

S-D Logic and the Open Innovation Paradigm: Marketing for un-embedded technologies

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Abstract

Purpose

During the last decade, firms have been modifying their innovation management processes to generate, implement and exploit new technological knowledge. A gradual shift from a closed to an open model of innovation has been the recurring pattern of this change. Following the new open innovation paradigm, firms have to revise their overall strategic orientation and to adapt their managerial procedures accordingly. We state that the perspective suggested by the New Service-Dominant (S-D) Logic can offer a useful guideline to firms in the implementation of an Open Innovation (OI) model.

Design, Methodology, Approach

We analyze the OI paradigm through the lenses of S-D Logic by emphasizing aspects that are common to the two perspectives, like the customers' participation in value creation, the complex networks of interaction among actors, and the difference between value proposition and value actualization.

Findings

This paper presents three main contributions. First, by means of the S-D Logic mindset, we characterize the bases of the OI paradigm. Second, for each of the ten foundational premises that depict the S-D Logic, we provide instantiations arising from firms that have implicitly adopted the OI paradigm. And finally, we move a step forward and discuss how suggestions provided by the S-D Logic can be put in practice within the context of the OI model.

Originality

This study integrates views from two different areas of knowledge (marketing and innovation) and especially from two new relevant perspectives of thought that allows for a better managerial response to the current trends of the global economy.

Key words: S-D Logic, Open Innovation, Value creation, Networks

Type: Conceptual paper

1. Introduction

The New Service-Dominant (S-D) Logic Paradigm was introduced by Vargo and Lusch in 2004. Since then, this paradigm has received much attention, being enriched by other authors, adapted to specific contexts and related to other approaches signaling its usefulness in understanding the essence of exchanges. As Ballantyne and Varey (2008) note, the outstanding contribution of the S-D logic paradigm is to put ideas together, which did not appear to belong together. Thus, the S-D logic encompasses previous fragmented logics in a perspective that is consistent, transparent, open and dynamic. This paradigm is founded in ten premises (Vargo and Lusch, 2004, 2008) that offer a mind-set to re-evaluate what is exchanged, what is offered, and how interactions between stakeholders should work in an efficient manner.

The Open Innovation (OI) Paradigm (Chesbrough, 2003) is a new perspective that centers in innovation creation as a function of both internal and external ideas of the firm. Chesbrough (2003, 2006b) presents eight aspects differentiating the OI paradigm from the traditional closed approach, which have a lot in common with the foundational premises of the S-D logic paradigm. Chesbrough (2006b) has called for research to enrich the OI paradigm and we believe that analyzing it through the lenses of the S-D logic foundations can shed light on a better conceptualization of the paradigm, open up new lines for research in innovation and especially, suggest new marketing practices for stakeholders.

For this aim, we first introduce the OI paradigm and its bases. Then, we focus on the ten premises of the S-D logic paradigm. For each one we describe its meaning and its interpretation for innovative firms; analyze what is the translation of the premise into the OI approach and offer real world instantiations on how this apply to innovative firms. In the following section we elaborate on practical implications for innovative firms and suggest a new type of segmentation based on key elements of both paradigms. Finally, we conclude with a discussion and suggest future lines of research.

2. The Open Innovation Paradigm

The main essence of the OI paradigm is that it contrasts the traditional “closed innovation” approach, whose principles state that a firm invests in research and development (R&D) activity with the aim of developing new technologies that become the bases to create new products. In turn, such new products are introduced either into existing markets (or segments), or into new markets. Thus, the new technological developments and, in general terms, the firm’s innovative capabilities represent a relevant source of sustaining competitive advantage, which the firm can leverage in order to strengthen its competitive market position. In the extreme case of products that are radically new both to the firm and to the market, monopolistic profits can be gained. The time sustainability of such monopolistic condition will depend on how much the firm is able to prevent imitation from competitors, by investing in effective appropriability mechanisms. Among all the available appropriability mechanisms, the most effective is “secrecy”, that is, a situation in which any uncontrolled public disclosure of information concerning the new technology is prevented. But secrecy can be maximized only if the firm develops the technology in-house, without any linkage with external actors.¹ Therefore, the firm has to operate in a “closed” innovative environment. The resulting technology development process can be described as a funnel (figure 1), whose boundaries are represented by the physical boundaries of the firm itself: several new ideas of product are submitted to both technical and market assessments; most of them are abandoned because they do not satisfy minimal success requirements; some of them are maintained and follow the remaining development process; few of them are eventually converted into new products and then introduced into the market; even less ideas become successful products.

[Figure 1 about here]

¹ The only linkages the firm establishes with the external environment are: i) from the supply side, with the scientific community, in order to absorb the scientific knowledge needed to start a technology development process; ii) from the demand side, with the consumer market, in order to assess unsatisfied consumers’ needs and determine which product features to include in the new product.

If this closed innovation model has worked well for long time, recent changes in the technological, competitive and commercial environment (advent of mass customization, increase of pace of technological change, strengthening of competition due to globalization) have emphasized its main limits:

- a) From the technology exploration side, firms' technological resources and capabilities have resulted inadequate to face the development of complex technological projects. A larger and increasing fraction of the needed knowledge was indeed located outside the firm's boundaries. In turn, the capability to settle various forms of collaborations with different actors (universities, public research laboratories, technological partners, suppliers, customers and even competitors) have become key in order to outsource such knowledge;
- b) From the technology exploitation side, especially after the development of general purpose technologies, firms have found themselves in lack of the complementary assets needed to enter all the potential application markets. As a consequence, besides traditional exploitation mechanisms, new forms of technology commercialization (such as licensing and spin-off creation) have turned out to be viable strategic alternatives.

In sum, firms' boundaries have gradually become porous and less defined, and the entry and exit of scientific and technological knowledge more frequent (figure 2). That is, firms had to adopt an "open innovation" approach, whose main characteristics (Chesbrough, 2006b) are reported in Table 1.

