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NEW SHAPES AND NEW STAKES: A PORTRAIT OF OPEN INNOVATION AS A PROMISING PHENOMENON

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An important literature in organization sciences has recently developed around the issue of open innovation (Chesbrough, 2003; Chesbrough *et al.*, 2006, Gassmann *et al.*, 2010, Huizingh, 2011). According to this stream of research, innovation is less and less frequently undertaken in-house, in a closed and integrated way, but becomes more “open” in the sense that many actors are involved in the different steps of the innovation process. Innovating firms increasingly rely on knowledge developed outside their borders. According to Chesbrough (2003; 2008), adopting an open innovation strategy is the key for success (Isckia, Lescop, 2010), although it is not the only one as remarked by Pisano and Verganti (2008).

Following the logic of open innovation, new forms of distributed innovative models and practices recently emerged (such as co-conception, innovation with customers, markets for ideas, crowdsourcing, open source, co-development, etc), which all shed new light on the nature of the economic problems and the management challenges at stake.

This article aims at introducing and defining the concept of open innovation, at presenting the new heterogeneous forms of open innovation that can be envisaged by firms and, most of all, at discussing the advantages and limits linked to each modality. In the first section we provide the main outlines of the concept of open innovation as it has been defined by Chesbrough (2003). In the second section we present the new modalities of open innovation practices (the shapes of open innovation). In the third section we discuss the costs and benefits of open innovation for organizations (the stakes of open innovation). In particular, we focus on the determinants that affect the success of such a strategy.

BRIEF REMINDER OF THE OPEN INNOVATION PARADIGM

For Chesbrough, who is considered as the initiator of this field of research, open innovation can be defined the following ways:

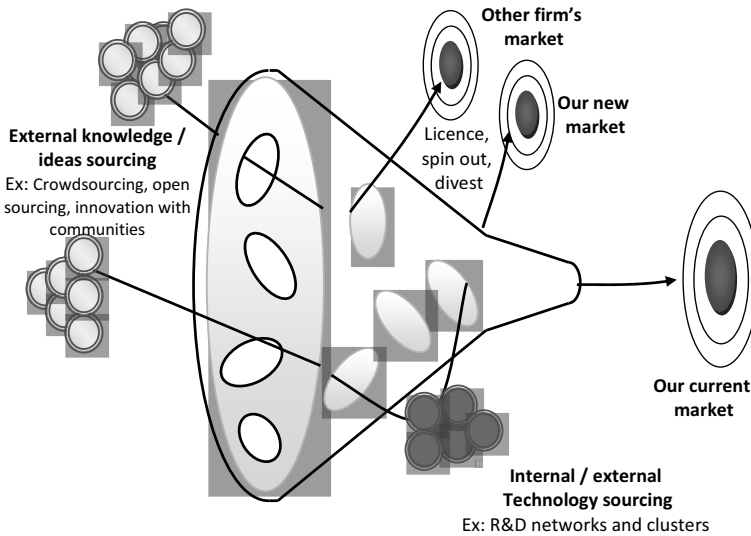
"I call the old paradigm Closed Innovation. It is a view that says successful innovation requires control. Companies must generate their own ideas and then develop them, build them, market them, distribute them, service them, finance them and support them on their own. This paradigm counsels firms to be strongly self-reliant, because one cannot be sure of the quality, availability, and capability of others' ideas: "If you want something done right, you've got to do it yourself" [...] For most of the twentieth century, this paradigm worked, and worked well."
(Chesbrough, 2003, p. xx and xxi; italics are ours)

"The Open Innovation paradigm can be understood as the antithesis of the traditional vertical integration model where internal research and development activities lead to internally developed products that are then distributed by the firm [...] Open Innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. 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, 2006, p. 1; in Chesbrough *et al.*, 2006)

The open innovation paradigm acknowledges that in a world-wide economy, with technologies becoming more and more complex, i.e. more difficult to understand and manage by one single individual or organization, it is necessary to find partners to collaborate with. As argued by Gassmann (2006, p. 223): "The 'do it yourself' mentality in technology and R&D management is outdated". This point was already raised several decades ago by Hayek (1945), for whom the increased complexity of the world was one of the most important advantages of a decentralized (market based) mechanism as compared to a centralized mechanism. In this line, open innovation is also a way to support division of labour and specialization in knowledge intensive activities.

