



Open innovation: so far and a way forward

Mokter Hossain

*Department of Industrial Engineering and Management,
Aalto University, Espoo, Finland*

Abstract

Purpose – The purpose of this paper is to identify strategic and tactical factors that are crucial to explore, in future, to get insight into the open innovation spectrum.

Design/methodology/approach – The study is based on literature review. To explore progress and future needs of open innovation studies, various contributory papers have been consulted and analyzed.

Findings – Definition of open innovation is yet to be clear-cut. What open innovation is and what it is not, is still being debated. Moreover, open innovation overlaps other concepts such as user generation, crowdsourcing, and distributed innovation. Even though research on open innovation has significantly grown, there are still many issues that need to be addressed to get insight about open innovation in various contexts. Studies are mostly performed in the context of large firms and in developed countries. Research in the context of developing countries is still almost an untouched area. Open innovation in the small to medium-sized enterprises' (SMEs') context has gained a foothold just recently. It is crucial to explore some managerial challenges, such as technology transfer, inbound and outbound process, absorptive and desorptive capacity development, particularly in the global open innovation context and it is essential to investigate how open innovation can be implemented for sustainable development.

Originality/value – This study is one of the few, if not only one, that has reviewed the trend of open innovation research and its practical implementation. Both researchers and practitioners will get a snapshot of open innovation and its growing necessity in the business world. Some issues have been highlighted, so that future study can be focused in those directions.

Keywords Open innovation, Challenges, Technology transfer, Intermediaries, Intellectual property, Small to medium-sized enterprises, Sustainable development

Paper type General review

Introduction

Open innovation concept has received tremendous attention from, both academicians and practitioners. The concept has been an explosion in the innovation function of many firms since it was introduced by Chesbrough (2003). He defines open innovation as “paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology.” This concept has become a commonplace across all technological industries (Weiss and Drewry, 2011). Open innovation concept emphasis on sharing knowledge within and among organizations (Abouzeedan and Hedner, 2012). However, most firms still struggle with how to implement open innovation concept in their business portfolios (Enkel *et al.*, 2009; Minshall *et al.*, 2010). Company and industry press are full of growing triumph of flourishing trend of open innovation (Haydock, 2011; Sheridan, 2011). Open innovation is growingly adopted in various disciplines, such as economics, sociology, energy, anthropology, psychology, etc. Despite its flourishing growth, critics are continuously throwing sarcastic remarks



against this overwhelm expanding concept. Moreover, there is an enormous lack of information on the effectiveness of the open innovation concept (Nakagaki *et al.*, 2012). Although open innovation has been adopted widely, what open innovations mean, its scope, how it is distinct and unique, etc. are under a great debate. Some researchers use different names for the same concept and some concepts overlap with the open innovation concept. Hence, this paper aims to throw some insight into the open innovation concept. Considering the progress of open innovation literature, this study finds research gaps and pinpoints future research direction on open innovation.

Definition of open innovation

Open innovation is not a clear-cut concept yet. It is expressed in various forms in the literature (Huizingh, 2011; Schroll and Mild, 2012). Generally, open innovation is an antithesis of closed innovation which implies vertically integrated model while internally developed product and distributed by firms. With extensive literature review, Dahlander and Gann (2010) point out that there are varieties of definitions of open innovation in the present corpus of literature. The definition of Chesbrough is the most widely accepted but seems too broad. There are some other definitions, too. For instance, another definition of open innovation is built on the concept of open-source software (von Hippel, 2005). However, Chesbrough (2012) believe that this definition does not consider the idea of business model and even there is no significant intellectual property (IP) protection for innovation. Anyhow, both types of open innovation imply powerful tools to stimulate innovation (Chesbrough, 2012).

Open innovation concept introduced by Chesbrough has been considered mainly relationship between various institutions for innovation. What is really open innovation is still in great discussion among the researchers and practitioners. Many researchers publish paper in the name of open innovation, which other researchers do not agree with these studies to fall under open innovation. West (2012) surprised, after some literature review on open innovation, to see the use of open innovation concept when it was not. Open innovation overlaps with numerous other concepts such as open source, user innovation, crowdsourcing, co-creation, distributed innovations, etc. and hence frequently create confusion and conflation even among researchers of this field.