[Figure 2 about here]

[Table 1 about here]

3. Open Innovation from the S-D Logic Paradigm lenses

In this section we focus on the ten premises of the S-D logic paradigm. For each premise we describe what it says based on the works of Vargo and Lusch (2004, 2008) and Lusch, Vargo and O'Brien (2007). Then, an interpretation of the premise's meaning is offered for both the closed or traditional innovation approach and for the OI paradigm. In discussing the latter, we elaborate on the

similarities between the OI and the S-D logic paradigms. To illustrate how these premises are translated into practice, we offer for each one an example of firms that have implicitly or explicitly adopted the premise bases with successful results.

FP1. Service is the fundamental basis of exchange

The first premise posits that “service” is the heart of value-creation and reflects the process of doing something beneficial for and in conjunction with another entity. This implies that the parts involved (operant resources) apply their specialized competences (knowledge and skills) to create the service, what is the essence of the exchange.

In the case of innovation, the outcome of innovative activity – being it a tangible high-tech product or intangible technological knowledge – generates a value that depends on the level of novelty of the innovation and on the capability it shows to solve practical problems more effectively than available technological solutions. In both cases, it is not the innovation outcome per-se that possesses a value. Rather, it is the creative adoption and implementation of it by the user that generates a value. In turn, this process of value co-generation is strictly influenced by the producer and user’s skills and competences, and by the complementarities existing among the two actors. Thus, the basis of the exchange between producer and user is the service embedded in the technological outcome, that is, the enhanced capability of innovation to solve current or future problems within the user’s context.

The OI paradigm (Chesbrough, 2003) is based on a set of bases that suggest that a good performance requires specialized competences. The perspective is open in the sense that knowledge is maintained within the firm and also searched outside the firm boundaries. It is recognized the need to connect with external sources of knowledge in order to produce the service. In this sense, the nature of the service is the technological knowledge co-generated by the firm and a set of heterogeneous actors. The potential value of this service (that is, the new

technological knowledge) originates from its use as a tool for enhancing the user's productivity or efficiency (or, in general terms, utility).

Take, for example, the technological knowledge embedded in a patent. Its potential utility can be converted in actual value depending on the application of it by any of the actors that have participated in its development, or any other firm that might adopt the same technology in the future. Notice that such future adopters are often unknown at the beginning and might belong to sectors that are technologically very far from the developers' main sector. Thus, the total current value of that new technological knowledge is largely unpredictable.

FP2. Indirect exchange masks the fundamental basis of exchange

This premise indicates that around the direct exchange there are too many products, processes, money, institutions and vertical marketing systems. These are only vehicles of exchange, which mask the service-for-service nature of the exchange. Micro-specialization is one of the illnesses that firms can have since the main basis of exchange can be sometimes forgotten.

A similar concern can be issued in the case of innovative contexts. According to the traditional innovation models, the main incentive that a firm has in innovating is developing a new (radical or incremental) technology to be embedded in a (new or modified) product in order to meet the needs of (current or future) customers. In this, the firm creates or strengthens its competitive advantage.

This model implies micro-specialization at different levels:

- i) at the sector level, the outcome of an innovative process is a technology whose unique use is in products that the firm develops for the markets in which operates or in which it aims at entering in the future;²
- ii) at the actor level, each actor is specialized in one activity. For instance, manufacturing firms develop technological knowledge to create new products; engineering or R&D consulting firms develop technological

² Notice, however, that such a sectorial specialization at the output side does not imply specialization at the input side. As shown in the case of multi-technology corporations (Granstrand, Patel and Pavitt, 1997), if the product to be developed is a complex system it is very likely that a firm needs to integrate different technologies arising from several technological domains.

knowledge to provide customized technological services; universities and other public research organizations develop scientific knowledge that remains of public domain and that can be freely used by any other actor;³

- iii) at the contract level, each type of exchange requires specialized contractual arrangements (market contracts in the case of innovative products, licensing and/or service contracts in the case of technology consultancy, research grants in the case of scientific knowledge).

When we move from traditional innovation models to the OI paradigm, the picture is much more complex and less defined. The final outcome of a firm's innovative activity is technological knowledge to be exploited in different forms and through different means (from new product development to corporate spin-offs creation). So, the same technological knowledge can be creatively adopted in several industrial sectors, by different types of customers (individuals or firms), by means of alternative contractual (and pricing) arrangements. This situation overcomes the traditional limits of micro-specialization and transforms the firm in a more complex organization. The key to manage such a complexity, however, is to recognize that at the core of a firm's innovative activity stands a service (technological knowledge), and that any combination of sectors, actors, and contracts is indeed a service-to-service exchange.

As an example, consider Lockheed Martin corporation, whose main business is aircraft manufacturing. One of the critical components of an aircraft is its avionics system, which (electronically) controls the functioning of the whole aircraft. Given that any aircraft is characterized by specific physical features, it always requires a customized avionics system that differs at least in some aspects from existing systems. By recognizing the strict aircraft-avionics system interdependence and the fact that any future pilot would have had the need to train in using the new system before piloting the new aircraft, Lockheed-Martin typically develops a flight simulator that is sold as a complementary service together with the new

³ However, it has been recognized since long that, in order to develop adequate absorptive capabilities, firms need to spend at least a part of their R&D effort in producing scientific knowledge similar to that developed by the scientific community (Cohen and Levinthal, 1989; Rosenberg, 1990)

aircraft. In order to further exploit its knowledge in flight simulators, however, the company decided to use the same technology to develop video games (that is, a product targeting a different market, with different customers, and with different contractual and commercial arrangements).⁴

As this example suggests, from the macro-economic perspective, the adoption of an OI paradigm expands the value created to customers. Indeed, what characterizes the production and use of (technological) knowledge is a high development cost and a close to zero reproduction cost. Thus, by limiting the exploitation possibilities to one sector/one contractual solution, as implicit in the micro-specialization pattern suggested by traditional innovation models, a firm faces an opportunity cost of missed created value.

