Chapter 12
Using Information Technology to Manage Diverse Knowledge Sources in Open Innovation Processes

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Abstract Companies adopting an open approach to innovation aim at exploiting as many sources of knowledge as possible to create new products or services. Communities of customers, networks of experts or other organisations are all considered sources of valuable knowledge. However, to be managed effectively, each source requires different tools and practices. Managers responsible for the implementation of a technological system supporting open innovation should be able to single out the requirements associated with each source and devise customised strategies to facilitate the knowledge exchange. This chapter: (1) provides a framework which enables managers to analyse each specific source of knowledge and elicit the associated requirements, (2) suggests seven strategies to facilitate the knowledge exchange and (3) shows how these seven strategies can be adapted to different sources of knowledge.

12.1 Introduction

For a company, an open approach to innovation consists, on the one hand, in exploiting external sources of knowledge to create new products, services or processes. On the other, it consists of external channels to exploit the knowledge it owns. Knowledge can be sourced from groups of individuals such as customers (Nambisan 2002; Carlsson 2004), lead users (von Hippel 2005), external experts or even an anonymous crowd. But it can also be obtained from universities, consultants, intermediaries, other companies or impersonal sources such as

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scientific publications and patents. Knowledge can be exploited in the form of patents (Gambardella et al. 2007), licences, spin-offs or it can be strategically used in alliances (Lichtenthaler and Ernst 2008).

Managing open processes, however, is far more complex than managing innovation within the boundaries of a single organisation. One important difficulty is that many diverse actors are involved in open innovation processes. In a closed innovation approach, for example, concepts of new products are mainly generated by employees in the marketing department. In an "open" company, they can be generated by customers, expert users or consultants. The problem is that the interactions with different sources of knowledge require different practices and competences.

In particular, different technological systems are needed to interact with different partners. Several authors studied the role of Information Technology in open innovation initiatives. Most of them, however, took a very specific point of view, considering interactions with a specific source or a specific recipient of knowledge and studying systems designed for those specific interactions. For example, there are information systems to interact with employees, like the ones implemented by Procter and Gamble (Huston and Sakkab 2006); with experts, like those involved by intermediaries such as InnoCentive (Chesbrough 2006) or with customers, like in the cases of Fiat, Cisco or Microsoft (Nambisan 2002).

In our opinion, the fit between technology and type of interacting actors is a fundamental criterion to implement an effective system. But what features should be different in systems implemented to interact with different partners? There is a lack of research in the literature addressing the issue of the technology-partner fit when designing or implementing information systems for open innovation.

The aim of this chapter is to propose a framework to support companies in implementing information systems suitable for each specific partner.

The starting point for our framework is the Relative Absorptive Capacity (RAC) theory (Lane and Lubatkin 1998). Building on Lane and Lubatkin's ideas we suggest that when the source/recipient of knowledge is different, also the difficulties in exchanging knowledge change. For example, when the company interacts with a scientist it will be easier to exchange scientific knowledge, but it will be more difficult to exchange product-related knowledge. The opposite holds true when the interacting parties are the company and a customer. Following this line of reasoning, it is possible to give directions on the design and implementation of information systems for open innovation suitable for different partners.

The remainder of the chapter is organised as follows: in Sect. 12.2 we briefly discuss the Relative Absorptive Capacity theory; in Sect. 12.3 we present our framework consisting of seven strategies to facilitate knowledge exchanges in open innovation processes; in Sect. 12.4 we discuss how the seven strategies can be adapted to different sources of knowledge, using as an example of possible sources a community of customers and a network of experts; in Sects. 12.5 and 12.6, respectively, we discuss the implications for practice and the implications for research.

12.2 Relative Absorptive Capacity

In this chapter, we draw on the Relative Absorptive Capacity (RAC) theory to build a theoretical framework aimed at supporting companies in designing and implementing information systems for open innovation.

RAC theory, proposed by Lane and Lubatkin (1998), is an extension of the Absorptive Capacity theory (Cohen and Levinthal 1990). Absorptive capacity is a firm's ability to acquire new knowledge in a certain domain. It increases with the firm's level of prior related knowledge. For example, if a software company employs personnel who have already worked in the field of grid computing, it will be easier for that company to keep up to date with innovations in this technological field.

