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Inbound Strategies and Innovation Performance : un'analisi del licensing tecnologico

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Indice

Introduction

The challenge in the economic environment is to identify which are the critical factors to be more competitive than the others. The first basic issue that should be considered is how to increase the innovativeness. The innovation problem represents the main issue that firms should detect and solve to gain a competitive advantage. Historically, the approach adopted to the innovation process was in a closed point of view. It means in this case that the innovation is realized just through the internal efforts. Firms attempt to achieve an innovation by the investment in research and development unit with a full trust in the internal capabilities. The environmental changes and the discovering of new evidences led to a change of course. The close innovation model appeared to be inefficient to guide efficiently firms to find out optimal innovations. A more open approach occurred to solve the innovation problems found it through the closed innovation model. The awareness of the widespread knowledge in the market has led firms to recognize that not all the needed sources can be internally found. It must be required to enter in a relationship with external forces to obtain further information, aimed to achieve a better performance in terms of innovation and financial returns. In my analysis, the first paragraph of the chapter treats about the passage from a closed to an open model in the innovation process. Subsequently, I showed the main aspects of the open innovation model that are essential to firms' innovation progress. This new approach has positive and negative aspects as intentional and non-intentional consequences. Therefore, through the study of this new paradigm, I presented all the aspects and critical issues that this model carried with it. The open innovation practices can be divided into two groups: the inbound and the outbound activities. The inbound strategies deal with the incorporation of the external sources, while the outbound strategies worry about the commercialization of the internal knowledge. Once I have detected each strategy, the next step was to identify in which way the external sources are integrated within the internal frameworks and which are the obstacles that need to be overcome, as the "not invented here" syndrome and low absorptive capacity. Basically, these obstacles, that firms face on their integrating activity, delay the innovation process and need to be overcome through a well-known analysis of all the main aspects that can suggest relevant solutions. Successively, I showed the relationship between the open innovation process and firms performance: which are the effects of this model in terms of financial performance and products and processes innovation. Once presented this relation, I study the connection that exists between the openness and the innovation performance. How the open innovation model can enhance firms' innovation performance? It should be considered, however, that the open innovation process is composed by two essential macro areas: the in-bound and the out-bound practices. Once I presented the

characteristics of these two different strategies, the focus of my analysis was posed on the inbound activities and their impact on the innovation performance and more specifically on the licensing linkage with the innovation performance. I exposed all the main issues of the licensing activities. The essential questions that led my detection were if really exists a real positively influence on the innovation process produced by the licensing strategy and then how and in which occasions we can find these positive aspects.

1. In the field of Open Innovation

1.1 From closed to open innovation

Innovation is recognized as the key asset to provide firm's business competitive position on the market and as a result an increasingly intense attention is paid to innovate. Generally, the innovation process was viewed as a part of the firms' internal organizational structure and consequently was assumed to be as a "closed" process, where value is generated inside and the key word is : self-reliance.

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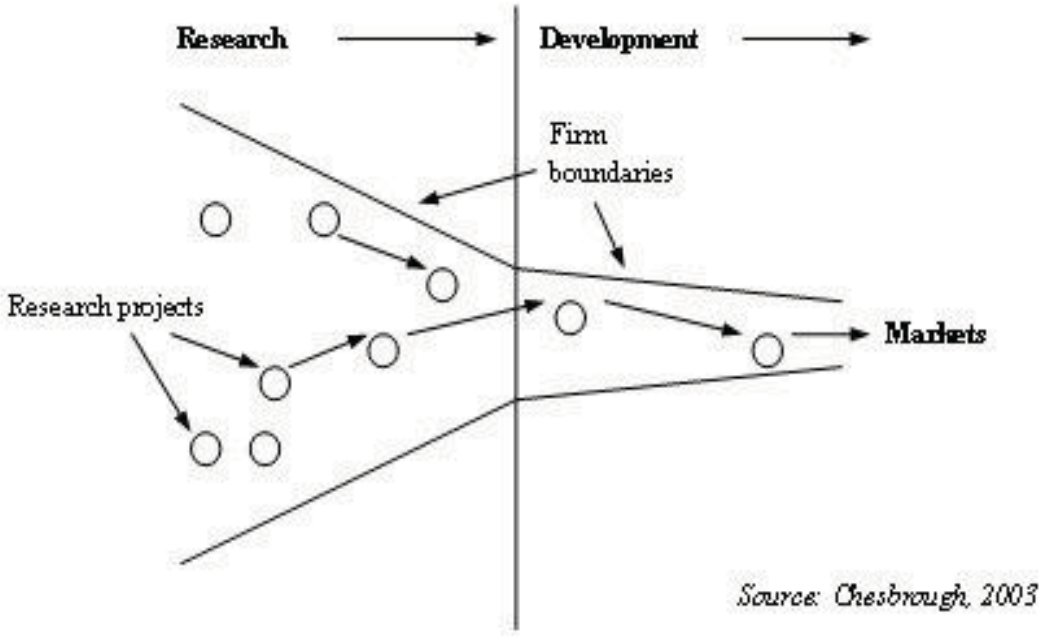

(Chesbrough, H. (2003) Open Innovation : The New Imperative for Creating and Profiting from Technology)