At the same time, however, in order to expand the possibilities of adoption and use (and value creation) of technological knowledge, the intervention of new actors – such as intellectual property intermediaries (for examples and references, see Chesbrough, 2003) – is often a necessary condition. Their role is that of assisting technology developers to search for and interact with potential users that might be dispersed in distant geographical and sectorial markets. From the macro-economic perspective, the costs associated to such intermediaries represent a drawback of the OI paradigm.

FP3. Goods are distribution mechanisms for service provision

This premise separates the “service” from the product, services or processes that transmit the service value. They are only mechanisms embodying knowledge or skills that render the service. This premise is useful to focus on the service essence.

The same distinction applies in the case of innovative activity, whose outcome – new technological knowledge – is exchanged by means of different distribution mechanisms. Depending on the typology of user, the technological knowledge is either embedded in tangible products, or it remains un-embedded and transferred as intangible knowledge. The first case refers to a situation in which

⁴ This example has been drawn from Rivette and Kline (1999).

high-tech final products or components (depending on whether a B2C or a B2B market is concerned) are sold by means of typical market contracts. The buyer of such products/components is indeed purchasing the service they provide, whose value depends on their actual utilization. By contrast, the second case refers to the provision of technology-based consulting services (un-embedded tacit knowledge), or to the exchange of patents (un-embedded codified knowledge). Among these two extremes, several combinations can be found. So, for example, it is not unusual to observe the provision of engineering services along with the licensing of codified, patented technological knowledge (Arora, 1995; 1996).

A firm which operates following the paradigm of OI should be able to combine these possibilities according to the user's needs and characteristics.

In the chemical industry, firms pursuing a similar strategic approach are largely diffused. Take the example of the polypropylene producer Himont (Cesaroni, 2003). While the company was active in the polypropylene market, through the offer of customized polypropylene compound (embedded knowledge), it was also active in the market for chemical technologies, where it massively licensed its Spheripol process technology (un-embedded codified knowledge). Furthermore, it was not infrequent that would-be licensees were buying not only the licensed technology, but also the engineering services (un-embedded tacit knowledge) needed to design and set-up the chemical plant based on the licensed technology.

FP4. Operant resources are the fundamental source of competitive advantage

Competitive advantage is driven by the comparative ability to cause the desired changes. It includes human skills, logistic capabilities, knowledge bases, supply chain relationships and non-imitable strengths.

For innovative firms this premise is well known. Starting from the resource based theory of the firm and arriving to the dynamic capabilities view (Barney, 1991; Prahalad and Hamel, 1990; Rumelt, 1984; Teece, 2006). the role of technological knowledge and the capability the firm shows in its generation, adoption and use

have been outlined as fundamental bases for competitive advantage. According to the traditional innovation theories, however, the main advantage arises when the firm is able to generate new technologies in-house by impeding other firms to participate in the technology generation, unintentional diffusion of knowledge is prevented, and the firm can benefit of the largest appropriability that maximizes the expected returns.

By contrast, the open innovation paradigm stresses the importance of collaborative agreements that the firm has to settle along the entire process of knowledge generation (since the phase of ideas definition). Thus, the true source of competitive advantage shifts from the capability to develop technologies in-house, to the capability of monitoring the external environment, of setting-up relationships with different actors (providers, competitors, other non-competitive firms, public research organizations, and final consumers), and of integrating several knowledge components. Key in this respect is an appropriate management of intellectual property rights, which are often used as a contractual weapon to enhance the firm's bargaining power.

The example provided by the semiconductors producer ST Microelectronics is a case in point (Cesaroni et al., 2005). ST Microelectronics has been a late entrant in the industry of semiconductors, which was (and still is) dominated by US and Japanese giants. After having exploited the opportunities offered by the niche market of MPEG encoders and decoders, the company soon realized that an enduring international expansion path fed by a persistent innovative activity could be sustained only by developing a vast and diverse network of partners to be involved in a complex value chain. As suggested by the network theory (Lorenzoni and Baden-Fuller, 1995), this implied the development of strong relational capabilities, which allowed ST Microelectronics to become the strategic center of a complex and geographically dispersed network of suppliers, technological partners and customers. Furthermore, the company understood that significant improvements in chip design could be obtain only by investing in basic research. Thus, an active participation to public research programs was

encouraged, and collaborations were established with universities and public research laboratories.

FP5. All economies are service economies

Service has been central to the economy, but is becoming more notorious as specialization and outsourcing increase.

Similarly to other economic activities, innovative activity can be considered a service-based economy, whose main objective is creating knowledge to solve problems, to increase efficiency and productivity, and to satisfy needs. Irrespective of the means by which new knowledge is exchanged (either embedded in or un-embedded from tangible products), the basis of any exchange is the technology-based service itself.

The same framework applies in an OI context, where the heterogeneity of technology exploitation possibilities and of knowledge creation conditions makes it explicit that any firm is indeed contributing in the development, diffusion, adoption and use of knowledge. Technological knowledge is the unifying element of the entire innovative value chain, and the unit of exchange among the complex network of actors.

FP6. The customer is always a cocreator of value

This premise is based on the interaction of operant resources and the co-creation of value. This means that the service will be best off if the end user is involved in the service production process.

The tendency to let customers being involved in value creation characterizes innovative firms since long ago, and not only (as it would be reasonable to expect) in the case of un-embedded knowledge that requires further developments and applications. As an exemplification, consider two cases, one from the consumer market and another from the industrial market.

As for the first example, in the software industry it is common practice that the market launch of a new software package is anticipated by the release of a “beta version”. This is a reduced version of the software package, which is given for

free either to a reduced number of lead users, or (more commonly) to every user, under the implicit and informal agreement that users report back to the company any problem and inconsistency they might find in using the software. Thus, users participate in software development and contribute in generating a higher value out of it.

Remaining in the same industry, the open source software is an extreme (but constantly growing) case of the example outlined above. Indeed, by definition, is created by a vast and geographically dispersed group of users-developers, who offer their software skills and experience for the benefits of themselves and any other potential user.

