



CHAPTER 1

Introduction

Globalization and the increased connectivity of economic actors have led to increased competition in business markets. Innovation is a major driver enabling and sustaining of a competitive advantage and promoting increases in productivity in a contested environment. Especially in times of limited resources and economic downturns, innovations are essential for the survival of companies and industries as a whole. Notably, innovations are more than just the first occurrence of an idea; they include its successful introduction into markets. Therefore, innovations are defined as the implementation of new or significantly improved products (goods or services) or processes (OECD/Eurostat, 2005).

“Today no one needs to be convinced that innovation is important – intense competition, along with fast changing markets and technologies, has made sure of that. How to innovate is the key question” (Drucker, 1988, p. 149). The traditional perspective has followed Schumpeter (1934, 1939) and has emphasized the required abilities of the lone entrepreneur. Open innovation presents a more interactive way for companies to innovate and was first proposed by Henry Chesbrough (2003a, 2003b). He claims that internal research and development (R&D) is no longer the invaluable strategic asset that it used to be. Firms should make use of knowledge inflows and outflows to accelerate internal innovation and find new commercialization opportunities for internally developed knowledge (Chesbrough, 2006a). Hence, the open innovation model fosters the openness of R&D projects toward external stakeholders. Openness encompasses being open to new influences from outside the firm and bringing ideas and knowledge from the

inside to the outside environment. Especially in early phases of R&D projects, openness is considered essential for successful innovations. The explanation lies in a fundamental characteristic of innovation: new innovations can consist of new combinations of existing ideas, capabilities, skills and resources. A greater variety of these factors leads to a greater scope and complexity of new combinations (Fagerberg, 2006). This fundamental logic has also been used to explain why, in ancient times, the inhabitants of the large Eurasian landmass have become more innovative and technologically sophisticated than more isolated populations, such as Native Americans and Australian Aborigines (Diamond, 1998; Fagerberg, 2006).

In the early and mid-20th century, diversification and integration were common strategies for R&D departments in large firms to acquire new knowledge and technologies (Chandler, 1977, 1990). Vertical integration counted as a barrier-raising investment that generates competitive advantages over existing and new rivals (Caves & Porter, 1977; Porter, 1980). Since the early 1960s, the innovation literature has emphasized interaction and described innovation as an information-creation process that arises out of interaction (Allen & Cohen, 1969; von Hippel, 1986; Trott & Hartmann, 2009). In practice, partnerships, strategic alliances and joint ventures have been rising rapidly since the 1970s as the costs for R&D and the risks involved continued to increase. Examples are the development of mobile communication technologies or treatments of AIDS and cancer, which are dominated by global competition between groups of firms (Hamel et al., 1989; Trott & Hartmann, 2009). Besides partnering with competitors, the companies have also become customer focused. Customer relationship management and customer involvement have their roots in marketing and quality management. Today, the inclusion of customers is important because they are better informed and have clear beliefs about product options and improvements (Reinartz et al., 2004; Dell’Era, 2010). The concept of lead user innovation, which embraces the co-creation and co-development of products with lead users, has become established in R&D practice (von Hippel, 1986, 2009). Further studies point to the importance of innovation partnerships with universities (Perkmann & Walsh, 2007; Bughanza & Vaerganti, 2009). Supplier integration was first stressed in the litera-

ture on supply chain management, which notes that the willingness of the suppliers to cooperate can strongly depend on the suppliers' dependence on the company (Kamath & Liker, 1990; Walton et al., 2006).