In this funnel, ideas and projects are introduced at the beginning in just one way. Equally, they can only exit and go into the market in one way. There isn't any connection with the external environment as well as with other companies. Innovation requires that firms generate and develop technologies internally, nurture, and market them until they are launched as a new good or service. This internal focus implies a faith on the internal capabilities to successfully innovate. The closed innovation is based on the assumptions that smart people in the field work for the firm to develop and discover innovations to profit from the resource and development. The main aspect is to be timely, in order to get it to market first, due to the fact that the first to commercialize will win. So based on these suppositions, the closed innovation creates value from investing in the internal resource and development unit, controlling the intellectual property so that the competitors don't profit from firms' ideas. Despite the success achieved, the closed innovation has gradually given away to a more externally focused way of organizing innovation, where the firms' development depends on openness and absorptive capacity. This paradigm has been challenged over the past years and that changed rapidly the approach to the innovation process. Several factors, including the increase in costs of the research and development department, coupled with the reduction of the product life cycle, have undermined the ability of companies to cope with the innovation activity, relying solely on the skills generated internally. The mobility of highly educated people has increased and large amounts of knowledge flows between firms. Furthermore, the availability of venture capital has had a significant boost recently, which had made it possible for good and promising ideas and technologies to be further developed outside the firm, for instance in the form entrepreneurial firms. Many possibilities to enhance and realize ideas and technologies outside the firm are growing, for instance in the form of spin-offs or through licensing agreements. These specific forces, especially the rising costs of technology development and the shorter product life cycles, make it very difficult to maintain an high level of R&D investments on a closed innovation model of innovation. "By itself, rising costs of technology development might mean that the big will get bigger and that everyone else will fall behind. But a second force makes these economics challenging even for the largest firms [..] the shortening product life cycles of new products today." (Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape, page 11) "The combination of rising development costs and shortening market windows compresses theeconomics of investing in innovation, reducing the company's ability to earn a satisfactory return on its innovation investment."(Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape, page 11) This picture shows how does these two forces act to reduce the firm's incentives to invest on innovation. In fact, as development costs rise and the product life cycle becomes shorter (close model after) , the purpose to innovate declines due to the

excess of the innovation costs. All these causes made it necessary to try to overcome business boundaries and access to the innovative solutions developed by external partners, through tools that offer speed and flexibility to the innovative process launched by the companies.

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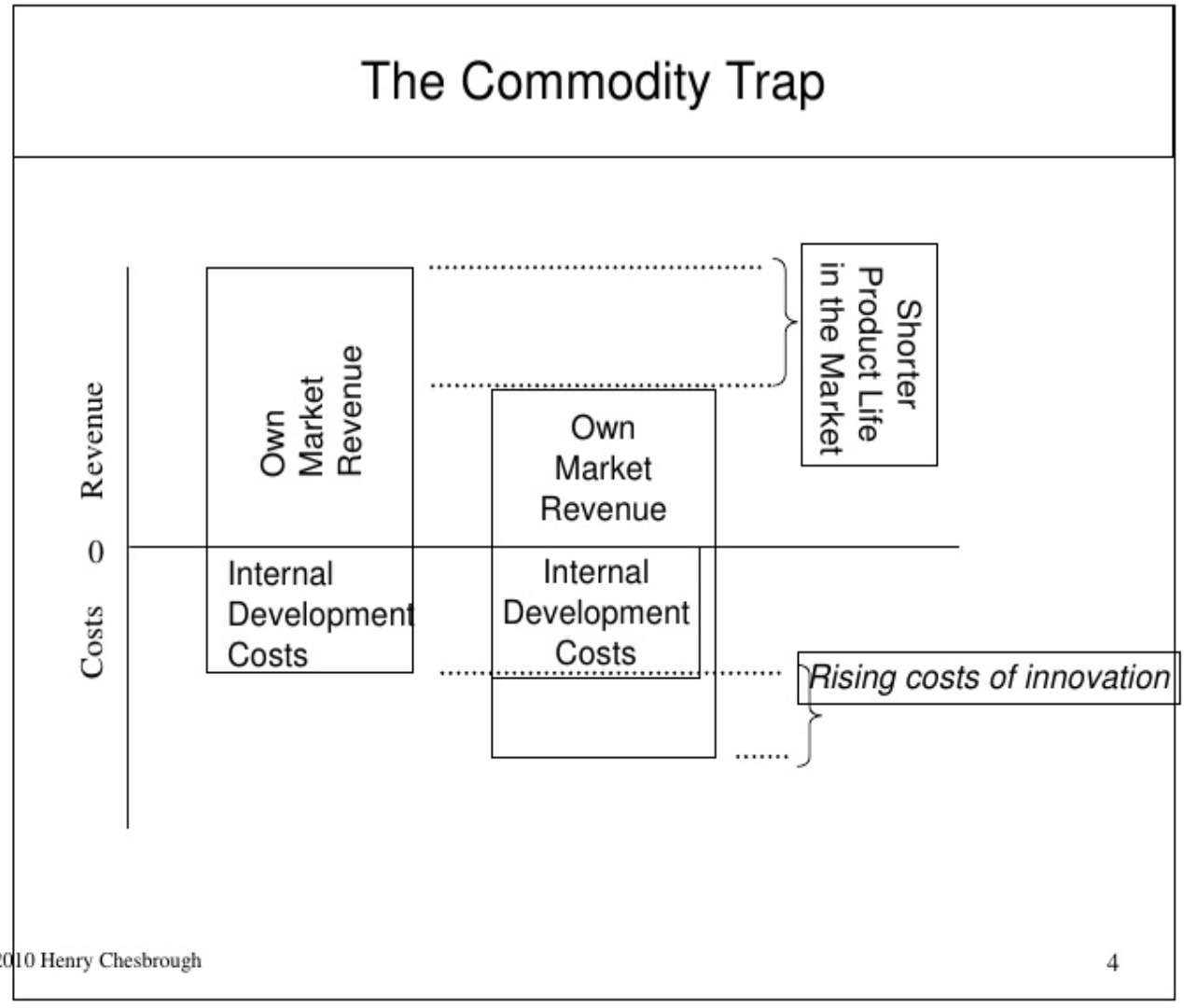

(Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape)