The second example is drawn from the industrial market of semiconductors. As described by Von Hippel (1994; see also Von Hippel and Katz, 2002), one of the most relevant changes promoted by semiconductors producers over the last decades has been the introduction of Application Specific Integrated Circuits (ASICs), which allow users to create customized circuits. The process works in three stages. In the first one, the semiconductors manufacturer designs and produces “standard” silicon wafers that contain an array of unconnected circuit elements. Then, by using a user-friendly CAD software package provided by the manufacturer, the user designs its custom interconnection layer to be applied to the standard wafer, and uses the same software to conduct trial-and-error experiments. Finally, a silicon foundry produces the integrated circuit, according to the layer specified by the user. In sum, this process reduces the need for information exchange, because each agent uses independently its tacit knowledge to solve its specific sub-problem. The underlying idea is that the technology supplier provides the user with a “technology package” containing a standardized technology and a tool kit, which enables the user to customize the same technology according to its own needs.

The example of ASICs brings to the attention the more general consideration that any final user can participate in the technology provision phase and can contribute to generate value out of it only if two conditions apply:

- a) The user must have enough skills and know-how in that specific technological field, or, at least, the technology developer has to provide to the user a specific tool needed to apply the technology according to the user's specific needs;
- b) The technology has to remain at a level that is general enough to be subsequently customized according to diversified needs – that is, it has to be less context-dependent (Arora and Gambardella, 1994). Indeed, only in this case the same technological knowledge can be adopted in different contexts and adapted to meet the requirements of specific users' needs.

FP7. The enterprise cannot deliver value, but only offer value propositions

Firms can not create and deliver value alone; they can only offer value propositions that create the service only following end user's acceptance, participation and consumption.

Also in the case of a new technology development the actual value depends both on its practical utilization and on how the new technology permits to solve existing problems better than past technologies or than any other available alternative. The new technology only represents the possibility to create value, but it does not provide any value per-se.

In order to explore this issue, consider the extreme case of patented technologies. As known, a patent represents a property right granted to a technological invention, which protects the inventor from uncontrolled imitation. Being an intellectual property right, a patent can be traded among economic agents. One of the typical contracts by which patents are exchanged are licensing agreements, whose specific pricing method exactly fits the idea of technology as value proposition rather than delivered value. Indeed, because the effective application of the technology is not known ex-ante, it results difficult to determine an exact price for it. In turn, licensing contracts distinguish two components of price, a fixed fee and a royalty component. The latter is usually computed as a percentage of sales that the licensee will obtain in the future by

using the technology, and thus it represents the means by which the technology developer co-participates to the value created by the user. In sum, any patented technology can be described as a value proposition, whose actual value strictly depends on the user's application decisions.

In an OI context, apart from the licensing of patented technologies, there are other solutions that replicate the same conceptual framework. When a company decides to leave a newly-created corporate spin-off to further develop a technology and bring it to the market, what that company is doing is to offer a value proposition to the spin-off. Then, by maintaining an equity share in the spin-off, the company receives a part of generated profits, and thus it is capturing a share of the value created by the spin-off by means of the original technology.

FP8. A service-centered view is inherently customer oriented and relational

The firm and the end-user are considered in a relational context since both create value in an interactive process. In combination with FP7, where value is finally determined by the end-user, the exchange is inherently customer oriented.

Innovative firms have recognized the centric role of consumers in new technology development since the Sixties, when a "demand-pull" model of innovation has started to replace the traditional "science-push" model (Rothwell et al., 1974). Even though that distinction between contrasting innovating models can be considered largely dated, recent studies confirm that consumers still play a dominant role in innovation development (Roberts, 2001). They represent a fundamental source of innovation and participate in different forms along the entire process of ideas generation, technology development, and technology implementation.

Fiat Research Centre (CRF – the corporate R&D centre of the Italian car manufacturer) represents an exemplification of this approach (Cesaroni et al., 2004). Having started its activities at the end of the Seventies as the Fiat Group's main R&D centre, CRF has soon tried to convert itself from a "cost centre" to a "profit centre" by exploiting internal technological competences outside the group's boundaries. This brought CRF to act as technological consultant mainly

on behalf of local firms. Among others, one key aspect of CRF's successful strategy has been that of recognizing the centric role of customers. Indeed, in defining customer's technological needs to be satisfied, CRF was used to take into account not only customer's explicit requirements, but also its latent needs, its competitiveness conditions, and (most importantly) the expectations of "customer's customers". In turn, this implied to CRF a relevant technological, organizational and managerial effort, because CRF's researchers were required not only to integrate know-how and competencies from different technological areas, but also to analyze the complex environment in which customers were operating. Nevertheless, such a complex effort was key to succeed.

If we analyze customers' role within the OI paradigm, at a first glance OI seems to underestimate the active role of customers. By stressing the idea that a firm can exploit its technological competences through different means even in situations of "false negatives" (that is, when a new R&D project fails to meet the criteria in earlier stages of the development process), OI seems to adopt a pure "science-push" approach. Nevertheless, this conclusion appears incorrect for at least two reasons:

- a) Irrespective of which actors will eventually appropriate the returns arising from the technology, any R&D project has to start from and conclude with an active involvement of end users, because only this condition can maximize the likelihood of functionality and success;
- b) A false negative R&D project that exits the firm's boundaries and follows an external exploitation path still needs further development and implementation. Such additional stages are managed by actors different from the firm that originally launched the R&D project. However, similarly to the original firm, these actors will have to adopt a customer-centered view if they aim at generating a technological knowledge that offers a value proposition to their customers. The problem only shifts from the original firm to such external actors, but it remains key for guaranteeing the success of the R&D project.

FP9. All social and economic actors are resource integrators

Organizations and individuals motivate and constitute the service exchange. All entities participating in the service production are considered social or economic actors.

In innovative activity it is possible to identify several actors participating in technology development (such as universities, public research laboratories, providers, partners, competitors, and customers), and hardly it can be asserted that a single firm may possess all the needed resources and competences to manage the development process entirely in-house. Each actor offers its specialized technological, organizational, relational resources and competences, and the value created emerges as the composition of marginal contributions.