Building on this idea, Lane and Lubatkin (1998) observed that the ability to acquire new knowledge also depends on the source of knowledge. In particular, the more the provider and the recipient of knowledge are similar, the higher is the recipient's absorptive capacity. Absorptive capacity, then, is not an absolute capability of companies or individuals: it depends on the partner they interact with. It is better called Relative Absorptive Capacity. In our view, RAC is not only a structural characteristic of the dyad of companies, but a "temporary capability" the two partners can build as a part of the exchange process. In other words, even if two companies or individuals are dissimilar, the recipient's RAC can be increased through the use of suitable procedures and organisational and technological tools (Carlsson et al. 2009). Lane and Lubatkin (1998) also suggest that two firms are more likely to effectively exchange new knowledge if they have similar (1) knowledge bases, (2) knowledge processing systems and norms, (3) organisational structures and (4) dominant logics.

In open innovation processes a company and its counterparts in a knowledge exchange are inevitably "different". For example, the knowledge bases, procedures, structure and logics of a community of customers are very different if compared with those of a marketing department. Our hypothesis is that the processes and tools a company implements when adopting an open innovation approach should increase the company's RAC. In particular, since we focus on technology, Information Systems should be designed and implemented in order to fit the specific provider/recipient dyad. In fact, different counterparts in the innovation exchange imply different levels of RAC for different knowledge domains. As a consequence, Information Technology should provide different kinds of support when the interlocutor changes.

12.3 How Information Technology Can Increase RAC in Open Innovation Processes

When the RAC between two partners is not sufficiently high, exchanging knowledge becomes difficult. However, technological tools and organisational procedures and structures can be put into place in order to increase RAC. Building on previous works (Carlsson et al. 2009), we propose seven strategies to increase RAC (see Table 12.1).

Table 12.1 The seven strategies to substitute for RAC

Strategy	Example Applications
Create shared resources to diffuse domain specific knowledge	Use Databases, Portals and Web 2.0 to share knowledge related to the problem at hand
Create shared resources to diffuse complementary knowledge	Use Databases, Portals and Web 2.0 to share knowledge related to complementary aspects (IP management, company policies, etc.)
Accelerate knowledge transfer	Create rich communication channels for knowledge transfer
Develop standard methods and rules	Use wizards, procedures and structured virtual workspaces to coordinate the interacting parties
Act as an intermediary organisational structure for innovation transfer	Create liaison roles such as gatekeepers and community managers
Manage relations with knowledge source	Introduce differentiated access rights
Build a company/network culture	Use reputation, recommendation and reference mechanisms

The seven proposed strategies have been obtained by expanding Lane and Lubatkin's (1998) framework through the integration of ideas derived from a review of the literature on open innovation. In particular, we reviewed the literature on open innovation looking for ways in which companies that adopted an open approach to innovation changed one or more of the dimensions which, according to Lane and Lubatkin (1998), influence RAC. As a result, we obtained the seven strategies, each of which is related to one of the four dimensions of RAC, namely knowledge base (strategies 1 and 2), knowledge processing systems and norms (strategies 3 and 4), organisational structure (strategy 5) and dominant logic (strategies 6 and 7).

12.3.1 Compensating for Differences in the Knowledge Base

Open innovation implies the direct or indirect interaction between employees in a company and external actors. For example, the knowledge from customers or lead users will be used by the marketing department. External experts will provide knowledge used by the R&D department. The transfer of knowledge will take place directly if an internal department directly manages the process, or indirectly if another office, task force or external intermediary manages the exchange.

In any case, the exchange will be easier if the interacting parties share a common knowledge base. Companies implementing an open innovation approach should foster the rapid creation of such shared knowledge bases if they do not already exist.

A non-negligible part of the transferred knowledge is not specific of an exchange, but is needed in several exchanges. An evident example is the knowledge related to IP protection issues which is involved in every exchange (at least in part). Storing and organising the knowledge which is needed repeatedly in open innovation exchanges would facilitate the interaction between partners.

A knowledge exchange usually implies more than one type of knowledge to be exchanged in both directions. For example, in the case of the intermediary InnoCentive, both scientific knowledge and knowledge related to IP issues has to be transferred from the intermediary to the solver, while knowledge related to the product/market is transferred from the seeker to the solver. In each exchange we can distinguish between the knowledge related to the specific technological or scientific area (e.g. knowledge about programming techniques in the case of interactions regarding software) and the knowledge related to complementary issues (e.g. knowledge related to IP or project management). We call the first type of knowledge *domain-specific knowledge* and the second one *complementary knowledge*.