The closed model incompatibility signed the turn over forward a more open innovation model. One

development that is hopeful for future innovation is the growing division of innovation labor. By a "division of innovation labor", Chesbrough means a system where one party develops a novel idea but does not carry this idea to market itself. Instead, that party partners with or sells the idea to another party, and this latter party carries the idea to market. This new division of labor is driving a new organizational model of innovation. (Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape)" To tap into this new division of labor, companies will have to open up their business models. If they are able to do so, many more ideas will become available to them for consideration, and many more pathways for unused internal ideas will emerge to unlock latent potential as those ideas go to market". (Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape, page 2) Opening business models involves two functions : creates value and capture a portion of that value. Value is created throughout the several steps of the production processes, where a set of activities added value that lead to new products and services. In this process of value creation, firms should establish a unique resource, asset or position that allow them to gain a competitive advantage. "Open models create value by leveraging many more ideas, due to their inclusion of a variety of external concepts. Open models can also enable greater value capture, by using a key asset, resource, or position not only in the company's own business but also in other companies' businesses" (Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape, page 2). The opportunity to increase value can be captured in the intermediate markets where firms find out resources and ideas that can fit well with their internal productions and can challenge them to discover new fields to be successful. "intermediate markets are markets in which an upstream supplier licenses its knowhow and intellectual property to downstream developers and producers." (Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape, page 4) Its refers to markets that emerge when a new technology is created, in a period prior of its sale. In the open innovation field, companies are likely to absorb external knowledge into their activities and to be gain through the licensing or selling of their own internal resources and ideas. On the other hand, in the closed innovation model these markets were rarely used, due to the fact that companies preferred to sell by themselves to gain more money and especially because weren't so many firms that knew how to use successfully that technologies. These markets provide a way to flow out of a company ideas and technologies that don't fit well with the internal structure, to find a better place to be successfully used. Intermediate markets could be inefficient when some prices and other terms of the transactions are difficult to be recognize. In that case, different mechanisms, like spinoffs and breakups, allow firms to gain access to gain intellectual properties that are then places in the new venture. While there are visible positive aspects linked with the innovations and their growth, intermediate markets

imply real risks that arise as well. Given their nature, the intermediate markets give opportunities to extend the companies' business. It is necessary that companies manage well the new businesses where they entered, otherwise these markets may be used by others to block them from entering into new businesses or to tax them in the businesses where they already are. The predominance of risks against benefits depends on the companies' ability to manage well intermediate markets and the business model they create for them. The open innovation model strikes the cost side by leveraging external R&D resource to preserve the innovation saving money and time and attacks the revenues side by broadening the number of markets addressable by the innovation. This new paradigm research a collaboration between actors, a means of accelerating the creation of new products and at the same time reducing costs and development risks. The main principle beyond is that the success comes from the union and interaction between internal and external ideas, so firms should profit from others' use of their internal intellectual properties and in the meanwhile buy others' IP, whenever it advances them. Therefore the sources are not exclusively internal, but need to be also external, in order to reduce costs and gain more. Portion of the significant value is created externally. Building a better business model is better than getting to market first. The business model plays a crucial role in this. After all, how and when external knowledge is required and used is to a large extent determined by the companies' business model, which describes how value can be created from innovations and which elements have to be sourced internally or externally. This progressive transition from Closed Innovation to Open Innovation wasn't immediately, but took time to firms to absorb the transformation of systems. First, a shift should take place in the way people look at the company and its environment to accept the new way to explain the innovation.

1.2 The open innovation (OI) paradigm

"The open innovation paradigm can be understood as the antithesis of the traditional vertical integration model where internal research and development (R&D) activities lead to internally developed products that are then distributed by the firm". (Chesbrough,H. Open Innovation Researching a New Paradigm, pag.1) OI describes an innovation paradigm shifting from an internal to an external focus. Cohen and

Levinthal defined open innovation as systematically encouraging and exploring a wide range of internal and external sources for innovation opportunities, consciously integrating that exploration with firm capabilities and resources, and broadly exploring those opportunities through multiple channels. “Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology. Open innovation processes combine internal and external ideas into architecture and systems” (Chesbrough,H. Open Innovation Researching a New Paradigm, pag.1). The research and development department is considered an open system, based on the assumption that valuable knowledge may come from the inside as well as from the outside and go to the market from inside as well as from the outside. Therefore, even the most capable R&D organizations should leverage external sources due to the fact that knowledge is widespread through all the companies. The internal technology interact actively with the external technology, so projects can be launched from either internal or external technology and also from a combination of these two sources. Technology can enter into the process at various stages.

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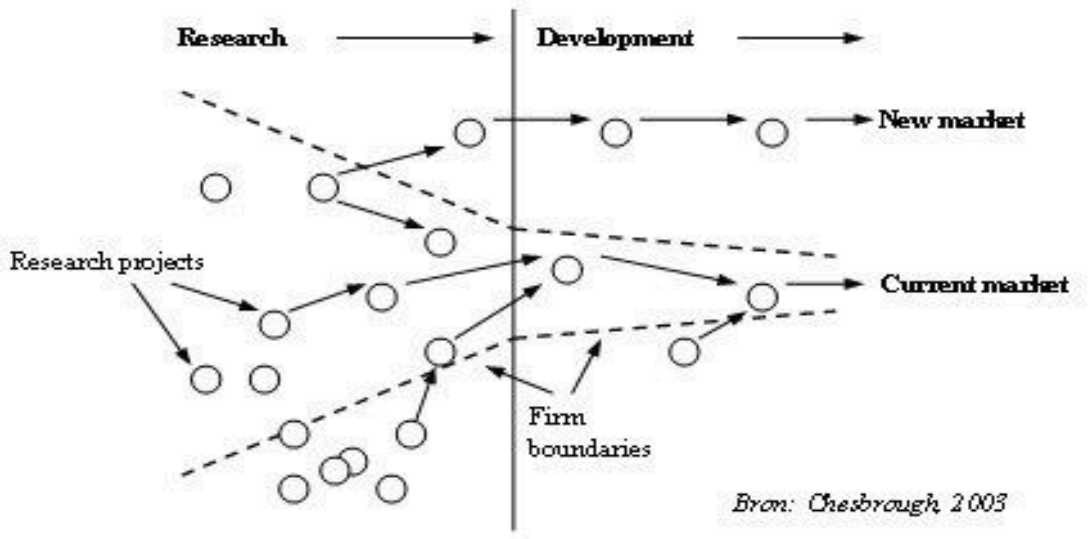

(Chesbrough, H. (2003) Open Innovation : The New Imperative for Creating and Profiting from Technology)

The openness of this model can be seen through the many ways in which ideas can flow into this process as they can flow out into the market. In fact, projects go into the market in several ways, for instance through out-licensing or a spin-off venture company as well as through the firm's own sales and marketing channels. Breaking up the firms' system boundaries became essential in an environment full of social openness. This evolution requires the open innovation model where the interaction between several forces is crucial to create a perfect business model that allow to gain a competitive advantage.

