assimilation, and absorption of external knowledge. Rapid technology change and increased technological complexity makes ‘openness’ essential for firms. Venture capital translates R&D outcomes to the market because it directly contributes to the execution of an innovative idea (including those coming from external technology sources) and shares the risks in new product development (Christofidis and Debande, 2001). These processes facilitate internal and external knowledge exchanges and push innovation across the boundaries of the firm.

In this picture, external sources of technology can have a more significant impact on the innovation model that firms choose to adopt. Enkel and Gassman (2008) studied the knowledge sources of companies and established the fact that clients, suppliers, and even competitors have become main sources of knowledge. In most industries, even industry leaders cannot research and develop a new technology completely on their own. Technological challenges and financial constraints push independent organisations, or even competitors, to collaborate. With progression in technology, more interdisciplinary subjects have emerged. Therefore, a different innovation environment started to form, which Chesbrough later called “open innovation”.

This triggered a series of debates among researchers, and the most discussed question is: is it always good for enterprises to use external sources to innovate and to what degree can firms rely on external sources? (Chesbrough, 2006)? Studies have discussed the pros and cons of open innovation (Almirall & Casadesus-Masanell, 2010). Chesbrough’s study discovered that external forces can enhance the efficiency of projects, and shorten working time, which can make a difference for short-term projects in particular. Yet, an over-dependence on external R&D may have a crowding-out effect on long-term innovation programmes, Christensen (2006) argued that, although external knowledge can become more accessible, firms should not abandon their core technologies. Knowledge and knowhow regarding firms’ core competitiveness, as well as in-depth R&D, should be maintained within the firm. But most of the research focus on the technological outcomes from openness, financial performance, as an indicator of value capture from open innovation, is less discussed.

A strategic perspective of trade-off between the benefits and the cost of open innovation is required to ensure firms with open strategy can balance between taking advantage of open innovation and maintaining core firm-specific competitive advantages

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