According to West and Gallagher (2006), open-source community might use some elements of open innovation but itself is not open innovation. User innovation is simply innovation performed by users. A commonly held belief is that open-source community works mostly free of cost and community members are not financially motivated. For instance, IP is not a considerable issue in open-source paradigm while it is a pivotal point in open innovation. Crowdsourcing is growingly getting attention especially in popular press. However, rigorous research on crowdsourcing is extremely meager. Only very recently several papers on crowdsourcing have been published in top-tier journals (e.g. Afuah and Tucci, 2012; Poetz and Schreier, 2012; Schweitzer *et al.*, 2012; Zheng *et al.*, 2011). Often times, crowdsourcing is considered tantamount to open innovation. The truth is crowdsourcing can be adopted in almost all purposes, for example, idea generation, design, opinion, encyclopedia, etc. InnoCentive – an intermediary platform – is frequently referred as both an open innovation and a crowdsourcing platform.

Types and boundary of open innovation

According to Chesbrough (2012), there are mainly two kinds of open innovation: outside-in and inside-out. Dahlander and Gann (2010) further classified outside-in open

innovation into two: sourcing and acquiring. They also classified inside-out open innovation into two: revealing and selling. The outside-in open innovation means opening up a company's innovation process to external environment while inside-out implies allowing external parties to use ideas which are internally un(der)used by a firm. The former aspect of open innovation has received tremendous attention, both in academic research and in industry practice while the latter aspect of open innovation is limitedly explored (Chesbrough, 2012). Apart from these two main classifications of open innovation (outside-in and inside-out), some researchers propose combined or coupled open innovation when both outside-in and inside-out open innovation processes take place simultaneously (Gassmann *et al.*, 2010; Veugelers *et al.*, 2010). Open innovation considers idea spillovers as a consequence of the company's business model. Spillover ideas are not considered as burden but as opportunities to expand the business model or spin-off a technology outside a firm with a different business concept. Another distinction of open innovation is the treatment of IP.

Academicians are continuously publishing research results related with open innovation successful cases. Moreover, consulting firms are offering new package based on open innovation concept. Some intermediaries are capitalizing from this opportunity and help large firms to transfer technology. The purpose of bringing technology to a firm is not to substitute but to complement internal technology of that firm. Connecting with different related people helps to accelerate technology transferring process. In early stage of idea generation, external people can have valuable contribution and boundaries are not clear. However, in later stage making boundary is crucial because to make an idea successful needs investment and coordination. Hence, IP protection is important to get return on investment. Technology transferring under open innovation largely depends on collaboration between internal people and external parties. People of a firm need to work with people moving out of that firm. On the other hand, external idea evaluation is difficult as little information is known about these ideas. For some valuable reasons, however, involving in technology transferring is imperative for many firms.

Technology transfer in open innovation

Firms are increasingly becoming aware of the technology exchange imperativeness. Exploitation of new ideas and find technology from external sources are a growingly considerable issue for many companies (Verbano and Venturini, 2012). Firms are also boosting of their open innovation success. Universities are opening new outlets and reshaping those outlets for technology transfer. Technology plays crucial role in open innovation as it flows various ways, such as inflow, outflow, coupled and cross-licensing (Chesbrough, 2003; Gassmann *et al.*, 2010; Veugelers *et al.*, 2010). Moreover, Van de Vrande *et al.* (2010) state three activities for technology exploitation: venturing, outward licensing of IP and involvement of non-research and development (non-R&D) personnel in innovative activities. The value of technology invention mainly depends on a business model of the enterprise (Chesbrough and Rosenbloom, 2002).

Traditionally in closed model, firms keep their IPs secreted and utilize in their internal uses and to acquire freedom and avoid costly litigation. Larger portion of patents neither used internally nor licensed out. In Proctor and Gamble, for instance, < 10 percent of patents are used internally (Sakkab, 2002). More than half of the Dow's patents remain unutilized. Most firms do not know the proportion of patents that are used internally or externally. Around 70-90 percent of patents languish and die

(Lichtenthaler and Lichtenthaler, 2010). More striking issue is that these unused patents are not even licensed out. Nokia Corporation has taken a unique initiative. It gives away non-core ideas as charity to other small firms who can make them commercial success (Hossain, 2012a). Small- to medium-sized enterprises (SMEs) are also heavily involved with technology sourcing. Lack of financial availability force them outsource some of their activities.