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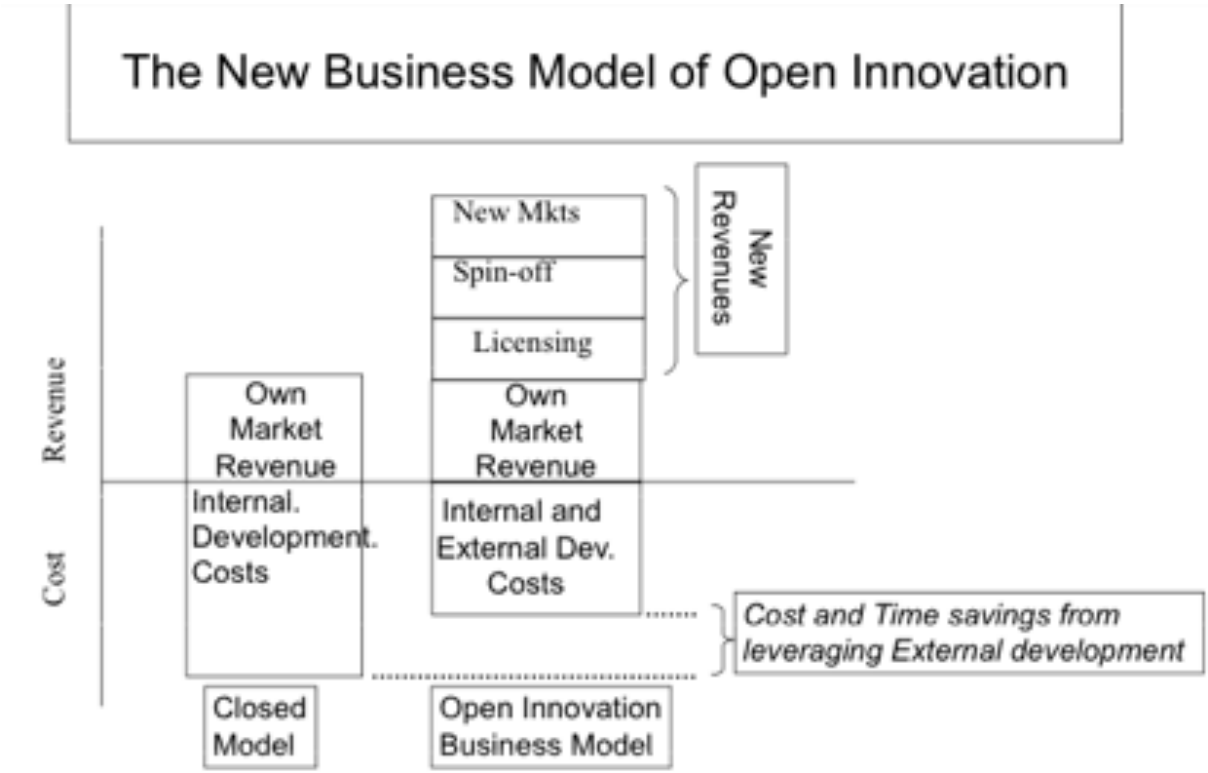

(Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape)

As it showed in this picture, the firm does not participate just in the market that it services directly. Now it participates in other segments through licensing, joint ventures, spin-offs and other. Through this process the amount of revenues increases and in the meanwhile the general development costs of innovation are redacted by a greater use of the external technology in the firm's own R&D process. The

open innovation movement is in full swing, and companies everywhere are turning to external sources for new product ideas. Being open is not the only assumption to be competitive. First of all, firms should be able to recognize valuable external sources to incorporate, based on the hypothesis that not all the technologies are useful for our business. Being aware of internal deficiencies allows firms to distinguish in an easier manner which kind of external technologies acquire or licensing in. Leveraging external sources, however, requires an ability to absorb the external technology and influences to gain from that. Firms should know how to manage information and technical aspects, to define a winning business model that can take place on the others. "Open innovation is a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model. These flows of knowledge may involve knowledge inflows to the focal organization (leveraging external knowledge sources through internal processes), knowledge outflows from a focal organization (leveraging internal knowledge though external commercialization processes) or both (coupling external knowledge sources and commercialization activities). (Chesbrough, H. ; Bogers, M. (2014) New Frontiers in Open Innovation, Chesbrough et. al) . So basically the management of knowledge spillovers implies a management of knowledge flows outside the firm's boundaries (outbound strategies) as well as inside the internal environment (inbound strategies). Based on the fact that Open Innovation is a firm-centric paradigm, the attention would pay more on inbound processes, that enhance more the firm's innovation performance, instead on the outbound procedures. The inbound procedures involves the search of external sources, the selection and acquisition of suitable innovations and the integration of these innovations into the firm's R&D efforts. "Open business models may lead to better financial performance by reducing the costs of innovation on the one hand and generating extra revenues on the other hand by monetizing technologies through licensing agreements and spin-off activities when the technology cannot be adopted profitably in the product markets of the company." (Chesbrough,H. ; Vanhaverbeke, W. (2014) in New Frontiers in Open Innovations, Chesbrough et. all) "Open innovation reflects the ability of firms to profitably access external sources of innovations, and for the firms creating those external innovations to create a business model to capture the value from such innovations. [..] Open innovation includes the use by firms of external sources of innovation and the ability of firms to monetize their innovations without having to build the complete solution themselves" (West, J. (2006) in Chesbrough et al. Open Innovation Researching a New Paradigm, page109) As Teece (1986) figured it out, firms' capability to pursue this latter course depends on appropriability. This guarantee that others competitors won't be able to commercialize the idea and at the same time this certainty generates an innovation incentive for the firm.