Figure 1 depicts the famous innovation funnel than can be found in many works on open innovation (a very similar representation being already provided in Wheelwright and Clark, 1992). This innovation funnel sketches the various possibilities of open innovation which may arise during the innovation process. It illustrates how innovation goals, innovation actions, innovation teams and innovation results interact with one another to create change within the organization.

Figure 1 – The innovation funnel



Sources: Wheelwright and Clark (1992) and Chesbrough (2003)

The funnel delimitates the firm's boundaries: Inside this funnel are the firm's knowledge bases, patents, technologies, capabilities and so on. The arrows which pierce the funnel and get through it represent flows of ideas, knowledge and information stemming from outside the firm and which are absorbed by the firm, enriched with its own knowledge and finally encapsulated in its own stock of available innovative resources.

Flows enter the wide mouth of the funnel and progress towards its neck. During their progression, many of them will be eliminated because the firm cannot on its own, or with the help of others, transform those external ideas into innovation. On the contrary, if the idea is interesting enough, then the firm can enrich it, through the use of additional external knowledge and competences (as symbolised by the sourcing arrow at the bottom of the figure). Some arrows are directed towards the actual market of the firm and are

thus parts of the originally intended innovation process. Other arrows are leading to new markets which the firm discovers as the innovative process goes on.

As scholars in economics and management of innovation, it is critical to question the novelty of this open innovation paradigm. This question is all the more relevant that, in a sense, open innovation is very similar to what other authors have called “disintegrated innovation”, “modular innovation” (Brusoni, Prencipe, 2001), “distributed innovation” (Kogut, 2008; McKelvey, 1998), “dispersed innovation” (Becker, 2001) or “collaborative innovation”. All these concepts emphasise the fact that useful knowledge being increasingly dispersed, innovative activities are not the privilege of one single entity but are distributed over a wide spectrum of heterogeneous actors.

For instance, Wheelwright and Clark (1992) presented several theoretical variations of the innovation funnel (actually 3 archetypes) and observed one empirical version of it. By surveying managers, they confirm that in practice the funnel (i.e. the firm) includes and “digests” external ideas from different sources (universities, quality and control departments, customers, etc), thus adopting open innovation practices (even though Wheelwright and Clark do not use the word “open innovation”).

Hence, given all those previous works, open innovation can hardly be considered as a radically new concept. To understand the degree of novelty of the open innovation phenomenon, it is important to consider its two faces: Outside-in and inside-out (Isckia, Lescop, 2010). Outside-in consists for a firm to rely on external sources of knowledge and to absorb technologies developed elsewhere. Conversely, inside-out refers to situations where a firm sells and exports knowledge and technologies developed inside (to use external paths to market). The first face of open innovation, outside-in, is clearly not new at all (for Trott and Hartmann, 2009, it is “old wines in new bottles”). Practitioners and researchers had for long understood the importance for firms to rely on external knowledge, as emphasised for instance, by the abundant literature on the absorption capacity (Cohen, Levinthal, 1989).

The novelty of the open innovation stream of literature lies more in its second face: Inside-out. This point stands indeed in sharp contrast to traditional theories which consider knowledge and innovation as a core activity that should never be shared or sold (Mascarenhas *et al.*, 1998). Conversely to this conservative standpoint, open innovation strongly advises firms to consider using external paths to market, to deliver licenses to other firms, to create spin-offs, i.e. to share their knowledge with others. With respect to this point, open innovation is clearly linked to the emerging literature on markets for technology (Arora *et al.*, 2001; Arora, Merges, 2004; Arora, Gambardella, 2010).