Recent years witnessed enormous interorganizational relationships for technology transfer. Firms consider technology as a crucial issue for various reasons, such as short technology life cycles, emerging and new technologies, risk sharing in technology development, R&D globalization, growing rivalry among firms, growing role of venture capital in financing technology to flourish, etc. (Vanhaverbeke *et al.*, 2012). Technology transferring is still challenging for most firms. Technology-related knowledge is unique in each case and transferring process is complicated (Mowery *et al.*, 1996; Simonin, 1999; Lichtenthaler and Lichtenthaler, 2010). Firms need to develop absorptive and desorptive capacities for technology transfer (see e.g. Cohen and Levinthal, 1990; Lichtenthaler and Lichtenthaler, 2010). Studies repeatedly show the increasing importance of technology management, too (Davis and Harrison, 2001; Rivette and Kline, 2000).

Most of the technologies transfer in one direction – one organization acts as a source and another as a recipient. Here source organizations need desorptive capacity and recipient organizations need absorptive capacity. An increasing emergence in is technology transfer while both parties are source and recipient simultaneously and each party should have both absorptive and desorptive capacity (Lichtenthaler and Lichtenthaler, 2010). Interfirm collaboration is a fundamental necessity to accelerate technology exchange, access to external resources (Spekman and Celly, 1995). No doubt, the degree of technology transfer varies enormously in different geographical locations. US firms are more active than European firms in technology transferring. Asian-based firms are very passive in technology transferring activities.

The role of intermediaries in open innovation

A set of bodies, which plays various roles in innovation process, has emerged, and they are called as intermediaries (Howells, 2006). The intermediaries are growingly playing important role in innovation and technology transfer (see cf. Hossain, 2012b). Firms often approach innovation intermediaries for their technology and idea. For many firms, it is essential but challenging to establish relationship with intermediaries (Sawhney *et al.*, 2003; Zhang and Li, 2010). Large firms rely on the R&D efforts of outside firms. The role of intermediaries beyond the company premises in creating, assessing, technological and social innovation is a recently growing phenomenon (West and Lakhani, 2008). The intermediaries are not just only broker houses but also they search, transform ideas and provide solutions aiming to fit individual clients need (Hargadon and Sutton, 1997). Necessary knowledge relevant to accomplish activities largely resides beyond a firm's boundaries (Lakhani and Panetta, 2007). So far, only a few empirical studies on open innovation intermediaries are performed (Lichtenthaler and Ernst, 2008). Intermediaries play pivotal role for technology transactions even though the real selling/buying firms decide transfer process as every firm is unique and has expertise on a particular technology (Autio *et al.*, 2004). The process of innovation and idea generation is increasingly becoming more open and widely distributed and that result growing collaboration between intermediaries and various firms (Coombs *et al.*, 2003). Intermediaries are also important in the low-income

countries for entrepreneurship and technology catch-up (Mazzoleni and Nelson, 2007). Several recent studies have provided some insights into intermediaries (see e.g. Gassmann *et al.*, 2011; Howells, 2006; Lichtenthaler and Ernst, 2008; Sawhney *et al.*, 2003; Tran *et al.*, 2011; Von Nell and Lichtenthaler, 2011). The scope of intermediaries are increasingly growing toward various new fields, such as technology transfer and diffusion, innovation management processes, networks and systems innovation, service organizations, etc. (Howells, 2006). They play a very important role in developing countries, too (Zhao and Zheng, 2011). The success rate of the intermediaries is limitedly known as they do not disclose about their transaction details (Lichtenthaler and Ernst, 2008). Often, intermediaries are not considered in innovation and technology studies (Cooke *et al.*, 2004; Godin, 2005; Malerba, 2002). Studies show that intermediaries lack necessary theory and model in the extant literature (Howells, 2006; Lichtenthaler and Ernst, 2008; Phan *et al.*, 2005). The popular triple helix model included industry, university and government but ignored intermediaries (Etzkowitz and Leydesdorff, 2000) despite their utmost importance in innovation and technology transfer. Some intermediaries have managed to attract venture capital (Lichtenthaler and Ernst, 2008). It means venture capitalists are convinced to invest in this kind of intermediary endeavor.