Appropriability relies on intellectual property (IP) law and certain types of Open Innovation are only possible through such IP protection. Therefore, for some innovation, IP law performs a key role in providing appropriability, and thus allowing some innovations to gain returns on their innovations and others to obtain a supply of external innovation. An high level of appropriability allows firms to gain the needed time to develop the idea, search a dominant design and take pleasure in any success realized by the technology. On the other hand, firms must vertically integrate to build a complete solution or, barring that, hope to realize an enforceable contract with suppliers of complementary products and capabilities necessary to commercialize the innovation. (Teece 1985) However, it should be considered that the relationship between appropriability and openness is not directly determined. Based on the study conducted in UK by Laursen and Salter (2006), it would seem that there is a direct connection between high appropriability and high openness. The analysis realized on the open source software (Chesbrough, H. Open Innovation Researching a New Paradigm , chapter 5) shows how firms invest in open innovation even if the open source limits their appropriability.

1.3 The advantages and disadvantages of the openness

To better go beyond and analyze the benefits and costs, openness should be evaluated as a continuum that covers varying degrees of openness, instead of considering a binary classification of open versus closed. The first examined type of openness is the “revealing”, where internal resources are revealed to the external environment seeking for indirect benefits, instead of timely financial rewards. The voluntarily divulging information to outsiders does not always mean a reduction of success. Sharing with conscientiousness or not, without any protection, could elicit collaboration and result in a steady stream of incremental innovation. On the other hand, the first-moved advantage is undermined in capturing better profits, because competitors could use revealed information to gain an advance. Choosing what reveal to the external environment needs to be weighted up. On the contrary the “selling” is an openness way where firms commercialize their inventions and technologies through selling or licensing out. In this case firms can more fully leverage their investments in R&D, due also to the fact that not all the generated patents are internally relevant. Actually there’s a more common use of the licensing-out practices.

Anyway, market failure may occur based on the fact that inventors are reluctant to reveal their innovations in some occasions. It happens when in the licensing process the inventor is willing to license to a potential licensee and he is forced to reveal some information to costumers. Therefore the potential licensee receive some information without paying and could gain an advantage on that stealing the idea. Furthermore, there are some transaction costs that occurs in transferring technologies between organizations, therefore the potential selling is not able to be fully leveraged. In addition, firms may be unable to forecast the potential value of their technologies in the licensing process. While firms are open to this process, they lack a valid strategy for bringing this into practice. Regarding the inbound strategies, the "sourcing" refers to the practice of how firms scan and use external sources of innovation within the internal activities prior to investing in R&D. In fact, Laursen and Salter define openness as "the number of different sources of external knowledge that each firm draws upon in its innovative activities". If the technologies are already available in the market, firms won't invest internally to develop them. Firms may benefit from the union of external and internal technologies, generating profitable new products and services. Organizations could over-search spending too much time looking for external sources of innovation. Katila and Ahuja found that search behavior is a crucial point for understanding the limits and contingent effects on innovation, therefore while there may be an initial positive effect on openness, firms can over-search or come to rely too heavily on external sources of innovation. In case of "acquiring" the external sources are incorporated paying. It refers to the practice of license-in and acquire expertise from outside. Buying or in-source external ideas increase the possibilities to gain more benefits. However, acquired knowledge too distant from the known internal language, won't be so useful. This practice needs to be associated with the internal communication in order to be fully helpful. Useful technologies are dispersed in companies of all sizes and all types. The companies' innovation process should be organize to become more open to external knowledge and ideas, because "not all of the smart people work for them". Anyway, the change forward a more open model is not an easy task. One of the problems a firm could face is internal resistance to the external sources. This resistance was named " not invented here" syndrome. Part of this syndrome depends on an attitude of xenophobia : we don't trust it because it's not us, it's something that we feel so far and different from us and consequentially it scares. However, employees are reluctant to accept easily new technologies also for more others rational components. Being a young, smart company helps to follow rapidly the changes in a fast changing industry. Large and old companies usually can only turn over their used model just when they perceive that the internal orientation strategy has failures. Based on the internal research and development, there may be developed ideas that aren't really used. Unused ideas are corrosive : demoralize the staff that

create them, represent a waste of corporate resources, choke and clutter the innovation system. If the ideas are kept bottled up inside, firms burn their market opportunity. Generally, the amount of unused ideas is high in many companies. “The reason for such low utilization levels is that many firms consciously keep the research portion of their R&D process only loosely coupled to their business model. […] Further, R&D managers often use the number of patents generate by an R&D researcher or an R&D organization as a metric to judge the productivity of that person or organization.” (Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape, page 28) Therefore, employees are induced to generate a large amount of patents to gain more rewards. “To carry this point further, there may be a budgetary disconnect between a research and development group on the one hand, and a business unit on the other.” (Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape, page 28)

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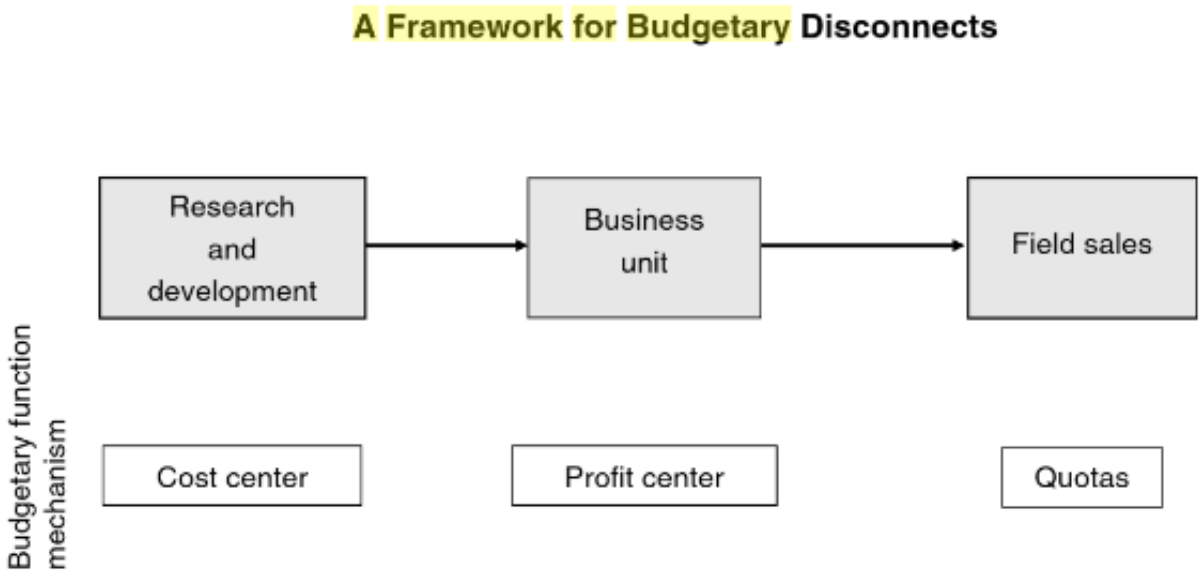