As a consequence, the following two strategies can be adopted to increase RAC:

1. *Create shared resources to diffuse domain-specific knowledge*: the team, office or intermediary managing the open innovation process can collect, organise and package knowledge related to each specific domain. These knowledge packages can be provided to the partners in order to speed up the development of a common, domain-specific knowledge base.
2. *Create shared resources to diffuse complementary knowledge*: the team, office or intermediary managing the open innovation process can collect, organise and package knowledge related to interdisciplinary (i.e. issues common to several technological domains) or complementary aspects (e.g. issues related to problems such as intellectual property rights, regulatory issues, technological infrastructures) useful in more than one exchange.

Information systems can significantly contribute to the implementation of these two strategies. Knowledge can be packaged, organised and made available through document management systems, knowledge repositories and portals (Robey et al. 2000; Kane and Alavi 2007) and tutorials. Wikis, forums and blogs can support the collaborative creation of knowledge resources. Hypertext and hypermedia technologies support the retrieval of knowledge available on the web, in intranets or in knowledge repositories (Robey et al. 2000). Applications for knowledge representation (Robey et al. 2000) help users to gain understanding of a set of concepts. Virtual learning environments help users to make sense of contextual knowledge.

Practical Tip

Face-to-face meetings are powerful knowledge transfer mechanisms. If possible, in the early phases of innovation exchanges, face-to-face meetings should be organised to facilitate the exchange of tacit knowledge. Once the partners know each other, then the subsequent exchanges of knowledge become easier. Besides, it is important to increase the level of trust towards the system. Personal, direct and face-to-face communication increases the reciprocal trust of the interacting parties.

12.3.2 Compensating for Differences in Knowledge Processes and Norms

In open innovation, the interacting parties use different work procedures and comply with different norms. This phenomenon has been studied in the interactions between companies (Lane and Lubatkin 1998), companies and universities, companies and public administrations. The phenomenon is even more evident in the case of interactions with customers, lead users or external experts. The practices and norms of customers when participating in open innovation processes are certainly different from those of employees in the marketing or R&D departments. Besides, the practices of customers are expected to be different from those of experts or lead users.

These differences in the way of working can easily yield inefficiencies, misunderstandings, conflicts and overall poor results. Open innovation systems can increase RAC both by facilitating and accelerating knowledge transfer and by defining methods and norms of interaction to be adopted by the recipient and the provider of knowledge. As a consequence, the third and fourth strategies to increase RAC are the following:

3. *Accelerate knowledge transfer*: the team, office or intermediary managing the open innovation process can implement tools, structures and procedures to facilitate knowledge flows between the interacting parties.
4. *Develop standard methods and rules*: by using standard methods and rules (including standard documents, procedures and technologies) provided by the team, office or intermediary responsible for the open innovation process, the participants can partially overcome the problem of different organisational processes.

While the two strategies 1 and 2 imply the need for well organised, easy to use databases, maybe integrated with Web 2.0 collaborative systems, the third strategy requires rich communication channels and collaborative spaces.

Information Technology provides several tools to support communication and discourse. As a consequence, it is able to speed up knowledge transfer (Robey et al. 2000). Collaboration tools such as Lotus Notes support intra- and inter-organisational learning. Web 2.0 technologies provide further possibilities to cooperate and exchange knowledge. In general, communication tools such as instant messaging facilitate the transfer of tacit and explicit knowledge (Kane and Alavi 2007).

User toolkits (von Hippel 2005) and tools for product or concept testing and simulation incorporate knowledge from the company. They are also a way for the company to acquire users' knowledge.

As concerns the fourth strategy, Information Technology is often used to create standard working methods. Also in the field of open innovation there are several examples of tools used to standardise interactions. For example, the open innovation intermediary InnoCentive provides solvers with interaction procedures consistent with the expectations of the seekers. The interaction takes place in a

structured virtual room dedicated to the specific challenge. Standard methods also reduce the need to exchange knowledge. User toolkits, for example, guide lead users in incorporating their knowledge into the product. Stock markets for innovation allow customers to express their preferences without explicit communication. Several companies implement open innovation strategies that include tools to standardise interaction procedures. A popular example is IBM's Connect and Develop.

Also the use of wizards, which consist of tools helping users to perform a certain task more effectively, can reduce the possibility of errors or misunderstandings when interacting with external knowledge sources.