Open innovation in SMEs

For some important reasons, considering open innovation in SMEs has become utterly crucial. An important part of open innovation is its implementation in SMEs. Open innovation in SMEs has received limited attention and hence appropriate studies on open innovation in SMEs are not common in research arena (Vanhaverbeke, 2012). Studies on open innovation mainly focus on large and technology-oriented firms (Chesbrough, 2003). SMEs' contribution is remarkably high in any national economy. Several studies have highlighted various issues related with implementation of open innovation in SMEs (Christensen *et al.*, 2005; Henkel, 2006; Lecocq and Demil, 2006). Yet, there are many other issues that remained unexplored. Moreover, SMEs also diverse in their activities and most SMEs do not have capability for systematic R&D works. Even though, large firms share the larger part of R&D expenditure of a country, the share of SMEs in R&D expenditure is growing rapidly. In USA, for instance, R&D spending of SMEs has increased from only 4 percent in 1981 to 24 percent in 2005 (National Science Foundation, 2006). Some evidences show that open innovation is even more important for SMEs than for larger firms (see e.g. Vanhaverbeke, 2012). So far, a few studies on open innovation in SMEs context are performed considering US firms (Chesbrough and Crowther, 2006; Lecocq and Demil, 2006). In European context, only several empirical studies with larger samples have been performed, too (Lichtenthaler, 2008; Parida *et al.*, 2012; Van de Vrande *et al.*, 2009). A few studies have been performed on whole Asian-based firms (see De Jong and Marsili, 2006; Kim and Park, 2010; Lee *et al.*, 2010; Massa and Testa, 2008; Su *et al.*, 2010; Suh and Kim, 2012; Vrgovic *et al.*, 2012; Zeng *et al.*, 2010). These studies are mainly based on specific industries and only provide a glimpse of ideas of particular industries. However, geographically, South America remained almost unexplored. SMEs lack resources, capability and IP protection. They need to collaborate closely with other large and small firms. SMEs deal with growing number of actors in innovation system with their market maturity and expansion (Laursen and Salter, 2006). They face more complex challenges for innovation and commercialization of their technology. A central concern is how to utilize the internal R&D capabilities of SME to maximize benefits through

open innovation (West and Gallagher, 2006). Hence, further studies considering some important aspects of open innovation in SMEs are crucial.

A note for future focus

Definitions of open innovation are not in coherence to place into an analytical framework. Open innovation was always used in various extent in decades back. Firms were incessantly relied on inflows and outflows of ideas. Open innovation literature congregated these ideas under an umbrella and makes it a distinct field for studies. Changing business model into open mode is a standing call for firms and open business model is crucial for creating value from a technology or an idea. Strategy of risk associated with open innovation is not also explored yet. The scope of open innovation studies is broadening. The boundary condition of open innovation is still not so clear and we need a lot more rigorous studies. Studies on inbound open innovation activities should get more priority than outbound open innovation activities. There are, at least, some aspects which demand urgent studies to understand open innovation on those contexts. For instance, open innovation in SMEs, technology transfer in open innovation, relation between open innovation and entrepreneurship, individual's role in open innovation process, etc. are among many others. Van de Vrande *et al.* (2009) point out that to executive open innovation, strategy, organizational structure, culture and human factors, etc. are crucial. Open innovation studies are performed typically on a particular industry, country, regions, etc. Future studies can consider global-level studies by considering data from several industries and from various countries of the world. Studies on several levels, such as organizational, human resources, industry, firm, individual, etc. are very crucial to expand in future. Even though studies on open innovation have stepped into Asian countries, it is limited within the countries of highly growing economies, such as South Korea and China. Despite Japan being a highly innovative country, there are no remarkable studies on open innovation in Japanese context. It seems, on the other hand, India is a fertile but uncultivated ground for open innovation research.

Extant literature has limited or no studies on failure cases of open innovation. Some issues related with open innovation have still remained untouched, for example, how to measure the benefits of openness in monetary figures, how should workforce be aligned to capitalize from openness, more importantly, how to align technology transfer strategy to corporate strategy, how to convince management for technology transfer if management is reluctant to adopt technology transferring strategy. We need to know the factors for open innovation failure. Another aspect of open innovation is the balance of internal and external R&D. Many people who work in R&D division of a firm fear that they might lose their jobs because of openness of innovation. Consequently, these people are reluctant to cooperate in technology transfer. There is little insight into costs associated with opening up innovation process. We need extensive studies on that field. It will help managers to know in which case open innovation is a profitable strategy. Future studies can explore costs vs benefits of openness. Process of sourcing technology is limitedly explored. Both theory and practice might be enriched through investigating how information and communication technology help to openness. How firms maintain necessary relations and avoid unnecessary relations, avoid risk, etc. is important to know in great detail. We need significant evidence about how firms integrate different ways of openness.