Figure 2.1. A Model of budgetary disconnection between R&D and the business unit

(Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape)

In this model, the researchers operate as a cost center. Manager out-source projects' production based on the amount of budget. The business unit is handled on a profit and loss basis, where output is sold to customers trying to maximize profits. In this orientation, these internal productions need to be fully developed without any additional costs to reduce risks of less profits. On the one hand, the R&D managers want to push out the projects as soon as possible, on the other hand the business unit managers prefer to wait before taking over the further funding of the R&D project on his profit and loss basis. The resolution of this budgetary disconnect is to place a buffer between the R&D operation and the business unit. This buffer allows to stop the R&D project until the time when the business unit will be ready to invest in its further application within the business. This allow the R&D managers to move on the next project without waiting for the business unit fundings until this unit judges it to be beneficial. But if this solves managers' problems, it creates a pile of projects stuck in the buffer. "These projects are often termed "on the shelf", because they are no longer being actively pursued by the R&D organization, nor are they actually being used by business unit" (Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape, page 30). How to overcome this challenge? Some research organizations are funded a part by funds from research contracts that tend to be fairly specific, and the last part may be financed by corporate allocation of funds or government research contracts. The internal underperforming idea may be beneficial for those who decide to give it away. But researches showed that not all the businesses are willing to enable the others' use . What induce managers to refuse the others' utilization of those unused internal technologies? First of all, managers may think that if they can't find a fruitful use for their own inventions, no one else can do better. Another problem may be the adverse selection. The buyer may have fear that the seller offer him the bad one technology. Therefore, in this perspective the seller has an advantage over the buyer. It the buyer possess a different business model for that technology, he's vision will be different from the seller. Thus, the buyer may see an opportunity that the seller is not able to see based on his different business model in mind. Another barrier may be the "not sold here" virus that argues that if we don't sell it, no one should it ; based on the belief that if the organization can't find a valuable use of this technology, is almost impossible that anyone else can do it. This virus implies the possible frustration of the R&D staff, because many of their ideas are not deployed in the market. "One way to overcome "not sold here" virus is to develop mechanisms that the company can employ to align incentives within the business unit to more closely approximate those of the overall firm" (Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape, page 33) " In this view of the world, it is far better to bury a potentially valuable technology that it is to let someone else utilize it and share the profits with you. This is socially very inefficient. It also denies

the inventors and developers of the idea the chance to see their work in use in the wider world and to learn from the users' experience with that idea. It also eliminates the company's ability to learn from what other companies did to create value from that idea, which might suggest a direction for the company's own business and business model to evolve." (Chesbrough,H. (2006) Open Business Models How to Thrive in the New Landscape)

1.4 The openness challenges and issues

In the open model, the coexistence of external and internal innovation entails three challenges. First of all, maximize the returns implies the production of internal innovations to be internally and externally commercialized, the developments of absorptive capacity to identify external innovations and the generation of intellectual property that indirectly generates a return through spillovers. Successful firms may combine a variety of these approaches. Maximizing returns to internal innovation involves the outbound licensing, as well as the patent pooling or giving away technology to stimulate demand for other product. In fact, maximize from the internal R&D means exploit technologies fully through the several ways in which ideas can be commercialize and used. As I mentioned before, OI is characterized by the incorporation of the external technology sources within the firms' innovation activities, that needs an absorptive ability. "The managerial challenges of utilizing external knowledge then center around identifying useful external knowledge, and then integrating that knowledge with the firm." (Chesbrough,H. Open Innovation Researching a New Paradigm) Even if external sources are recognized, it does not mean that these will be used by the firm. Not all the firms develop an incorporating ability. How firm can exploit external knowledge? Basically, integration involves scanning abilities to identify innovations, a willingness to accept external frameworks and innovation from the inside, and the capacity to combine spillovers with firm-specific internal innovations to develop a product tailored to the firm's specific needs. The latest challenge regards motivations. The incentives for generating the knowledge spillovers should be analyzed at two levels: the individual and the organizational. Motivating people to generate their IP without any financial returns is a management challenge for open innovation. One of the motivational models is expectancy theory, which posits that individuals are motivated by a

combination of valence (the intrinsic or extrinsic attractiveness of a reward) and instrumentality (the path to that reward) (Lawler, 1971). The proprietary innovation model intents to solve this challenge through a combination of extrinsic compensation with adherence to traditional scientific norms. The integrated innovation model solved this challenge though extrinsic compensation from the firm coupled with adherence to traditional professional scientific norms. On the other hand the external model doesn't formally address individuals but appears to rely upon others. The organizations' incentives to contribute spillovers relies upon two categories. In one case, the innovation's benefits are addressed to the innovator without any decrease generated by the sharing that benefit. Suppliers and costumes collaborated to improve products moved by personal interests. A firm will share innovation that grows the market if the returns from this operation are attractive enough. Organizations share innovation based on their advantage. (Chesbrough,H. Open Innovation Researching a New Paradigm) Another issue, that firms in an open innovation world face, is correlated with the intermediary markets. I've already defined that the intermediate markets for innovation exists and are becoming widespread, but anyway there are many inefficient that limit the growth of secondary markets. for instance, the lack of information, regarding the extent and terms of trade, is one of the principal limitation. Information are the basis to guarantee a real market function for coordinating the exchanges. Without any type of date, it won't be possible to recognize available technologies. Anyway, even if it's quite possible recognize available technologies, determine how to value technologies is not so easy. This value depends on the buyer's willingness to pay to a willing seller. First of all, companies should consider whether a secondary market has a positive impact on our own industry and in what period. Once they have answered to some questions in order to detect where the secondary markets are useful, there are several steps to follow. the first stair is to invest in the development of market knowledge, where, as all the others markets, there are insiders. they should take the time necessary to be an insider. Then, put together all the transactions our company has already done on both sides of the licensing market. Push on the strengthen of the notes comparisons with peers in other organizations and of the collection of data on recent licensing transactions. At the same time, they should elaborate a shopping list of technologies and ideas and develop also a separate list of unused technologies that might be useful for the other companies. For some organizations may be beneficial to find out intermediary organizations that can represent them in searching for external technologies or help them to give away to the others.

