European Research Studies,
Volume XIV, Issue (1), 2011

Open Innovation: Organizational Challenges of a New Paradigm of Innovation Management

José López Rodríguez[1], Antonio García Lorenzo[2]

Abstract:

The goal of this paper is to analyze the main problems that emerge from the open innovation model. Adopting as analytical framework an organizational perspective we divide the main challenges that arise from the management of open innovation in two main categories: coordination problems as a result of open the innovation system to ideas and knowledge that may lie outside the boundaries of the firm and, incentive problems related with the creation and value capture of ideas an knowledge by the innovator. We describe and analyze several problems related with coordination and incentives.

Keywords: *Open Innovation, Coordination, Incentives, Intellectual Property*

JEL Classification: *M12*

[1] *Contact author: Department of Economic Analysis and Business Administration, Faculty of Economics and Business, University of A Coruna, Campus de Elvina, s/n, 15071, A Coruna (Spain), *jolopez@udc.es*
[2] *Department of Economic Analysis and Business Administration, Faculty of Economics and Business, University of A Coruna, Campus de Elvina, s/n, 15071, A Coruna (Spain), aglec@udc.es*

1. Statement of the Problem

Open innovation is a term coined by Professor Henry Chesbrough in his book, *Open Innovation: The new imperative for creating and profiting from technology* (2003, HBS press) that relates with the management of innovation processes. Open innovation is a paradigm that assumes that valuable ideas can come from inside or out of the company and can go to the market from inside or outside the company as well. This approach places external ideas and external paths to market on the same level of importance as that reserved for internal ideas and paths to market during the Closed Innovation era. At the heart of the open paradigm is the assumption that enterprises cannot conduct all R&D activities by themselves, but instead have to capitalize on external knowledge which can be licensed or bought (Gassmann, 2006). At the same time, open innovation assumes that internal ideas and knowledge can also be taken to market through external channels, outside the current business of the firm, to generate additional value (Chesbrough et al., 2006).

These movements of knowledge and ideas *outside-in* and *inside-out*, referring in the innovation literature as technology exploration -innovation activities to capture and benefit form external sources of knowledge to enhance current technological developments) and technology exploitation –innovation activities to leverage existing technological capabilities outside the boundaries of the organization- (Rothaermel y Deeds, 2004;Lichtenthaler, 2008) present two main general organizational problems for firms[3] named coordination and incentive problems. In this paper we analyze and describe several problems related with coordination and incentives.

2. Organizational Challenges of Open Innovation: Coordination and Incentives

Organizational design encompasses two key elements; one is the design of coordination mechanisms between activities and tasks and the other is the design of an incentives system that serves as reward system and to avoid opportunistic behaviour (López et al, 2010). In this sense and using this essential framework of organizational design we apply it to analyze different problems that raise the management of open innovation related with coordination and incentives.

2.1 Coordination Problems

Coordination implies not only the design of mechanisms of interrelation between activities/firms/organizations for innovation (coordination post-contractual) but also the searching and selection of ideas, knowledge/collaborators for carry out

[3] Open innovation embraces a pool of different practices both technology exploration and technology exploitation practices, each of one presents its specific problems (van de Vrande et al., 2009), but our goal is to frame and describe using the more representative tools of organizational design the more general problems of open innovation not the very specific problems associated to every single practice.

the innovation activities (coordination pre-contractual). In this sense when firms implement an open system to innovation they face several problems. Some of these problems related with the coordination tasks are, the searching valuable ideas and knowledge outside, networking and divergence.

The problem of searching valuable ideas outside

One of the first coordination problems that face open innovation is the searching of external sources of ideas and knowledge to enhance current technological developments (coordination pre-contractual). This problem arise searching or information costs (of competitive intelligence). The importance of theses costs are very variable depending on the type and nature of innovation process. For example, these costs can be very high for a very complex innovation process and less costless for a more simple innovation development. Also, the searching costs include not only the production of information about suppliers but the own needs of the firm which not always are known clearly.

The problem of networking

When open innovation is operationalized through the collaboration of multiple partners the coordination tasks became more complex because of the increasing number of participants. Greenstein (1996) points out that openness increases costs because it requires the cooperation of multiple suppliers and /or complementors. For example, the construction of Boeing 787 Dreamliner which meets multiple technologies from many companies located in more than a hundred locations, have meant a huge amount of work in terms of coordination all of these companies to achieve the maximum potential of them. In strategic terms, the competitive advantage of Boeing doesn't come from its technical knowledge from hundreds of technologies but from the way of coordinate and link all of these companies to the project (Zabala Martínez, 2009). In this sense, an efficient coordination will create more value from innovation, not only form firms engaged in innovation but for customers and society in general.