The OI paradigm recognizes and emphasizes the importance of the complex network of actors that participate in technology development. Further, with respect to the traditional innovation paradigm, OI identifies new resource integrators that often play as intermediaries among other actors, and that often base their competences on the management of intellectual property rights.

One of the most cited examples in this respect is that of InnoCentive.com (Chesbrough, 2006a; Lakhani, 2008), which acts as a virtual innovation marketplace. The functioning on InnoCentive business model is rather simple, being that of facilitating the meeting between firms (“Seekers”) that need to find punctual solutions to their technological problems (“Challenges”) and a vast and dispersed group of technicians (“Solvers”) willing to offer their technological skills and expertise. Thus, as soon as a Seeker poses a Challenge, external Solvers submit their proposed solutions. Solutions that are judged acceptable are then rewarded by the Seeker with a cash prize. InnoCentive manages all this process, and provides solutions to solve problems of intellectual property rights transmission (from the Solver to the Seeker). In this respect, InnoCentive’s role is that of resource integrator, which contributes to value creating by allowing the exploitation of (Solvers’) technological competences otherwise unexploited.

FP10. Value is always uniquely and phenomenologically determined by the beneficiary

This premise indicates that value is always judged from the end-user depending on the specific situation (time, place and network relationships) he is in.

This last premise perfectly fits into the innovation context (and similarly into OI), and can be drawn from the analysis conducted so far. As a matter of fact, a new technology must be considered a potential solution to practical problems, whose actual usefulness (and, hence, value) strictly depends on the context in which it will be practically applied. The more a technology is General Purpose (Helpman, 1998), the higher the number of contexts where it can be applied, and the higher the overall value generated.

Take, for instance, a patent protected technology and consider the structure of “claims” included in the patent documentation. Each “claim” represents a possible specification of the same technological knowledge, from the most general – that explains the content of the technological base – to the most specific – that explains how to use that technological base to obtain a determined product. Thus, each claim already represents a potential outcome of the same technological base. Actual technology’s value, however, only results from how end users will be able to adopt that technology to satisfy their particular needs, that is how each claimed product will be effectively transformed in actual (and valued) product. Once again, without end user’s intervention, a patent is only a value proposition.

4. What can be learned from looking OI through the S-D logic approach: Implications for innovative firms

One of the main consequences of adopting the S-D Logic framework to analyze the OI paradigm is that of redefining the way in which innovative firms should think at their marketing strategies, and specifically at market segmentation. According to the OI paradigm, an innovative firm can exploit its technological competences either through an internal or an external path. In turn, the latter can be further divided into two alternatives:

- a) Licensing-out of (codified) technologies;
- b) Transfer of (tacit) technological knowledge (e.g., by means of consultancy or complex engineering services).

If these two possibilities are regarded as two separated market segments that include customers with different characteristics and that can be addressed by pursuing specific strategies, the problem shifts to the analysis of which features distinguish the two segments and under which conditions one segment is more attractive than the other.

In order to solve this question, it might be useful to refer to the scheme reported in Figure 3. It compares two dimensions. The first dimension concerns *the number of potential customers* to which a technology can be transferred without making considerable modifications and adaptations to it. On one extreme, the technology can be transferred only to one customer; on the other it can be transferred and applied to a large number of differentiated customers. The second dimension concerns the *degree of codifiability* of the technology, i.e. the possibility to reduce and codify the tacit component of which it is made. In the presence of technologies highly codified, technology transfer can be promoted without a strict interaction between technology supplier and users. The exchange, in this case, becomes similar to market transactions for products, and can be actuated by means of licensing contracts. In sum, while the first dimension depends on the size of the market the company faces, the second concerns the characteristics of the technology to be transferred. Both, however, can be influenced by firms' actions.

[Figure 3 about here]

As revealed by the technological change in electronics and chemicals over the last decades, the codification of technological knowledge is also the result of efforts promoted by firms in order to use general and abstract knowledge bases applicable in diverse contexts (Arora and Gambardella, 1994). This result can be obtained only if firms heavily invest in research activities, whose returns can be expected only in the long-run. Thus, firms have to make an effort in order to translate technological knowledge into more general and abstract categories, not

directly linked to the specific application for which that knowledge has been originally developed, but that go back to scientific bases that lie behind the technology itself. In other words, firms have to make the technology less context-dependent. The question then shifts to: Do firms have enough incentives to move towards that direction? Among others, one possible incentive to the codification of technological knowledge comes from the fact that firms can maximize the returns from their innovative activity by selling the technology to a potentially high number of users. Indeed, once the technology has been made less context-dependent, the same technology can be applied to different sectors, contexts, and firms without having to sustain high adaptation costs. As a consequence, the market of potential customers enlarges.

Thus, in the presence of non-codified technologies and a low number of potential users, technology transfer can be promoted only by means of “one-to-one” interactions between technology suppliers and acquirers. This solution allows the transfer of tacit knowledge, and makes the exchange effective for both actors. The supplier will directly come to know how the potential user is going to apply the technology being transferred, and will profit of this information by maximizing the technology’s price, according to its value for the user. This scenario represents a fairly “traditional” pattern within the context of division of innovative labor, and is typical of research centers (or engineering firms) which work on orders of external customers. Compared with a pure model of technology market, this model of “one-to-one” technology transfer offers a higher degree of customization, but limits the diffusion of the technology as a package.

Conversely, when the technology can be highly codified, and the size of the (potential) market is large, firms face an opposite situation and technology can be transferred to a potentially high number of users. The supplier does not directly know all the users, and the exact value they give to the technology, so that she cannot maximize the returns from each transfer. However, the supplier can try to maximize the number of transfers, by defining generic and standardized exchange contracts. The necessary condition for this situation to happen is the

absence of tacit components of technological knowledge, whose presence would imply a stronger interaction between the two parts.