Open innovation is often confused with open source practices, such as the ones that have emerged in software development. People frequently associate the two concepts and believe that adopting an open innovation strategy necessarily means to abandon its intellectual property rights and to put its knowledge into the public domain. Yet, open source-like phenomena are only one extreme case of open innovation (Pénin, 2011). Open source is both more open and more interactive than traditional modes of open innovation. We will see in the next section that most modalities of open innovation rely on secrecy and exclusive intellectual property rights. Unlike open source, open innovation is not about a community that builds a public good available to all. Open innovation is mostly about firms that develop bilateral (or multilateral) collaborations, that trade knowledge on markets for technology or that outsource a part of their research. In any of those cases, keeping the control over its technology is critical.

A way to stress the differences between open source and most cases of open innovation is to consider the role of intellectual property rights. Most studies emphasize that strong intellectual property rights, and patents in particular, are fundamental to ensure the raise of open innovation (Laursen, Salter, 2006). The reason here is that firms are more willing to collaborate and to exchange knowledge if they are protected. For instance, in the specific case of markets for technology, it is well-known that exchanging unprotected information is almost impossible (Arrow, 1962). Free riding behaviours would undermine the exchange. Hence, strong intellectual property rights, by preventing possible free riding behaviours, are critical to secure transactions and exchanges on markets for technologies. Similarly, in the case of formal R&D agreements, intellectual property rights are important to structure and secure the collaborations. In other words, open innovation is absolutely not innovation without intellectual property rights. Conversely, the latter are keys to the rise of the open innovation paradigm.

Put differently by Huizingh (2011), open innovation mostly coincides to situations where the innovation process is open whereas the innovation outcome remains closed (see Table 1).

Table 1 – Open innovation process vs. open innovation outcome (Huizingh, 2011)

		Innovation outcome:	
		Closed	Open
Innovation process:	Closed	1. closed innovation	3. public innovation
	Open	2. private open innovation	4. open source innovation

A reason often provided to explain the new dimensions taken by open innovation in the recent decade is the importance of technologies of information and communication (TIC). First, TIC has dramatically improved information flows. In other words, TIC has encouraged long-lasting practices of open innovation (such as formal R&D alliances) by easing the finding of partners and improving coordination. But TIC also facilitates interactions between multiple individuals. In this sense, they have allowed the emergence of new modalities of open innovation such as those that rely on recurrent interactions with an important number of different people (crowdsourcing, open source communities, etc.).

To conclude this section, open innovation is a very broad concept. It means that, with respect to innovative activities, the borders of the firm are nowadays more permeable (pieces of knowledge flow in and pieces of knowledge flow out). The position we adopt here consists in considering not only open innovation as a new wine (at least in its inside-out version) but also to investigate the new bottles it is encapsulated in. Open innovation obviously encompasses many very different modalities. Some practices of open innovation are very open and interactive whereas others are more secrets and lowly interactive. In the next section we propose an inventory of the new shapes that open innovation may take.

THE NEW SHAPES OF OPEN INNOVATION

Before providing the reader with a list of new open innovation practices, a certain number of caveats have to be made. First, the list we propose is not properly ordered. Future research will have to develop a coherent typology of open innovation modalities, according to their level of openness and interactivity among others. But, this is beyond the scope of our introduction. Furthermore, this list does not account for the types of partners considered. For each modality detailed hereby, partners can be suppliers, customers, rivals, public research organizations, or competitors. Third, we concentrate on the *new shapes* of open innovation, thus ignoring more traditional practices such as strategic alliances, co-conception, innovation districts and bilateral collaborations (Nooteboom, 2004). All those modalities have already been treated exhaustively in the literature, which explains why we prefer to focus on more recent and original practices such as crowdsourcing, innovation with communities, markets for technology and acquisition and spin-offs.