Another example of a suitable tool is the quick poll and survey tool for reducing differences in knowledge processes and norms, especially when the knowledge exchange consists of acquiring external users' opinions or ideas concerning a new product or service.

Practical Tip

International standards provide a shared language and common procedures to organisations. Knowledge exchanges are facilitated if the partners adopt the same international standard. From a pure IT perspective, ensuring the full compatibility of the software application with the most common web protocols and mobile operating systems will increase and facilitate knowledge exchanges.

12.3.3 Compensating for Differences in Organisational Structures

When conceptualising RAC, Lane and Lubatkin (1998) considered organisational structure a key factor in knowledge processing systems. Organisational structure embodies organisational knowledge. As a consequence, similar organisational structures imply similar organisational knowledge and, thus, an easier knowledge exchange. In open innovation processes, the source of knowledge is often a community or a network of individuals. Lane and Lubatkin's (1998) argument holds also in this case. Communities or networks have their roles, their (weak or strong) relations and even their hierarchical systems. That is, a community or a network has an organisational structure which embodies organisational knowledge. Obviously a company's and a community's organisational structure are very different and this could hinder knowledge exchange. So, the fifth strategy to increase RAC is:

5. *Act as an intermediary organisational structure for innovation transfer*: the team, office or intermediary managing the open innovation process can develop tools, roles and relations able to limit the problem of different organisational structures.

The intermediary organisational structure is often virtual. Organisational structures are virtual when they are reconfigurable, geographically dispersed and based on electronic communication (Corvello and Migliarese 2007). These organisational units mainly operate on the web. They collect dispersed individual knowledge and distribute it to organisations after organising and elaborating it to support innovation (Verona et al. 2006). Virtual knowledge brokers are an example of this kind of structure. According to Verona et al. (2006), virtual knowledge brokers are "the virtual manifestation of knowledge brokers (KBs)—third parties who connect, recombine, and transfer knowledge to companies in order to facilitate innovation".

Practical Tip

Several web-based intermediaries exist that act as intermediary organisations in innovation exchanges. Organisations which do not consider it economically convenient to develop internal structures to manage innovation exchanges (e.g. small firms) can exploit the services of such intermediaries. In general, different organisational structures imply different communication, collaboration and decision-making procedures. Accordingly, for each type of OI partner, it is important to identify its dominant organisational structure (i.e. peer-open-community vs. hierarchical-closed community) and then develop a flexible "interface" structure able to manage the interaction with different communication, collaboration and decision-making styles.

12.3.4 Compensating for Differences in Dominant Logics

According to Grant (1996), a firm develops preferences for projects of a given type, size and risk level, and favours strategies dependent upon certain key success factors, stages of product life cycle or product-market positions. This set of preferences is called dominant logic. When two companies exchange knowledge the dominant logic influences the effectiveness and efficiency of the knowledge transfer. Also a community of customers or a network of experts has their dominant logics. For example, customers are likely to be interested in functional aspects of a product while experts are likely to be interested in a product's technology.

The differences in dominant logics affect the interaction. For example, customers or experts could be interested in solutions which are not the ones the company is interested in. To some extent, this phenomenon is unavoidable and even positive since it can increase creativity. If not controlled by the company, however, it can easily yield inefficiencies and information overflow. As a consequence, the sixth and seventh strategies we propose are:

6. *Manage relations with knowledge sources*: the team, office or intermediary managing the open innovation process can develop tools, rules and procedures which differentiate the roles of the participating actors according to their dominant logic.

7. *Build a company/network culture*: in the long run the company can select among the external actors the ones that will become partners in open innovation processes and build together with them a shared culture to support the interactions.

Relations can be managed by introducing processes of progressive inclusion of external actors in a company's network (Migliarese and Corvello 2010). That is, the relation with an external actor becomes more intense as the two parties interact repeatedly. Information technology can support the implementation of these processes by introducing differentiated access rights for old-timers and newcomers in a community/network.

The Internet enables the creation of virtual customer environments—platforms for collaboration that allow companies to tap into individual and social customer knowledge through an ongoing dialogue (Verona et al. 2006). Kane and Alavi (2007) suggest the concept of Electronic Communities of Practice to indicate those virtual milieus able to create and sustain communities online. These environments can be used to create a shared culture, shared ethics and to build trust.