The second scenario of market-based technology transfer might represent an evolution of the first one, in the case in which firms adopt strategies in order to increase the codification of technological knowledge, and to enlarge the size of the market. Although the value obtained by each transaction may be lower than the value obtained with customized technology transfers, the overall benefit of this strategy may be greater than “one-to-one” transactions, in the presence of increasing returns in technological development. In many technological sectors, such as software, this condition is satisfied, provided that the largest part of investments is required at the initial phase of generation of knowledge and development of competences, and that subsequent applications require costs close to zero. Furthermore, this pattern implies that firms might have incentives in developing general purpose technologies to be applied to several diversified application sectors. This choice increases the size of the market, and allows firms to take advantages of increasing returns in technology application (Arora et al., 2001).

Situations different from “one-to-one” and market-based transactions are either strategically dominated by the two, or inconsistent. Consider first the case of technologies that can be highly codified, and of a small number of potential customers (left upper side of Figure 3). This situation is inefficient to the supplier. Indeed, intrinsic characteristics of the technology allow its codification and its subsequent transfer to a higher number of customers. By choosing to concentrate on a small number of customers, firms sustain high opportunity costs. In turn, this strategy is clearly dominated by the possibility to enlarge the size of the market and increase the number of potential customers. Similarly, the case of technologies that cannot be codified, and of a large market (right lower side of Figure 3) is inconsistent. A non-codified technology is usually based upon tacit and localized knowledge, often resulting from the resolution of specific problems. The same technology rarely can be applied to different contexts and users. However, in order to enlarge the size of potential market, the supplier can

try to increase its codification, and make the technology applicable to firms and contexts different from those where the technology has been originally developed.

Examples of firms located in the “technology market” area can be observed in knowledge-intensive large firms (e.g., producers of modules of complex technologies), in small firms focusing in technology development without downstream assets in production and marketing (e.g., some small firms in the semi-conductors industry), and in those organizations with relevant technological, but scarce commercial competences (e.g., universities). It is worth noting that actors of technology markets are not only firms producing and selling technologies, but also intermediaries whose role is to connect technology buyers and sellers, hence reducing the amount of transaction costs.

Examples of firms located in the area of “one-to-one” transactions can be found in more traditional industries, like machinery and the automotive sector. Indeed, technologies developed in the automotive sector have context-dependent characteristics and are often the result of problems with a specific and localized origin. These technologies have a strong tacit component, which makes their transfer particularly problematic and based on strict user-supplier interactions. To be sure, the automotive sector makes use of many technological fields – such as optics, and electronic systems – which are based on more general and abstract scientific bases. As far as their relevance within the automotive sector increases, the role of tacit components in automotive technologies reduces.

In sum, the different means by which a technology can be transferred and exchanged imply that firms solve specific problems. Even though “one-to-one” interactions represent a more traditional transfer method, the way in which these interactions can be profitably operated largely depends on the capability of actors to implement appropriate organizational and managerial solutions.

5. Conclusions

In this paper we have explored how the Open Innovation Paradigm and the Service-Dominant Logic Paradigm relate one to the other. Both perspectives see

the value-in-use as the center of exchange. In addition, they consider that better value is to be gained from collaboration and co-creation of actors. These perspectives represent a step forward in the way of doing businesses, leaving behind the orientation to products and manufacturing that now are seen just as vehicles of service. The first contribution of this study is then the integrated view of different areas of knowledge (marketing and innovation) that allows us to think in terms of essentiality of the service. The instantiations presented for each premise show that innovative firms that have implicitly focused efforts on key aspects of the S-D logic have achieved successful results. This is another contribution of this work that encourages innovative firms to consider improving practices in the various premises. It is very likely that the better the performance based on the premises, the higher the competitive advantage of actors. A third contribution of this work, in terms of implications of the integration of the paradigms, is the proposal of a new classification of customers, according to the market segment they belong to: one-to-one consulting-type market for (tacit) technological knowledge, on one side, and markets for (codified) patented technologies, on the other side.

From a marketing perspective based on the S-D logic, many challenges are now opened for innovative firms. We outline at least four. One challenge is to think of new or more efficient ways to get other actors more involved in the co-creation process of the service. In this respect, an effective management of intellectual property rights is key to minimize potential conflicts among partners, and to create incentives to participate in collaborative agreements. A second one is to identify efficient ways for selecting actors to collaborate with. Interactions with different stakeholders and intermediaries become critical in the creation of value. In this sense, relationships based on trust, transparency and symmetry form the bases of successful exchanges for the implied parts. In turn, this will promote long-term and beneficial relationships. A third challenge relates to the value propositions and the new forms to communicate them. An effort should be made in order to create rational expectations of the exchanges. Clear and straight messages will increase actors' satisfaction and will enhance their ensuing

positive behaviors. A fourth challenge regarding operant resources resides on recognizing the role that plays each of the operant resources on the service production. In this line, investing in training of employees and collaborators (for example, through internships, joint participation to research programs) will increase the value created in exchanges.

All in all, we believe that the S-D logic mind-set helps a firm in focusing on the real reasons of its function. In particular for innovative firms, the S-D logic makes firms to think of more open ways to do exchanges, creating more value not only for end customers and the firm, but also for society at large. Research on the challenges outlined above is the beginning of innovative managerial practices that will fit the current trends of the global economy.

References

- Arora, A. (1995), "Licensing Tacit Knowledge: Intellectual Property Rights and the Market for Know-how", *Economics of Innovation and New Technology*, Vol. 4, pp. 41-59.
- Arora, A. (1996), "Contracting for Tacit Knowledge: The Provision of Technical Services in Technology Licensing Contracts", *Journal of Development Economics*, Vol. 399, pp. 1-24.
- Arora, A., Fosfuri, A. and Gambardella, A. (2001), *Markets for Technology: Why They Exist, Why More Do Not Exist, and Why Should We Care*, MIT Press, Boston.
- Arora, A. and Gambardella, A. (1994), "The Changing Technology of Technological Change: General and Abstract Knowledge and the Division of Innovative Labor", *Research Policy*, Vol. 23, pp. 523-532.
- Ballantyne, D. and Varey, R.J. (2008), "The Service-Dominant Logic and the Future of Marketing", *Journal of the Academy of Marketing Science*, Vol. 36, No. 1, pp. 11-14.
- Barney, J.B., (1991), "Firm Resources and Sustained Competitive Advantage", *Journal of Management*, Vol. 17, No. 1, pp. 99–120.