Crowdsourcing (or open sourcing). Crowdsourcing is a business practice that means literally to outsource an activity to the crowd (Howe, 2006; Burger-Helmchen and Pénin, 2011; Guittard and Schenk, 2011). Its emergence is strongly linked to the development of new technologies of informa-

tion and communication, especially to the Web 2.0 that eases the connection among a large number of dispersed individuals. With respect to inventive, complex or creative tasks, crowdsourcing implies that the firm, rather than solving a problem internally, posts it on a web platform, so that potentially everybody (the crowd) can try to solve it and submits solution to the firm. Then, the latter chooses the winning proposal, rewards it, produces it and commercializes it. As opposed to more formal and integrated forms of collaborations discussed above, in which firms collaborate with well-known partners with whom they may have developed tight links for a while, crowdsourcing is equivalent to really opening the collaboration, since potentially everybody can submit an answer.

Innocentive, founded in 2001 by Eli Lilly, remains today the most famous example of crowdsourcing (<http://www.innocentive.com>). This platform connects firms that have a problem that they cannot or do not want to solve internally and a crowd of inventors who are ready to devote time to solve those problems and are eager to find a solution. The sponsor (the firm) posts the problem online (describes it and sometimes also details the properties of the expected solution) and offers a reward for a solution to this problem. Then, inventors in the crowd provide solutions and one (or couple of them) win the prize. The “Connect and Develop” initiative of Procter and Gamble is also a well known example of crowdsourcing of inventive activities.

Innovation with communities (very often of users). Another modality of open innovation consists for firms to rely on external communities to which they outsource a part of the innovative activity. Those communities can take many forms. It can be, for instance, open source communities, as in the software sector in which firms often rely on the work of outside developers (Ågerfalk, Fitzgerald, 2008). In this case, although the developed software is free of IPR, firms can make money out of complementary services and assets. It can also be user communities¹. It is indeed important for firms to mobilize their users, which are often in a privileged position to develop new things and ideas. Innovation with users can take the form of an integrated relationship, as discussed above, but it can also take the form of more open relationship, in which the firm does not have one single privileged customer, but relies on a community of users. This is the main difference between crowdsourcing and innovation with communities. In the case of crowdsourcing the firm

1. It is important not to confuse innovation with a community of users that is discussed here with the literature on « user innovation » that has been developed mostly by von Hippel (2006). According to this stream of literature in many cases it is lead users who directly innovate. But in this case they start to innovate alone, without the support of a firm. It is therefore quite different from what we present here.

does not rely on a well know community with which it has developed strong links in the past. It merely outsources a problem to an anonymous crowd. Conversely, in the second case, the firm relies on a well known community, the firm and the community evolve jointly. One sees therefore the emergence of a new core competence for firms: The ability to create loyalty and to transform an anonymous crowd into a loyal community. It is critical because, once loyal, customers can be considered as a source of competitive advantage for the firm.

Examples of innovation with communities of users have recently flourished, first in the software sector, but also in the video-game industry, where it has been shown to be crucial to for firms to mobilize a community of users in order to survive (Cohendet, Simon, 2007; Burger-Helmchen and Guitard, 2008). Similarly, the case of Lego clearly emphasizes the benefits arising from a tight relationship with a community of users (Birkinshaw *et al.*, 2007).

Spin-in, spin-out, acquisition and divestment. Open innovation can also take the form of new venture creation or acquisition of external ventures. A direct application of the two faces of open innovation, inside-out and outside-in, indeed consists in either acquiring a new technology by buying-out the firm which has developed it (outside-in) or creating a spin-off in order to pursue outside the development of a technology invented inside (inside-out). This modality is hence at the heart of the work of Chesbrough (2003) and it is a growing phenomenon in the knowledge based economy in which it is frequent for big manufacturing firms to buyout small successful start-ups, as illustrated by the case of the pharmaceutical industry (Hamdouch, Depret, 2001). In this sector big-pharmaceutical companies do not hesitate to acquire biotech start-ups to take advantage of their patent portfolios. In a sense, pharmaceutical companies first outsource part of their upstream research to small biotech start-ups and then, when the project is perceived as sufficiently mature, buyout the start-up in order to pursue the innovation on their own. Similarly, it is often important for firms to found spin-offs in order to ensure the development of new projects, which cannot be pursued internally. According to Christensen (1997), the creation of spin-offs is, for instance, one of the privileged solutions to escape the innovator dilemma and to allow the firm not to miss the eventual rupture in its industry.