The problem of divergence

Another problem related with coordination in open innovation processes have recently been posed by Almirall and Casadesus-Masanell (2010) named as divergence cost. These authors arguing that when a product or system is opened to outside suppliers or complementors, some choices that could have been made by the original system designer are now undertaken by independent firms that pursue their own interests. Devolving control in this manner provokes that the system developer loses some freedom to establish the technological trajectory of the system. Restraining this freedom is costly since it amounts to operating under constraints that could have been avoided with a closed approach. Indeed, suppliers and complementors are likely to maximize their own payoffs, not those of the original designer. And while there may be some positive correlation between the interests of

different industry players, goals generally will not be perfectly aligned. So openness can generate costs of suboptimal coordination due to divergent objectives of firms. In particular, these authors found that open innovation generally is superior to closed innovation when complexity is not high because networks of companies in charge of development come up with better products and these benefits of discovery offset the cost of divergence. For very basic and very complex innovations companies follow a close approach to innovation.

Finally, we have to say that failures in the coordination tasks can caused very important delays in the project development and carry out billionaire losses. Therefore, coordination is a very important problem when open innovation is launching, especially for projects of great magnitude and importance that requires multiples participants.

2.2 Incentive Problems

Incentive problems of open innovation coming from the opportunistic behaviour of agents (both from inside and outside the firms) in relation with the management of ideas and knowledge for innovation witch can affect the creation and value capture of them. Some of these problems related with incentives are, the left ideas inside the firm, the information revelation, team production, and commercialization.

The problem of left ideas inside the firm

Chesbrough (2003) in his investigation on firm innovation practices argues that there are many ideas and knowledge left inside the firms without developing, I meant, without taking them to the market, because other ideas receive more attention for commercialization. In a framework of open innovation, this situation can create incentives in some employee or group of employees to develop these internal ideas and knowledge outside the firm creating new independent firms (venturing activities -Spin-outs[4]-). So, the parent company can fail to take advantage or not make profitable their own ideas and knowledge which other business models can do it.

And, what can be worse, other companies that exploit these ideas can become competitors of the original firm, taking market share from it. Related with this Franco and Filson (2006) examine spin-outs as a source of technological diffusion in rapidly evolving high technological industries. Their analysis suggests that, other things equal, research-oriented employees accept lower wages at firms with better technological know-how in exchange for the implicit opportunity to learn about their employer's technology and capabilities. Employees who successfully

[4] Spin out is a firm formed when an employee or group of employees leaves an existing entity to form an independent start-up company. The parent firm can be a firm, a university or another organization. A spin-off is created when a firm creates a new firm out of one of its existing divisions, subsidiaries or subunits. In the case of a spin-off, the new firm is created as a deliberate act of the parent, and the owners of the parent are the original owners of the new firm (but only temporarily).

learn can leave their employer and start their own firms using some of their former employer's know how. As this opportunity has high future value, employees are willing to accept lower wages today in return for the chance to "spin out" tomorrow.

The problem of revelation (a problem of economic information)

In a context of open innovation another problem that companies face are related with the transmission or managing of information (intellectual property) across their boundaries (Chesbrough, 2006). Ideas, knowledge or technology that firm possesses cannot be revealed completely to possible clients or allies (collaborators) because this transforms a private good in a (quasi) public good without any compensation. Once the information is transferred into the market the firm can loose the economic value of information making difficult to recover it (Arrow Information paradox[5]).When the potential purchaser has this detailed knowledge as to understand its capabilities can decide whether or not to buy it. Even though innovators may have difficulties when share or reveal information to others for appropriating its value there is still another way of reveal information that firms cannot control by themselves, the mobility of employees. In this sense, Arrow (1962) writes: "Mobility of personnel among firms provides a way of spreading information. Legally imposed property rights can provide only a partial barrier, since there are obviously enormous difficulties in defining in any sharp way an item of information and differentiating it from other similar sounding items"
And later,"… the inventor will have in any case considerable difficulty in appropriating the information produced. Patents laws would have to be of an unimaginable complexity and subtlety to permit such appropriation on a large scale".

The problem of team production

Cooperation or collaboration between firms in an Innovation Project (under a schema of open innovation) can face a problem of team production[6] In a typical situation of team production it is difficult and costly to measure the contribution of each participant to the final output, and this can originate that some of the participants do not carry out a suitable effort in their tasks, because they are engaged in other more interesting projects, thus affecting –reducing- the potential value of the project Therefore, firms working together in an innovation project need to have an adequate system of incentives to avoid free-riding problems. In this sense, some works (Hoffman y Schlosser, 2001) show that free riding behaviour, among other problems, are factors that affect the success of strategic alliances in small and medium-sized enterprises.