- Cesaroni, F. (2003), "Technology Strategies in the Knowledge Economy: The Licensing Activity of Himont", *International Journal of Innovation Management*, Vol. 7, No. 2, pp. 223–245.
- Cesaroni, F., Di Minin, A. and Piccaluga, A. (2004), "New Strategic Goals and Organizational Solutions in Large R&D Labs: Lessons from Centro Ricerche Fiat and Telecom Italia Lab", *R&D Management*, Vol. 34, No. 1, pp. 45-56.
- Cesaroni, F., Di Minin, A. and Piccaluga, A. (2005), "Exploration and Exploitation Strategies in Industrial R&D", *Creativity and Innovation Management*, Vol. 14, No. 3, pp. 222-232.
- Chesbrough, H.W. (2003), *Open Innovation. The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press, Boston (MA).
- Chesbrough, H.W. (2006a), *Open Business Models: How to Thrive in the New Innovation Landscape*, Harvard Business School Press, Boston (MA).
- Chesbrough, H.W. (2006b), "Open Innovation: A New Paradigm for Understanding Industrial Innovation", in Chesbrough, H.W., Vanhaverbeke, W. and West, J. (Ed.), Oxford University Press, Oxford.
- Cohen, W. and Levinthal, D. (1989), "Innovation and Learning: The Two Faces of R&D", *Economic Journal*, Vol. 99, pp. 569-596.
- Granstrand, O., Patel, P. and Pavitt, K. (1997), "Multi-technology Corporations: Why They Have 'Distributed' rather than 'Distinctive Core' Competencies", *California Management Review*, Vol. 39(4), pp. 8-25, Summer.
- Helpman, E. (Ed.) (1998), *General purpose technologies and economic growth*, MIT Press.
- Lakhani, K.R. (2008), "InnoCentive.com (A)", *HBS case*, No. 9-608-170, Harvard Business School, Boston (MA).
- Lorenzoni, G. and Baden-Fuller, C. (1995), "Creating a strategic center to manage a web of partners", *California Management Review*, Vol. 37, No. 3, pp. 146.
- Lusch, R. F., Vargo, S. and O'Brien, M. (2007), "Competing Through Service: Insights from Service-Dominant Logic", *Journal of Retailing*, Vol. 83, No. 1, pp. 5-18.

- Prahalad, C. K. and Hamel, G. (1990), "The Core Competence of the Corporation", *Harvard Business Review*, Vol. 68, No. 3, pp. 79-91.
- Rivette, K.G. and Kline, D. (1999), *Rembrandts in the Attic: Unlocking the Hidden Value of Patents*, Harvard Business School Press, Boston (MA).
- Roberts, E. (2001), "Benchmarking Global Strategic Management of Technology", *Research Technology Management*, Vol. March-April, pp. 25-36.
- Rosenberg, N. (1990), "Why Do Firms Do Basic Research?", *Research Policy*, Vol. 19, pp. 165-174.
- Rothwell, R., Freeman, C., Horseley, A., Jervis, V.T.B., Robertson, A.B. and Townsend, J. (1974), "SAPPHO Updated-Project SAPPHO Phase II", *Research Policy*, Vol. 3, pp. 258-291.
- Rumelt, R.P., (1984) "Towards a Strategic Theory of the Firm," in Lamb, R. (Ed.), *Competitive Strategic Management*, Prentice-Hall, Englewood Cliffs (N.J.).
- Vargo, S. and Lusch, R.F. (2004), "Evolving to a New Dominant Logic for Marketing", *Journal of Marketing*, Vol. 68, No. 1, pp. 1-17.
- Vargo, S. and Lusch, R.F. (2008), "Service-Dominant Logic: Continuing the Evolution", *Journal of the Academy of Marketing Science*, Vol. 36, No. 1, pp. 1-10.
- Von Hippel, E. (1994), "'Sticky Information' and the Locus of Problem Solving: Implications for Innovation", *Management Science*, Vol. 40, No. 4, pp. 429-439.
- Von Hippel, E. and Katz, R. (2002), "Shifting Innovation to Users via Toolkits", *Management Science*, Vol. 48, No. 7, pp. 821-833.