Licensing-in, licensing out, market for technologies, cross licensing and patent pools. A modality, less radical than buying or creating a firm, consists in granting or buying a patent license. Licensing-in and out are indeed the most direct way to buy or to sell a technology. Practices of licensing-in and out are hence a central pillar of open innovation as presented by Chesbrough. Here, open innovation goes hand in hand with the rise of markets for technology on which firms can trade technology and knowledge (Arora

et al., 2001; Pénin, 2010). As already mentioned earlier, IPR and patents in particular are keys to the development of such markets. Without them it would be very difficult for small technological firms to sell their technology (big manufacturing companies would prefer to free ride). As an illustration of the growth of the open innovation phenomenon, the number of licensing agreements is bursting worldwide and this trend is likely to continue (Guellec, Pluvia Zuniga, 2009).

Sometimes firms do not sell patents but barter them against other patents in cross-licensing or patent pools agreements. Such agreements are specifically relevant in sectors where the technology is complex, i.e. multi component (electronics being the prominent example). In those sectors it is important for firms to secure a freedom to operate. One strategy to do so is to exchange patents so that all the members of the agreement have the freedom to develop their products. Patent pools are hence also often linked to issues of standard setting.

Finally, such a variety of open innovation shapes cannot be understood independently of their related stakes, each open modality having its own advantages and limits. The next section thus details the pros and cons of open innovation practices.

THE STAKES OF OPEN INNOVATION

Embracing an open innovation strategy entails many potential opportunities for firms, but also some threats and costs, leading to new challenges for both practitioners and policy makers. Hereafter we refine our analysis of those risks and benefits depending on the open innovation modality, as we are convinced that stakes are not the same for all the open innovation practices presented in the previous section.

New opportunities...

Division of labour and specialization

“This great increase of the quantity of work which, in consequence of the division of labor, the same number of people are capable of performing, is owing to three different circumstances; first to the increase of dexterity in every particular workman; secondly, to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labor, and enable one man to do the work of many.”

(Smith, 1776, p. 17)

The benefits of the division of labour have been pinpointed by researchers and practitioners for a while, and constitute one of the pillars of the

development of open source. Actually, in open innovation practices, the traditional benefits of the division of labour and specialization are amplified by network division of labour effects (Garzarelli *et al*, 2008).

The division of labour is highly beneficial for economic actors, as clearly explained by Lakhani and Panetta (2007) in their famous “Joy’s Law”: “No matter who you are, most of the smartest people work for someone else” (sentence attributed to Bill Joy the co-founder of Sun Microsystems). This joke intends to point out that whatever the R&D efforts of an organization, it can only pay to look outside the organization and to absorb external knowledge. It also means that, an organization has to divide its knowledge production between several actors. A consequence of such an approach is that organizations are able, and sometimes are compelled to buy pieces of knowledge to external providers. In many cases it is indeed faster and more profitable to acquire external existing knowledge, by buying a license for instance. The development of licensing agreements on markets for technology hence fosters division of labour and sustains the emergence of technological firms specialised in knowledge production” (Arora, Merges, 2004).

Harnessing the mass

According to Eric Raymond, increasing the size of a research team is an efficient strategy to quickly detect and solve any problem in the innovative projects the research team is working on. More precisely, he explains that a large enough number of testers and developers is a key condition for quick problem solving in software code. He calls this phenomenon the “Linus’ Law” in reference to the practice adopted by Linus Torvalds in the Linux community. The underlying idea is that the more numerous the contributors, the more likely they are to identify and fix any bug, each of them being sensitive to other subparts of the same problem and behaving according to their own (specific) cognitive models. Hence, crowdsourcing is very efficient to generate diversity and novelty, as a large population of potential contributors is at reach. By choosing not to rely on traditional partners when developing their future products or processes, firms clearly aim at diversifying the competences, routines and knowledge bases they are getting access to. Indeed, such diversity is often synonymous of new and sometimes, competing knowledge, which has been shown in the literature as being necessary to adopt exploration behaviours and not only rely on exploitation strategies.