Literature on technology transfer is very fragmented and lacks continuous research stream. Technology transfer in both directions (outward and inward) is still unexplored

but it is an important element of open innovation. There is an urgent need to explore technology commercialization phenomenon. Technology transaction in small firms is an unexplored area in open innovation. Studies on absorptive capacity conducted to a considerable extent but still we need more research to understand it for very quickly changing technology market. Research on desorptive capacity is still in the cradle. To understand various means of technology transfer, large-scale research on absorptive and desorptive capacity is necessary. Researchers triumph only successful cases of technology transfer while failure cases and reasons of those failures are rarely explored. Managers still baffle in technology transfer, hence there are urgent necessity for research to find factors that stop managers to be active in technology transferring. The role of technology transferring in corporate strategies, relationship pattern among various stakeholders, etc. could be pertinent for future studies. We need to know how various technology-transfer-related functions vary in terms of location, time, culture, industry, economy, etc. There is an extreme necessity to establish theories and models to understand when to adopt only out-licensing, only in-licensing and combination of both. Researchers have a lot more to do to tackle these issues. Moreover, performance measurement scale in technology transferring is important for managers so that they can measure technology transfers. The role of venture capital in technology transfer is growing and hence, insightful studies are necessary in this area.

Open innovation in SMEs is a relatively newly considered area of study. Previous studies show that open innovation lesson learned from large firms is not appropriate in SMEs context. Only a handful of studies are performed so far. More rigorous analysis in various industries and markets is necessary. Studies should consider geographical contexts, such as South America, Asia, etc. Studies on open innovation in SMEs mainly cover ICT and biotechnology and these research results are not relevant for many other SMEs. The role of managers and entrepreneurs to implement open innovation in SMEs is still unexplored. Future studies may bring connection between entrepreneurship literature and open innovation and it will help to strengthen our understanding. Moreover, the relationship between open innovation in SMEs and discovery-driven growth theory could be a new area to explore. To make a rich body of literature, it might be a wise to approach various management disciplines together. Studies may take broader approach to generalize research results so that policy makers can establish policy for open innovation in SMEs. Some activities related with open innovation in SMEs are easy to implement, others are complex. Future studies may scrutiny various activities to understand the degree of their complexity. Interaction between large and small firms differs in open innovation management. Moreover, culture, decision-making process, firm size, industry, and organizational structure, and financial structure, etc. should consider in the future studies.

The open innovation concept is continuously covering multiple organizations collaborating together. Hence, more complex issues are emerging. How to protect IP and share ideas among different stakeholders is a growing concern for collaborating organizations. Managing open innovation activities is going to be significantly crucial in future. It will not be limited within a few large firms anymore rather it will be a part and parcel of all variety of organizations. Open innovation process provides facilities to transfer internal and external knowledge in various organizations with variety of modes. We need to know much about its boundary, critical success and failure factors, challenges for different sizes and levels of organizational structures. Extant literature has no rigorous studies about difficulties managers face to implement open innovation culture among employees and in various divisions in a company

(Rufat-Latre *et al.*, 2010). Some researchers have contributed on the challenges firms face in open innovation implementation (Nakagaki *et al.*, 2012).

Skeptics, however, point out that this open innovation concept has been exercised long before Chesbrough's introduction and it is a false dichotomy (Trott and Hartmann, 2009). Other researchers believe that open innovation concept is a very short-sighted idea (Woudhuysen, 2012). It is true that the downside of open innovation is rarely a focal point of researchers. Despite all these hurdles, open innovation concept is flourishing. Any kind of open innovation policy should consider sustainable development issues. So far, literature on open innovation namely deals with business benefits and consideration of sustainable development in open innovation research field remains totally ignored. Open innovation model might help firms and governments to provide sustainable products and services that can contribute to overall global sustainable development. Impact of open innovation concept to achieve a sustainable value particularly in developing countries could be an interesting area for future studies. How open innovation can be implemented for sustainable development should be a fundamental focus of future research.

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About the author

Mokter Hossain is a Researcher at the Department of Industrial Engineering and Management, Aalto University, Finland. His research interest includes open innovation, crowdsourcing, intellectual property, technology transfer, and user innovation, etc. He has published several journal papers and more than ten conference papers in these fields. Mokter Hossain can be contacted at: mokter.hossain@aalto.fi