[5] Takenaka, Toshiko (2008): Patent Law and Theory: A Handbook of Contemporary Research. Research Handbooks in Intellectual Property. Edward Elgar Publishing.
[6] The analysis of team production was developed from Alchian y Demsetz (1972).

On the other hand, alliances, joint projects and collaboration on ideas and technology need great specific investments depending on the participation of the other part to be put in value and therefore it demands very complex guaranties, mutual knowledge and confidence which cannot be generates rapidly and instantaneously.

The problem of commercialization/exploitation

When there is the possibility of use and exploitation of a firm technology by other firms (a typical feature of open innovation), the strength of property rights can be damaged. This can affect the innovator capacity to capture value from innovation (also the opposite is true, because firms can increase their benefits through technology licensing, but our paper is focus on problems of open innovation), thus affecting the incentives to invest (David y Greenstein, 1990). In this sense, the firm capacity for profiting from intellectual property licence depends on buyer's use of them. If buyers use licence for competing in the same market, this can produce a dissipation of the benefit (Arora et al., 2001), so the firm proprietary of technology does not have incentives to license it.

Also, Chesbrough, (2006) emphasizes that open innovation raises a challenge of imitation and devaluation of ideas that firms need to manage adequately. He said that if customer is a big company and the supplier a very small company, the small company has to be assured of that some of its best ideas and technologies are well protected. A big company working in a related area with the small company can allow the big firm to understand and imitate much of the value from the small firm without infringing directly its protected intellectual property. In order to avoid this problem big and small firms need to adopt practices for reducing this risk.

Finally we have to say that for the fruitful development of an open innovation system companies need to implement an incentive framework "win-win". This kind of incentive schema guarantee that all parts engaged in the innovation process (firms/organizations/consumers) will benefit and gain from openness.

3. Conclusions

Open innovation represents the antithesis of the traditional vertical integration model of innovation, where internal research and development activities lead to internally developed products that are then commercialize by the firm. By contrast open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology (Chesbrough et al., 2006). In a world where the chances of interconnection between people, firms, customers suppliers are enormous (caused by the great development of TIC´s –specially internet, but also, low transport cost) that makes knowledge more accessible than never before, firms, particularly in the context of innovation, can and should take advantage of this new

ecosystem for doing and improving innovation changing from "do it alone" to "do it with others". In this sense Jonas Ridderstrale y Kjell Nordstrom in his famous book, *Funky Business. Talent Makes Capital Dance,* (Book House Publishing AB, 2000) write that "*In the global village we can not do things alone. We need to meet partners for working all over the world. We need, the best not the closest ones*". The essence of open innovation subscribes this principle.

The management of open innovation besides its benefits and new opportunities for firms, especially for small and medium-sized firms, raises some important challenges from a pure organizational perspective that can be summarized in two key elements. The first one are the problems related with coordination as a result of engaging in collaboration with other agents in the innovation process and the second one are the problems related with incentives in the creation and value appropriation of ideas and knowledge from the innovator. Coordination problems arise from: i) the searching and information about ideas and knowledge – collaborators- that can be valuable for our innovation project, ii) the arrangement of cooperation when increasing the number of external contacts for innovation and iii) the divergent objectives of firms engage in an innovation project that can creates difficulties to establish the technological trajectory of the product increasing the coordination costs. Incentives problems arise from: i) the ideas and knowledge exploited out of the firm by the creation of spin outs that can become competitors of the original firm, ii) the transmission of ideas and knowledge across the boundaries of the firm loosing the economic value of them, iii) the problem of free riding when innovation is carry out with other firms (a typical problem of team production) and iv) the damaging of property rights and therefore the difficulties for profiting from technology when innovations are exploited by other firms.

Finally, even though open innovation represent a new way of managing innovation we cannot conclude that open innovation is always superior to closed innovation in every situation. There are some problems, as we related before, faced by open innovation that in a context of closed innovation does not emerge. So, new avenues of research need to conduct studies that prove empirically the benefits and advantages of adopt this new paradigm of innovation. In this sense some attempts have been made showing under which situations and contexts this paradigm prove to be superior to closed innovation (Almirall y Casadesus-Masanell, 2010).