Practical Tip

The participation in virtual communities of practice or communities of interest can be useful to discover potentially useful inventions but also to create links with potential partners in innovation exchanges or in joint innovation projects.

12.4 Supporting the Management of Diverse Knowledge Sources Through Information Technology

The framework we provided, consisting of seven strategies to substitute for RAC, can be used as a tool to adapt a company's open innovation approach to the specific knowledge source. In particular, it can be used to specify a differentiated approach to the management of Information Technology for each source.

When the source of knowledge is a community of experts, a community of customers or another organisation, RAC varies because the knowledge bases, knowledge processing systems and norms, organisational structures and dominant logics of the source are intrinsically different.

The seven strategies of our framework are a blueprint to be customised for the specific kind of source. For example, the tools to be used to "accelerate knowledge transfer" are different when the knowledge source is another organisation or when it is a community of customers. In the first case, the interlocutors know each other and have defined roles and rules of interaction (e.g. they know the respective working hours). Rich, synchronous communication channels are needed which facilitate the exchange of information. In the second case, the company interacts with a semi-anonymous crowd. Customers interact when they

choose and mainly asynchronously. Interaction rules are much more blurred. Appealing or even entertaining tools are needed, which allow the consumer an easy interaction while allowing the company to collect and organise data in a structured way.

To exemplify how our framework can be used, we consider in this chapter two possible sources of knowledge: a *community of customers* and a *network of external experts*. To the first category belong communities such as those promoted by FIAT or Microsoft (Nambisan 2002), while to the second belong the networks managed by web-based intermediaries such as InnoCentive or Ninesigma.

Before going on to explain how the seven strategies can be practically implemented in the case of a community of customers or a network of experts, it is useful to reflect on some main differences which characterise these two types of knowledge sources.

12.4.1 Two Examples of Knowledge Sources: Customers and Experts

Communities of customers and networks of external experts represent sources of valuable knowledge for the firms. However, these two kinds of knowledge sources show some important differences relevant to the scope of this chapter.

First, communities of customers are reasonably expected to be more numerous than typically restricted and specialised networks of experts. This difference will have practical implications in terms of architectural sizing of the information systems to be implemented.

Another difference consists in the fact that, typically, large communities of customers comprise anonymous users who are presumably totally unknown to the firm. Networks of experts, instead, being much more limited, will be made up of technical and scientific experts whose identity can also be known to the firm they are interacting with. This difference allows the firm (1) to (potentially) understand the specific needs and requirements of expert users and, accordingly, (2) to take these needs into account when designing interaction and communication tools. The same does not easily hold in the case of anonymous customers.

From a demographic point of view, furthermore, customers' communities are typically expected to be more variated than experts' ones. This implies that when designing a technological system for interacting with customers, particular care should be given to the development of tools and interfaces suitable for users of different ages, different expectations and different mental and psychological attitude.

Also, the cultural and educational backgrounds of the two types of knowledge sources are critical factors affecting the development of proper interaction tools and procedures. Experts, by definition, will exhibit a higher level of scientific and technical knowledge than customers. This entails that different kinds of knowledge

can be acquired from these distinct sources: complex and product-related knowledge from experts, simple and market-related knowledge from customers.

Finally, customers differ from experts also in terms of motivation driving them to contribute and collaborate in the open innovation processes. Some customers could be generally attracted by the opportunity to actively participate in the product development process, thus expressing their own tastes, preferences and ideas, some others could be simply interested in the rewards offered by the company.

Experts, on the other hand, are interested in collaborating with the company, solving its technical and scientific problems and acquiring notoriety and reputation within their community.

Understanding the motivations in each case allows the company to implement proper tools, rules, procedures and organisational mechanisms (e.g. rewarding systems) to effectively manage, nourish and strengthen external communities.

In the following section, we will see how the distinct characteristics of the two knowledge sources turn into tangible and practical differences in terms of systems, tools and procedures to be implemented to effectively interact with them.

12.4.2 An Application of the Framework to Customers and Experts as Knowledge Sources

The objective of this section is to show an exemplified application of the proposed framework to the development of proper open innovation systems for two distinct knowledge sources: a community of customers and a network of experts.

We will discuss how to *tailor* each of the seven suggested strategies to the specific knowledge source to be managed.

12.4.2.1 Create Shared Resources to Diffuse Domain-Specific Knowledge

Customers are usually involved either in the earlier stages of open innovation processes, like idea generation and selection of potential new products, or in the final stages, like product testing and promotion.