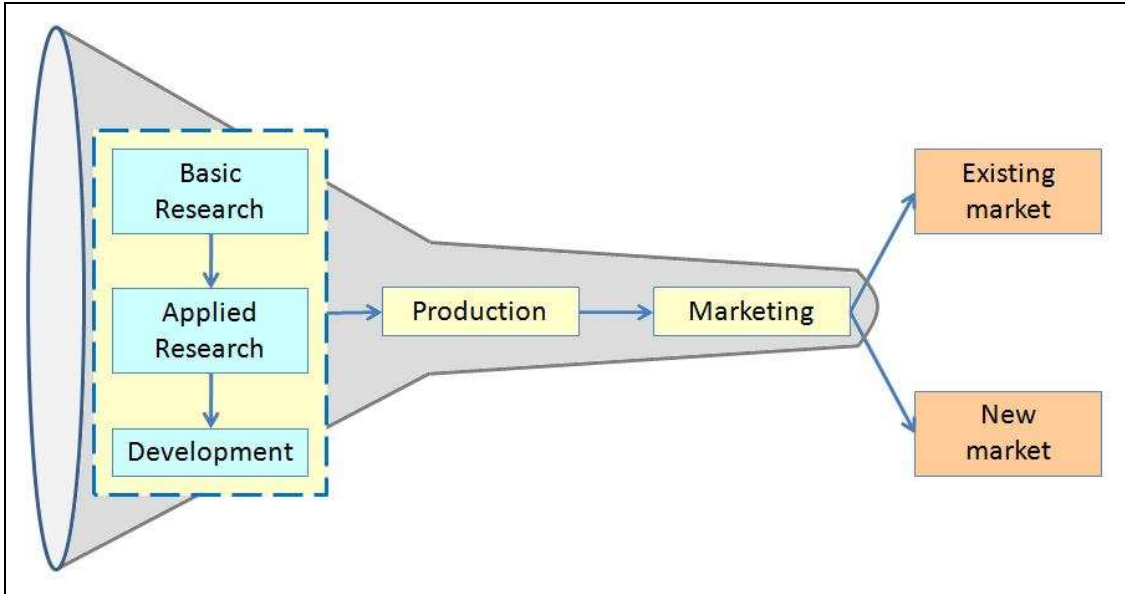


Figure 1 – The “closed innovation” paradigm

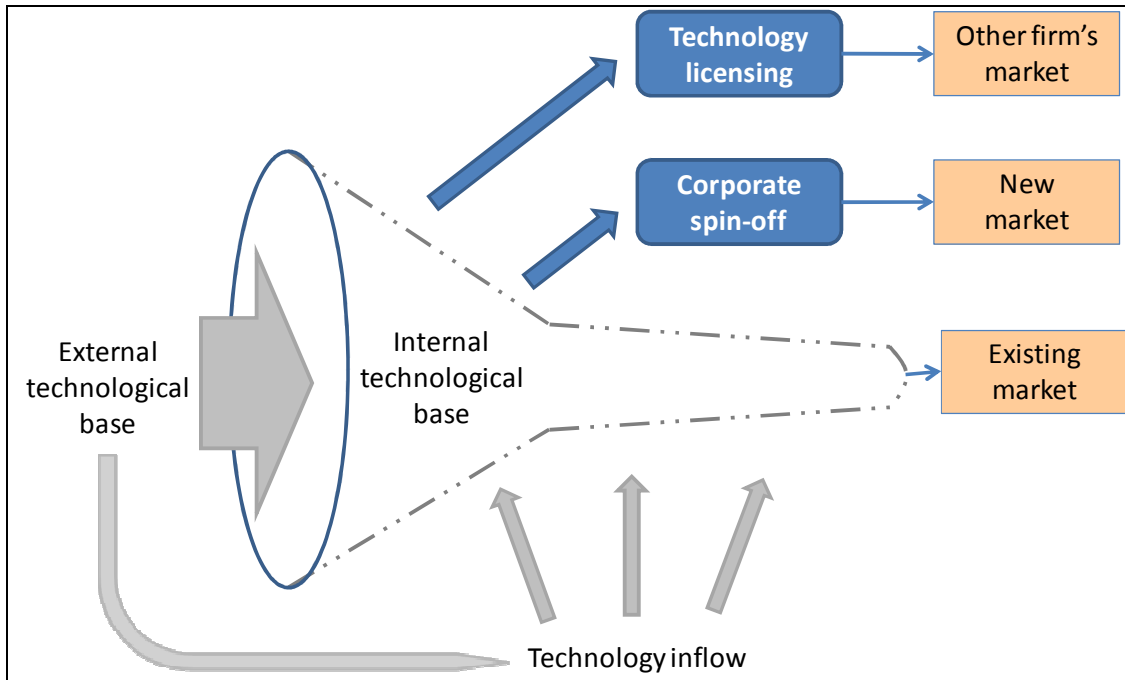


Figure 2 – The “open innovation” paradigm

Source: adapted from Chesbrough (2003)

Table 1 – Main differences between “open innovation” and “closed innovation”

1.	External knowledge is as important as internal knowledge
2.	Continuous seeking of “genius people” inside and outside the firm
3.	False negative R&D projects can have a market
4.	New channels enabling flows of technologies that lack a clear path to market internally seek a path externally
5.	Knowledge is widely distributed and of high quality in general, so there is a need to connect with external sources of knowledge.
6.	Proactive role of IP management facilitating the use of markets to exchange valuable knowledge
7.	Intermediaries play a direct role in the innovation market: more intermediaries with more functions
8.	New metrics for assessing performance are needed (e.g. R&D in the supply chain, percentage of innovation generated outside the firm, time for an idea to get from the lab to the market and by channels, utilization of patents for others, value generated, investment in other firms)

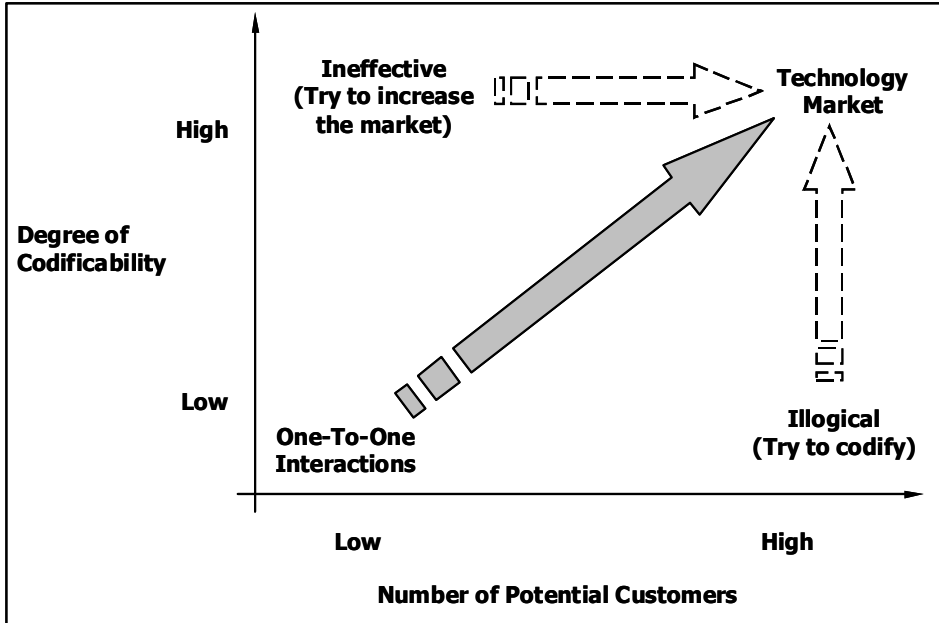


Figure 3 – Technology market segments