1.5 Open Innovation and firms' performance

Firms which do not cooperate and which do not exchange knowledge reduce or even destroyed their knowledge base on a long-term basis and lose their ability to enter into exchange relations with other firms and organizations. Therefore, cooperation with externals is core to increase innovativeness and reduce time to market (Ebersberger, B. ; Bloch, C. ; Herstad, S. ; Van De Velde, E. (2010) Open Innovation Practices and their Effect On Innovation Performance). Open innovation activities have a positively strong impact on the firm's performance and on the firms capacity for novel innovation. Furthermore, a broad based, holistic approach may be beneficial in terms of returns than a deep focus on a specific single aspect. Anyway, a strong internal ability is still required. The R&D intensity needs to be always present and correlated with the widespread external sources. Furthermore, the international vertical collaboration must be considered in terms of innovation performance. Innovation collaboration along the value chain is strongly correlated with superior innovation performance. Two measures of innovation performance were used among four different countries that led to demonstrate these results. The first is a measure of innovative novelty; whether firms have introduced a product innovation that is new to their market. The second measure is the share of sales due to novel product innovations, thus measuring the scope or impact of new to market product innovations. The first can thus be considered as a measure of the ability of firms to create and implement novel innovations, while the second is a measure of the impact or success of the firm's novel innovative activity. (Ebersberger, B. ; Bloch, C. ; Herstad, S. ; Van De Velde, E. (2010) Open Innovation Practices and their Effect On Innovation Performance) "University cooperation can be considered instrumental for enhancing product and process innovations as well as for increasing the share of sales of newly developed products. Therefore, the firms' innovativeness can strongly depend on cooperation with universities. By contrast, the engagement of consulting firms does not have any significant effect on the evaluated innovation performance measures. Thus, R&D management better choose to consult with public rather than private research institutions." (Matthias Inauen Andrea Schenker-Wicki, (2011),The impact of outside-in open innovation on innovation performance", European Journal of Innovation Management). The cooperation with university enables the stream of information about new knowledge and developments, the flexibility in innovation, a valuable network with high level contacts both nationally and internationally and also the reduction of the R&D costs based on the support given for research projects. Anyway this not the only positive collaboration that lead to an increased in the innovation performance of firms. Generally, it can

be said that all the networks, collaborations and relationship determined by the open innovation activities have strongly positive impact on the innovation performance. Anyway, a higher openness towards cross-sector companies decreases generally the process innovation performance. Furthermore, the openness towards customers is a crucial point to obtain product innovations and sales of new product. An overemphasis on internal sources has negative aspects as the probability increase of missing opportunities and also competitive disadvantages. External sources increase the performance in every sectors. Customers and suppliers represent a pool of knowledge useful for the internal improvements and results. Researching collaboration and partnership enhance the performance and the internal development of products and services. Firms should anyway be aware of diversity when they are choosing technologies and ideas to integrate in the internal R&D department. The absorptive capacity and cognitive distance are crucial points to take care about. The innovativeness is closely linked to the openness. Anyway, too much openness results in a negative impact on the firm's long-term innovation success, because attention is allocated too "thinly" and control over core competences is easily lost. Open innovation has become an integrated part of companies' innovation strategies. The OI practices has a positive impact on products and processes innovations. Basically, the openness towards external sources can result in a high level of innovation performance. "The open innovation-performance relationship is not necessarily straightforward; rather, important factors in the firm context enable and facilitate the realization of performance gains from open innovation. Heightened performance can derive from open innovation, but firms must have the ability to enact it, specifically through their relational capability. Along with this ability, firms need appropriate opportunities to enact open innovation, whether through a knowledge-rich industry context or resource slack that engenders their agility and responsiveness." (Sanjay R. Sisodiya, Jean L. Johnson, Yany Grégoire, (2012) Inbound open innovation for enhanced performance: Enablers and opportunities)