In these stages, exchanged knowledge is related to products' functionalities and market characteristics more than to technical or scientific aspects. At these stages, the company is interested in maximising the circulation of new ideas, so it should develop appealing or even entertaining collaboration tools which stimulate intuitive, easy and fast interaction with customers, and at the same time, triggering viral mechanisms and allowing integration with social networking platforms.

Networks of external experts, instead, are involved in the innovation process mainly to solve technical issues arising during the design and engineering phases. Domain-specific knowledge here includes technical and scientific knowledge about

products or processes. The exchanged knowledge can be of great importance to the firm. As a consequence, knowledge protection features have a central role in collaboration tools design and selection.

Moreover, external experts, being highly professional, skilled persons, typically self-motivated to collaborate in open innovation projects, need reliable and effective collaboration tools more than user-friendly and entertaining interfaces. Effective tools to manage this kind of interaction are, for example, databases and knowledge repositories shared on virtual private networks (VPN) or protected extranets.

12.4.2.2 Create Shared Resources to Diffuse Complementary Knowledge

Similar considerations could be made about the creation of complementary knowledge bases.

Since the role of customers in open innovation processes is primarily bound up with creative and innovative idea generation, customers will primarily need complementary knowledge concerning product functionalities (e.g. features of the product/service to be designed), interaction rules (terms and conditions of the relationship) and involved collaboration tools (e.g. software the customers have to use to interact with the OI system). Other examples of complementary knowledge to be diffused within communities of customers, especially in the software industry, are the licensing mechanisms regulating the use and development of software products (e.g. free software licences and open source licences). Forums, blogs and FAQ sections are suitable tools for this purpose. They support the rapid and efficient diffusion of knowledge resources within a community.

As to external experts, the support they provide often implies the exchange of innovative scientific and technological knowledge and solutions that could be protected by patents or licences. Accordingly, a fundamental aspect to be managed when interacting with networks of external experts is the complementary knowledge concerning intellectual property rights, regulatory issues and contractual norms regulating the knowledge exchange.

Document management tools which allow the efficient and secured transmission of legal documents and information like MOUs (Memorandum Of Understanding), NDAs (Non-Disclosure Agreements), patents and confidential product designs, especially if combined with certified electronic mail, are an effective way to increase the source's and recipient's knowledge exchanges.

12.4.2.3 Accelerate Knowledge Transfer

Information technology supports more efficient and effective communication and information exchanges. However, it is useful to differentiate between systems and tools for large, heterogeneous crowds of amateur customers and tools for smaller communities of skilled and professional experts.

When the knowledge source is a community of customers, the company usually deals with a multitude of distinct users from which it expects to receive simple and possibly codified information about product preferences, market expectations, new product development ideas, and so on. Customers can interact at any point and knowledge exchanges normally do not require personal or direct interaction between the users and the company's employees. Accordingly, interaction tools can be designed in the form of simple and asynchronous communication interfaces integrated with Web 2.0 systems. In order to accelerate the knowledge transfer, there could be quick poll and survey applications and tools for product or concept design, testing or simulation among the functionalities to be provided.

Conversely, when a company means to accelerate and foster knowledge exchanges with a network of external experts, it has to develop a different kind of communication tools. As previously said, external experts provide a company with scientific and technological knowledge that can be highly complex to transfer on the one hand, and highly difficult to acquire on the other. The knowledge transfer requires a close, direct and sometimes synchronous interaction between the source and the recipient of knowledge. As a consequence, to speed up this kind of communications, companies should design rich communication channels that provide rapid feedback. These channels can include: Web 2.0 tools, instant messaging, chats, web conferencing and virtual workspaces.

12.4.2.4 Develop Standard Methods and Rules

To normalise the knowledge processing procedures and norms between two communicating parties (thus overcoming the problem of different organisational processes), the solution advanced in this chapter consists of developing standard methods and rules of interaction.

Standardising interaction patterns basically implies developing common interfaces by means of which a company is able to internally convey external inputs coming from collaborating partners. Standard interfaces also mean communicating through standardised documents, procedures and technologies.

Communities of customers will primarily need user-friendly interfaces which do not hinder creativity and participation. Interaction tools have to be intuitive and easy to use. Accordingly, the main focus when implementing such tools is more on design and usability issues than developing complex functionalities. Particular attention must be placed on maintaining these virtual collaboration spaces as entertaining and appealing, even integrating them with social networking platforms (e.g. Facebook, Twitter, Myspace). The language used should not be too technical or domain specific.