Open innovation takes a more general perspective by assuming that the innovation potential increases due to cooperation with multiple stakeholders from the external environment. Notably, a research gap exists regarding the impact of open innovation activities on the innovation performance of firms. Nearly all existing studies on open innovation do not emphasize performance implications and are based on single case studies in high-tech industries (West et al., 2006; Lichtenthaler, 2008; De Backer et al., 2008). Very few empirical large-scale analyses on the impact of open innovation on innovation performance exist. Laursen and Salter (2006) investigate the role of openness among English manufacturing firms and find that an intensive external search depth for innovation opportunities is associated with radical innovation. Lichtenthaler (2008) shows increased open innovation activity in medium- and large-sized firms in German language countries. However, his study does not analyze performance implications and is limited to technology-oriented sectors and manufacturing industries. Van de Vrande et al. (2009) analyze innovative small- and medium-sized enterprises in the Netherlands and find that open innovation is as relevant for service firms as it is for manufacturing firms. They identify organizational and cultural issues as the main barriers to the successful adoption of open innovation. The Swiss Economic Institute (KOF) Innovation Survey, the Mannheim Innovation Panel of Germany and the Community Innovation Survey of the European Union have not yet focused in detail on the effect of open innovation on innovation performance. Although the European Community Innovation Survey evaluates the existence and importance of innovation collaborations, no performance implications of different open innovation activities are reported (CIS/Eurostat, 2008).

The literature review manifests a lack of empirical evidence of performance implications of open innovation. To close the research gap, this thesis investigates whether firms that emphasize open innovation can positively influence their innovation performance and which open innovation activities contribute the most

to innovation performance. Multiple types of performance measures are considered, namely, process and product innovations, incremental and radical innovations as well as the percentage share of sales made up of newly developed products and services. The study broadens the prevalent perspective by analyzing open innovation in manufacturing and service sectors except the banking and insurance sector. R&D managers of stock-listed enterprises in Germany, Switzerland and Austria are subjects of the empirical study. Data were collected through an anonymous online survey available via the associated Internet domain name <http://www.open-innovations.ch> (see Appendix for more information). Contact details of the firms' managers were collected via the companies' web pages and via telephone. A total of 783 companies were contacted in the survey period from April to June 2009. From these companies, 141 R&D managers provided complete valid responses, representing a response rate of 18 percent.

The terminology used in the questionnaire was based on the commonly agreed definitions provided by the Oslo Manual (OECD/Eurostat, 2005), which is relevant for both the manufacturing and the service sector. As three core processes of open innovation in R&D management exist (Gassmann & Enkel, 2005; Chesbrough & Crowther, 2006), the questionnaire was structured accordingly. Whereas companies monitor the environment and acquire knowledge in the *outside-in process*, the commercialization of in-house knowledge is the main purpose of the *inside-out process*. The *coupled process* combines outside-in and inside-out processes and focuses on network usage. In addition, we evaluated characteristics of the companies' innovation strategy and innovation culture. The thesis provides new empirical evidence that allows statements about the impact of open innovation activities on firms' innovation performance.

The second chapter focuses on the outside-in core process of open innovation and analyzes the impact of its openness on innovation performance. To represent determinants for openness, we measure the existence and intensity of outside-in open innovation activities during the five-year reference period from 2004 to 2008. The open innovation activities refer to knowledge acquisition from different stakeholders relevant for R&D. The stakeholder selection is similar to existing

studies (e.g., CIS/Eurostat, 2008; Arvanitis et al., 2010) to facilitate the comparability of the results. The results reveal interesting differences between intra-industry and cross-industry cooperation. Whereas the first form of knowledge acquisition has a positive influence, the latter has a negative effect on innovation performance.

The third chapter analyzes the impact of an open inside-out core process on firms' innovation performance. Inside-out open innovation involves the exploitation of existing internal knowledge and technologies. The empirical results show that companies pursuing closed innovation are more likely to create incremental innovations. Companies that emphasize inside-out open innovation exhibit a higher radical (breakthrough) innovation performance.

The fourth chapter deals with firms' internal and external innovation perspective. The internal perspective focuses on firms' corporate culture and its internal openness to access the collective intelligence of the entire workforce. In particular, we examine the impact of cross-functional teams in R&D projects on innovation performance. The external perspective deals with the impact of coupled innovation activities resulting from Web 2.0 and social networking technologies. The results reveal that cross-functional teamwork in R&D projects has been increasingly implemented as a part of firms' internal network strategy. Remarkably, we found no significant effect of intensive cross-functional employee cooperation on firms' innovation performance. Regarding the coupled process, firms using Web 2.0 and social networking technologies to a greater extent show higher innovation performance. Additionally, the endurance of external networks and a fault-tolerant corporate innovation culture play a crucial role in achieving high innovation performance.