Harnessing the mass is also a good way to escape the innovator’s dilemma (Christensen, 1997) and to find disruptive technologies and run disruptive innovations. In his seminal paper, Christensen (1997) hence recommends that existing firms watch for innovations outside their boundaries (outside

in) and that they invest in small firms that might adopt their innovations (inside out).

Lastly, harnessing the mass but rewarding a limited number of proposals (in the case of crowdsourcing) or no knowledge at all (in the case of user communities) can also be seen as a source of large cost savings. Indeed, developing those original ideas internally would have meant that the firm had hired additional high innovative potential individuals.

Modifying the firms' borders

From an evolutionary perspective, the development of new organizational shapes and boundaries are important for four reasons (Aldrich, Ruef, 2006). We can adapt those reasons to the specific case of the evolution of open innovation practices which leads to the following conclusions: First, the evolving boundaries of the open innovation phenomenon allow firms to overcome the selection pressures that affect the direction of their innovation process. Second, with evolving boundaries, firms using open innovation actively participate in the population dynamics. Third, after boundaries coalesce and activities begin, organizations become viable carriers of routines and competences. They thus contribute to the reproduction of population-level knowledge and its diffusion. As new entities, they are potential sources of variation within populations. Fourth, after it emerges as an entity, an open organization becomes another arena in which new routines and competences can be generated, nurtured, and possibly copied by others.

Generating a new geography of innovation

The development of active cluster policies in developed economies confirms the idea that collaborative activity and R&D networks of actors are of interest for modern economies and should be supported. Hence, Hussler and Rondé (2009) and Rondé and Hussler (2005) show that, in the French context, the key factors explaining the innovative dynamics of regions are the networking capacities of regional actors (developing open innovation practices between actors being more beneficial at the territory level than improving the innovative resources available on the territory). To put it differently, opening the innovative boundaries of the firms also leads to changing the regional innovative dynamics: Firms located in less well-endowed territories in terms of innovative resources (physical and human ones) are not doomed anymore to underperform their counterparts located in other (more favoured) places. Indeed, undertaking collaborations with actors of innovation outside the territory allows firms to access the missing resources and thus realigns the innovation potentials of different regions.

...and new challenges

Developing new knowledge management skills

Lichtenthaler and Lichtenthaler (2009) take a look at knowledge transfers occurring during the open innovation process. They merge the literature on knowledge management, absorptive capacities, and dynamic capabilities to propose an original integrative perspective, which complements the concept of absorptive capacity by the notions of knowledge exploration, retention and exploitation inside and outside a firm's boundaries. They identify six 'knowledge capacities' as a firm's critical capabilities for managing internal and external knowledge in open innovation processes: Inventive, absorptive, transformative, connective, innovative, and desorptive capacity (see Table 2). Those different capacities allow the firm engaged in open innovation to reconfigure the knowledge bases it relies upon and realigns them with technological and commercial needs.

Table 2 – Complementary absorptive capacities in open innovation
(Lichtenthaler, Lichtenthaler, 2009)

	Knowledge exploration	Knowledge retention	Knowledge exploitation
Internal (Intrafirm)	Inventive capacity	Transformative capacity	Innovative capacity
External (Interfirm)	Absorptive capacity	Connective capacity	Desorptive capacity

Concretely firms need to develop specific knowledge capacities to deal with open innovation and associated external knowledge flows. The development of such new knowledge management capacities requires time and effective knowledge integration across boundaries. Usually, this evolution has to include changes in organizational structure and culture, e.g. overcoming 'not-invented-here' attitudes. Finally, a central challenge that firms face if interested in engaging in open innovation is the investment in the building of those new and complementary capacities.

Regarding knowledge management problems, one may mention another difficulty, i.e. the problem of transferring know-how and tacit knowledge between actors. Indeed, an efficient co-development of knowledge and innovation requires trust and common routines building, which in turn requires the establishment of long-term links. But establishing long-term links with every partner limits the forthcoming diversity of contributors, and then contradicts the original engine of openness.