Experts, instead, are more likely to appreciate professional interfaces, structured virtual rooms that provide more functionality to the user. A professional expert who collaborates within an OI project is driven by a mix of intrinsic motivation (i.e. passion for an area of expertise) and extrinsic motivation (i.e. reputation, notoriety, monetary rewards). Appealing and entertaining user-friendly interfaces can be

useful but they are not essential. Rather, it is important for experts to express their full competences and knowledge, in the case of gaining reputation within their community. Collaboration interfaces, accordingly, have to support expert users thoroughly; technical language is the norm; there are fewer requirements in terms of ease of use.

12.4.2.5 Act as an Intermediary Organisational Structure for Innovation Transfer

Communities of customers and networks of experts are typically characterised by different structures. Usually in a network of experts technical competence is recognised as a source of legitimate influence. The same does not necessarily hold for communities of customers. When interacting with a network of experts, the company should introduce roles as *knowledge brokers* or *gatekeepers*. In the case of a community of customers, the role of the *community manager* should be introduced. Such a role is typically marketing oriented and is familiar with social networks.

12.4.2.6 Manage Relations with Knowledge Sources

In the previous paragraph, it has been highlighted how partners who share different dominant logics could find it difficult to exchange knowledge. In order to prevent this pitfall, companies should implement OI systems that differentiate users according to their dominant logic.

One possibility is to differentiate access rights and categorise customers and experts in different profiles depending on their status (customer or expert), experience in the community (old-timer or newcomer), capabilities or interests (area of expertise). Effective OI systems should also promote and encourage different levels of involvement between users: the system should discriminate between coordinating or leading users, active users, peripheral users and outsider.

12.4.2.7 Build a Company/Network Culture

Another strategy to overcome the differences in terms of partners' dominant logics consists in creating a shared community or network culture with external actors.

Regarding technological aspects, social networking platforms can be developed to foster and support interactions and relationship-building processes among users (customers or experts). Instant messaging tools, forums and blogs can be implemented to encourage communication and the building of a common identity.

Finally, reputation, recommendation and references mechanisms, along with competences profiles can be activated within networks of experts in order to satisfy their needs for reputation and notoriety.

Table 12.2 summarises some relevant features that differentiate communities of customers from networks of external experts for each of the seven strategies suggested to increase RAC and gives examples of the suitable information technological tools to be implemented in order to successfully manage the two different kinds of knowledge sources.

The tools listed in each cell of Table 12.2 are clearly not exclusive of the each kind of source. However, we deem each tool to have a specific value for the source it is associated with.

12.5 Practical Advice

By adopting an open approach to knowledge sourcing for innovation companies, aim at exploiting as many sources of ideas and knowledge as possible. The external environment provides many different sources: communities of customers and users, networks of experts, universities and other companies. All these sources are able to provide valuable knowledge.

However, as multiple flows of knowledge are activated through the involvement of all these sources, the management of knowledge becomes more and more complex. Information technology can support the management of these knowledge flows, but companies need guidelines on how to implement the correct system for problems they may encounter.

This chapter focuses on one specific problem: how to adapt the technology to the specific source of knowledge?

As a matter of fact, the interaction between the company and each of its sources requires technological systems with specific features. In this chapter, we provided a framework which supports decisions related to the technological system to be implemented.

Building on Lane and Lubatkin's (1998) RAC theory, which considers four characteristics (knowledge base, knowledge processing systems and norms, organisational structure and dominant logic) as being crucial in influencing the ability to transfer knowledge between a source and a recipient, we suggest that a company has to analyse these four dimensions in the source it intends to exploit before starting to implement a system for the external sourcing of knowledge.

For each of the four dimensions, we suggest strategies which can support the transfer of knowledge and ideas. We propose seven strategies in total. When the difference in one dimension is especially relevant, then a suitable technological system should be designed in order to reduce the difficulties created by this difference.