References

1. Alchian, A. y Demsetz, H. (1972): "Production, Information Costs, and Economic Organization". *American Economic Review, Vol. 62(5), pp. 777-795*.
2. Almirall, E. y Casadesus-Masanell, R. (2010): Open versus Closed Innovation: A Model of Discovery and Divergence". *Academy of Management Review, 35(1), pp. 27-47*.
3. Benavides, C.A. (1998): Tecnología, Innovación y Empresa. Ed. Pirámide, S.A., Madrid.
4. Chesbrough, H. (2003a): Open Innovation: The New Imperative for Creating and Profiting from Technology. Harvard Business School Press, Boston, M.A.

5. Chesbrough, H. (2003b): "The Era of Open Innovation." *Sloan Management Review, 44, 3 (Spring): 35-41*.
6. **[x]**Arrow, K., Economic Welfare and the Allocation of Resources for Innovation, The Rate and Direction of Inventive Activity (Nelson editor), 1962.
7. [X] Franco, A.P. and Filson, D., Spin-outs: Knowledge diffusion through employee mobility, *RAND Journal of Economics, 37(4) (2006), p. 841-860*.
8. Chesbrough, H. (2006): Open Business Models: How to Thrive in a New Innovation Landscape. Harvard Business School Press, Boston, M.A.
9. Chesbrough, H,. Vanhaverbeke, W., y West, J. (2006): Open Innovation: Researching a New Paradigm. Oxford University Press, London.
10. David, P. y Greenstein, S. (1990): "The Economics of Compatibility Standards: An Introduction to Recent Research". *Economics of Innovation and New Technology, 1, pp. 3-41*.
11. Drucker, P.F. (1986): La Innovación y el Empresario Innovador. Edhasa, Barcelona
12. Edwards, T., Delbridge, R. y Munday, M. (2005): "Understanding Innovation in Small and Medium-Sized Enterprises: A Process Manifest". *Technovation 25, pp. 1119-1127*.
13. Franco, A.P. y Filson, D. (2006): "Spin-outs: Knowledge difusión through employee mobility", *RAND Journal of Economics, Vol.37(4), pp. 841-860*.
14. Greenstein, S. (1996): Invisible Hands versus Invisible Advisors: Coordination Mechanisms in Economic Networks. En E. Noam y A. Nishuilleabhain (Eds.), Public Networks, public objectives:135-160. Amsterdam: Elsevier Science.
15. Hoffman, W.H. y Schlosser, R. (2001): "Success Factors of Strategic Alliances in Small and Medium-Sized Enterprises: An Empirical Survey". *Long Range Plannig, 34, pp. 357-381*.
16. Hymer, S (1960): The International Operations of National Firms: A Study of Direct Investment. Tesis no publicada, MIT, Massachusetts.
17. Keil, T. (2002): External Corporate Venturing: Strategic Renewal in Rapidly Changing Industries. Quorum, Westport, C.T.
18. Lee, S., Park, G., Yoon, B. y Park, J. (2010): "Open Innovation in SMEs: An Intermeditated Network Model". *Research Policy, 39, pp. 290-300*.
19. Lichtenthaler, U. (2008): Open innovation in Practice: An Analysis of Strategic Approaches to Technology Transactions". *IEEE Transactions on Engineering Management 55(1), pp. 148-157*
20. Nieto, M.J. y Santamaría, LL. (2007): "The Importance of Diverse Collaborative Networks for the Novelty of Product Innovation". *Technovation*.
21. Rothaermel, F.T. y Deeds, D.L. (2004): "Exploration and Exploitation Alliance in Biotechnology: A System of New Product Development". *Strategic Management Journal, 25(3), pp. 201-222*.
22. Ridderstrale, J. y Nordstrom, K. (2000): Funky Business. Talent makes capital BookHouse Publishing AB, Originally edition Authors and BookHouse Publishing Sweden, 1999)
23. Rogers, M. (2004): "Networks, Firm Size and Innovation". *Small Business Economics, 22, pp. 141-153*.
24. Van de Vrande, V., Jong, J. P.J. y Vanhaverbeke, W. (2009): "Open Innovation in SMEs: Trends, Motives and Management Challenges". *Technovation, 29, pp. 423-437*.
25. Von Hippel, E. (2005): Democratizing Innovation. MIT Press, Cambridge, M.A.
26. Zabala Martínez, J. (2009): El desafío de la innovación abierta, (21/12/2009 en www.elpais.com)
27. Zeng, S.X., Xie, X.M. y Tam, C.M. (2010): "Relationship between cooperation networks and innovation performance", *Technovation, 30, pp. 181-194*.
28. López, J., García, M, y Mariz, R. (2010). "La naturaleza del diseño organizativo", Forthcoming in Cuadernos de Gestión.