Dealing with HR management concerns

The distribution of useful knowledge outside the boundaries of the firm is a central component of the open innovation paradigm (Chesbrough, 2006). However this distribution might be uneven. In that case, diversity and number are not necessarily synonymous of quality. Indeed, in the case of crowdsourcing for instance, some ideas posted on the net remain unsolved, due to a lack of proposals by the crowd. At the other extreme case, some problems may generate plenty of proposals by the crowd, only a very limited number of them being accurate, therefore leading to a significant time waste by the firm analyzing the exhaustive sample of proposals (Mehlman *et al.*, 2010). Moreover, firms have to spend plenty of their time in checking whether the knowledge and solutions provided by their (more or less numerous) partners are genuine and reliable.

Brooks (1975) concludes the same way, when he argues that “adding manpower to a late project makes it later”. Indeed, a large team raises some communication complexities and coordination costs. These arguments connect directly to “collective action” theory developed by Olson and according to which “the larger the group, the less likely it will further its common interests”. In open innovation, the challenge seems even greater as innovative teams become not only larger but also inter-organizational. Hence, Burger-Helmchen and Pénin (2011) but also Lebraty (2007) highlight the significant transaction costs firms have to bear when they are engaged in crowdsourcing activities for instance. Such transaction costs may stem from the fact that partners might be motivated by very different incentives. And since they are not in a clear hierarchical relationship, they may be less easy to constrain to achieve common interests. Wallin and von Krogh (2010) pinpoint the challenges faced by firms dealing with volunteers (as it is the case for crowdsourcing for instance), the latter having their own rationales for taking part in the open innovation process. When dealing with communities of users, for instance, it is also worth noticing that contributors are mostly motivated by internal motives (task enjoyment, Puca and Schmalz, 1999; or quest for a social status, Forgas *et al.*, 2005), rather than by any financial remuneration, which requires to think about new remuneration methods.

Lastly, a feeling of rivalry may also occur between actors of innovation within the firms and actors outside the firms who receive a huge echo within the firms’ boundaries, the former being frightened by a potential job competition with the latter.

Answering burning issues related to ownership and property rights

Most existing studies on the topic conclude that inbound open innovation practices are more frequent and developed than outbound ones (Bianchi *et al.*; 2010, Cheng, Huizingh, 2010). Many explanations might be provided to such a phenomenon. Among them, the fear of diffusing relevant knowledge has been pinpointed in the literature (Rivette, Kline, 2000). Indeed, by sharing its knowledge with other business partners (and sometimes selling this knowledge to other economic actors), a firm agrees to lose (at least partially) the mastery over the use of its technology².

The IPR problems are also quite significant in inbound open innovation practices, notably when crowdsourcing and open source communities are at stake. Indeed, intellectual property rights, when they exist, have to be thought about quite early in the innovation process (as soon as a firm provides some elements of terms and conditions (cahier des charges) to their potential partners), when none of the partners does have any idea of the economic and technological potential of the idea raised by the collaboration process. Moreover, the question of the identity of the owner of knowledge posted by the crowd in answer to an existing problem, but not selected and rewarded by the firm looking for solutions, remains open and calls for additional work on IPR in crowdsourcing practices. Indeed, let us suppose that someone submits a proposal to a problem that has been posted on a crowdsourcing platform by a given firm. The firm looking for solutions does not use this proposal immediately to solve the original problem which has been crowdsourced, but relies on the knowledge later for another problem it is facing. How do those actors share their rights? The other way round, by revealing the problem it might be confronted with, a firm posting a call for proposal on crowdsourcing platforms diffuses private information on its strategy and/or its internal organization, which might be quite useful for competitors working on similar technologies. In this case, the firm relying on crowdsourcing to develop its innovation may be the victim of a technological hold-up. On that point, it is worth noticing that crowdsourcing of innovative ideas is rather restricted to a limited number of industries such as chemistry and pharmaceuticals, both of which are characterized by an efficient IPR system (Burger-Helmchen, Pénin, 2011).