In practical terms, we suggest that, to design an effective open innovation system, the following "checklist" should be considered:

- Firstly, a firm should identify *who* the main knowledge sources are it intends to exploit

Table 12.2 The seven strategies for different knowledge sources

	Community of customers	**Network of external experts**
Create shared resources to diffuse domain specific knowledge	• Portals, document management tools • Forums, blog and RSS Focus on: – Entertainment and appealingness – Usability	• Database and knowledge repositories • Virtual private networks, extranets Focus on: – Reliability – Security
Create shared resources to diffuse complementary knowledge	• Forums, blog and wikis • FAQ. (frequently asked questions) Focus on: – Firm expectations and product func. – Contribution terms and conditions (rewards, Intellectual Property rights)	• Document management systems • Certified and secured email Focus on: – Confidentiality agreements – IP rights and licensing agreements – Complementary tech. information
Accelerate knowledge transfer	• Asynchronous comm. channels • Quick poll and survey tools • Product design and testing tools Focus on: – Simple and impersonal comm. – Inputs codifiability and analysability	• Rich comm. channels, rapid feedback • Instant messaging • Video/audio and web conference Focus on: – Rich and personal communication – Flexibility and complexity of inputs
Develop standard methods and rules	• User-friendly interfaces and wizards Focus on: – Appealing design – High usability – Compatibility with users systems	• Structured workspaces • User toolkits Focus on: – High functionality and performance – Less emphasis on ease of use
Act as an intermediary organisational structure for innovation transfer	• Community managers Focus on: – Marketing competences	• Gatekeepers and Knowledge brokers Focus on: – Technical competences

(continued)

Table 12.2 (continued)

	Community of customers	**Network of external experts**
Manage relations with knowledge source	• Differentiated access rights by: – Interests and capabilities – Driving motivation – Involvement level Focus on: – Customers profiling – Segmentation of tools	• Differentiated access rights by: – Competences and area of expertise – Driving motivation – Experience Focus on: – Competences and expertise profiling – Different contributions management
Build a company/network culture	• Social networks and user profiles • Instant mess.ing, discussions, forums Focus on: – Appealing and usable design – Socialisation capabilities	• Social nets and competences profiles • Reputation mechanisms Focus on: – Selective access and membership – Communication capabilities

- Secondly, for each knowledge source, the existing differences between:
- Source's and firm's *knowledge base*
- Source's and firm's *knowledge processing systems and norms*
- Source's and firm's *organisational structure*
- Source's and firm's *dominant logic*

should be analysed and measured

- Finally, for each difference in one of the four dimensions, and for each identified knowledge source, one of the seven suggested strategies should be implemented and proper information systems and tools should be designed to fill that difference.

Managers should take into account the fundamental principle that no technical system is suitable and sufficient to interact and to exchange knowledge with multiple and variegated knowledge sources.

12.6 Implications for Research

Two aspects need to be further investigated from the point of view of scientific research:

1. To manage inbound open innovation effectively, it is necessary to take into account the differences between the recipient and the source of knowledge. RAC's theory provides a framework to study these differences and their impact on open innovation processes. In this chapter, this framework has been expanded and used to draw guidelines for managers. However, empirical studies to evaluate the impact of RAC on open innovation are still needed.
2. This chapter suggests that technology can support the creation of RAC. The effectiveness of different tools in increasing relative absorptive capacity is another topic which deserves further investigation: which tools are more suitable for which situations? What environmental conditions influence the relationship between technology and effectiveness of innovation processes? What other competences and capabilities, together with technology, are needed to implement effective open innovation processes?

Overall, this chapter proposes a promising framework to study an aspect of open innovation, which is important but still under-investigated.

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Further Reading

A previous version of the framework discussed in this paper was proposed in the cited paper by Carlsson, Corvello and Migliarese (2009). For readers interested in Open Innovation, besides the two by now classic books by Henry Chesbrough, we suggest the paper by *Chesbrough and Kardon Crowther "Beyond high tech: early adopters of open innovation in other industries", R&D Management, 36(3): 229–236, 2006*. We also recommend two special issues of international journals dedicated to the topic: *Technovation (2011, 31(1))* and the *European Journal of Innovation Management* (*2011, 14(4)).* For more information about RAC two papers are particularly interesting: the already cited paper by Lane and Lubatkin (1998) and *Lichtenthaler "Relative capacity: Retaining knowledge outside a firm's boundaries", Journal of Engineering and Technology Management, 25, 200–212, 2008*. The importance of the specificity of the different sources of knowledge is also considered in the paper by Abecassis-Moedas and Mahmoud-Jouini "*Absorptive capacity and source-recipient complementarity in designing new products: an empirically derived framework, Journal of Product Innovation Management, 25(5): 473–490, 2008*.