2. Depending on the precise content of the licensing agreement, the firm selling its technology may enforce the license buyer to share any forthcoming improvement of the original technology under license.

DISCUSSION: RETHINKING THE COMPETITIVE RULES WITH NEW SHAPES AND STAKES

Table 3 shows some shapes and stakes of open innovation, restating some cases or literature examples given in the previous section. In the light of this illustration, the competitive rules and the business model in an industry should be designed in a new way in order to account for those new shapes and stakes.

The distinctive feature of these new competitive rules is that cooperation becomes predominant: Based on horizontal and dynamic relationships, cooperation generates a new and complex balance between partnership on the one hand and rivalry on the other hand, a situation which results in a permanent state of disequilibrium.

Indeed, Andersson *et al.* (2009) state that mutual leverage of knowledge among the participants of innovation processes, such as open innovation, provides the optimal utilization of resources both tangible and intangible. Unlike vested interests playing against competition, collaborative efforts made by those agents who put knowledge into action are incentives not to collude but to combine cooperation and competition so as to enhance precompetitive forces working for the general interest of the knowledge society. The motto becomes “a larger cake is better than a larger slice”.

Cooperation is needed to increase the dimension of the market, while competition remains the essential ingredient that motivates players to strive for excellence. In contrast, the traditional competitive paradigm can only lead to each player struggling to make its own share of the market cake increasing more rapidly than the cake shrinks. Through cooperation (through open innovation practices), companies learn how to practice the very sophisticated “coopetition” game – the frontier of collaborative practices. Coopetition is to compete and cooperate with the same players.

Conversely, while maintaining the dynamics of competition, the open innovation process, allows companies to improve the coordination of activities so that, for example, it comes more naturally to sell inventory in excess to direct rivals. Revealing inventory, pricing, design specification, and other kinds of hot information to competitors is something that sounds strange in the conventional business culture. Nevertheless, this conduct becomes a crucial challenge, albeit with unpredictable consequences, as soon as companies are aware that they have to change their own behaviour going online and becoming more open.

Table 3 – Shapes and stakes of the open innovation phenomenon

Open innovation evolutions according to:	Shapes: modalities of open innovation				
	Crowdsourcing, open sourcing	Innovation with communities	Spin-in, spin out	Licensing-in, licensing out	R&D networks, and clusters
Stakes: Determinants of success	Division of labour and specialization	<i>Case:</i> Open source software		<i>Literature:</i> Arora and Merges, 2004	<i>Literature:</i> Lakhani and Panetta, 2007
	Shared cost and risks		<i>Case:</i> Pharmaceuticals	<i>Case:</i> IPR <i>Literature:</i> Arora <i>et al.</i> , 2001	<i>Case :</i> Regions <i>Literature:</i> Hussler and Ronde, 2005
	Diversity generation	<i>Case :</i> Innocentive		<i>Literature:</i> Pénin, 2010	
	Harnessing the mass		<i>Literature:</i> Cohendet and Burger-Helmchen, 2010		

CONCLUSION

This article aimed at providing the current state of the art on the open innovation phenomenon. We have first questioned the originality of the open innovation paradigm, by confronting it with other related concepts developed in previous literature. Second, as most of the papers on the topic agree on the firm being nowadays more permeable in its innovative process (pieces of knowledge flowing in and pieces of knowledge flowing out of it), we have investigated more in depth the new modalities open innovation practices may take. The coexistence of various shapes of open innovation led us to analyse the benefits but also the costs and new challenges raised by those different declinations of the open innovation model.

At the end of the paper what is worth stressing is that if open innovation practices have recently attracted great interest both by researchers and practitioners, we progressively discover the pitfalls such innovative strategies might be correlated with. In particular, we found that firms engaged into open innovation practices have to learn how to maintain or modify their organizational boundaries, and how to reproduce or develop their strategic knowledge. Preserving this knowledge requires that actors play two contradictory roles: As users of what organizations offer through the resources they control, and as supporters of what organizations must do to reproduce those resources. Hence, much research remains to be done to support managers in designing well-suited managerial tools to become successful in their open innovation initiatives.

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