1.5.1 Environmental moderators and outbound decisions

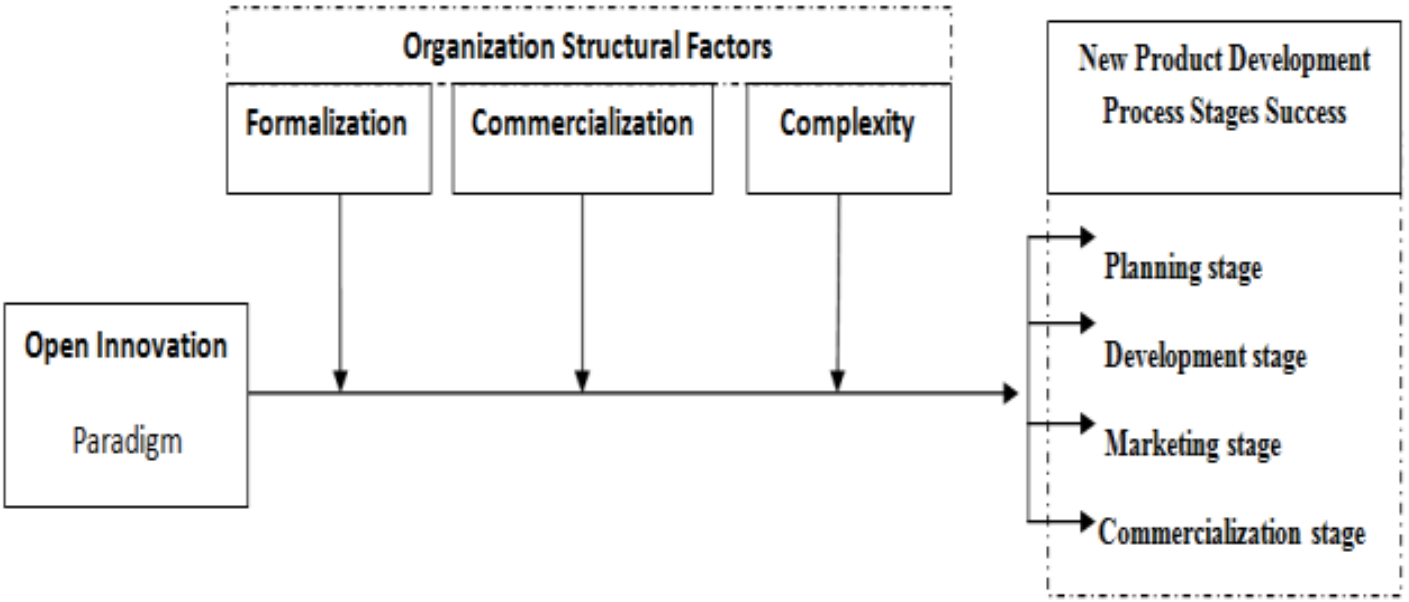
A firm's outbound open innovation strategy is reflected by the level of restrictions on transferring technology. Firm's performance is extremely influenced by external environment. In numerous firms,

outbound open innovation is a part of corporate strategy, and it exceeds a marginal activity of commercializing unused technologies (Fosfuri, 2006). Anyway, this practice has major risks as consequence, due to the fact that it may weaken a firm's competitive position through transferring relevant knowledge. Formulating an open innovation strategy may be beneficial to lead firms to take 'keep or sell' decisions. May be useful sometimes to protect a firm's technology property by limiting outward technology transfer, but not always. Achieving an high use of outbound strategies could increase the revenues and benefits for the firms itself. Therefore, the performance effects of outbound open innovation are extremely correlated with a firm's particular situation. Depending on the particular environmental situation, it may be beneficial to transfer a specific technology or not (Teece, 1998; Fosfuri, 2006) Based on the firm's particular situation, could be reasonable to sell its own technology or protect its intellectual property. The strategic and monetary benefits of internal decisions have a crucial role in shaping innovation strategies that are influenced by environmental moderators. In other words, the relationship between outbound open innovation strategies and firms performance could be moderated by patent protection, technological turbulence, transaction rate and competitive intensity. A strong patent protection reduces the possibility of high profits from outbound strategies. To capture the benefits, firms usually need a sufficient patent protection. Intellectual property rights can enhance the technology transfers. In fact patent may reduce the transaction costs in technology market. Patent protection positively affects the relationship between outbound open innovation and firm performance, therefore can be considered as an essential facilitator of successful outbound strategies. Regarding the technological turbulence, a firm's possibility to capture the benefits from its own technologies is reduced by an high rate of technological change. Therefore, the higher the technological turbulence the higher the firm's benefits from pursuing an outbound open innovation strategy. In fact technological turbulence positively moderates the relationship between outbound open innovation and firms performance. A high rate of technology transactions increases the benefits of outbound strategies and a high degree of market perfection based on frequent transactions could be considered as a facilitator of inter-firm technology transfers. Therefore, transaction rate positively moderates the relationship between outbound open innovation and firm performance. Regarding the competition , the impact of the outbound strategies may be affected by the degree of competition that enhances the demand in technology market despite this may increase managerial challenges. Anyway, firms may increase their performance from outbound strategies although competition. Therefore, competitive intensity positively moderates the relationship between outbound open innovation and firm performance. Generally , outbound open innovation strategies have a positive effect on firm performance that it is higher in environments characterized by high degrees of

technological turbulence, transaction rate and competitive intensity.

1.5.2 On the enhancing of new product development process

Through the open innovation practices, there was defined a new process to develop products that is not anymore based only on the internal sources but take advantages from the combination between the internal and external technologies. The dimension of organizational structure and the external environment are crucial points within the innovation process and play an important role in all stages of innovation process. Furthermore, the new product development is a complex activity that is related to organizational structure and contextual factors; that its characteristics affect the new product development process. (Lee & Souder, 2000) On the research and practice of the new product development open innovation takes an important place. Through open innovation strategies flow internal and external inputs within the new product development process (NPD). The innovation process is characterized by three phases: the Fuzzy Front End (FFE), the new product development and commercialization. The new product development process involves several stages, but can be synthetically categorized into four stages: planning stages, development stage, marketing stage and commercialization stage. It requires an highly level of collaboration and participation to obtain inputs from multifunctional teams. Sharing ideas and different points of view could enhance the chances of success. Openness is the key asset to develop successful goods and services. In this process the organizational has a role, due to the fact that influence the NPD process success and the open innovation strategies . In fact, organizational structure defines common goals and provides roles and procedures. Three dimension took a relevant place on literature : formalization, centralization and complexity. These are moderators of the impact that open innovation has on the success of new product development. In other words, these represent effective variables on the relation of open innovation and new product development success.



(Sanaz Monsef, Wan Khairuzaman Wan Ismail (2012) The Impact of Open Innovation in New Product Development Process)

"This synthesis model may be used for better understanding of open innovation that contributes in explaining the new product. It can also be used to develop a questionnaire in order to evaluate the impact of open innovation on new product development success." (Sanaz Monsef, Wan Khairuzaman Wan Ismail (2012) The Impact of Open Innovation in New Product Development Process)

1.5.3 Inbound strategies and product innovation performance

Products' innovation is basically stimulated by the openness. The open innovation practices enhance firms' internal R&D, allowing product and process innovation through the several ways in which firms

interact with the external environment. There are several ways in which external sources can be incorporated within firms' R&D department and they may change the internal results. Anyway, in terms of product innovation, all the inbound strategies exert right influences on product innovation. For instance, external acquisitions have positive effects on firms' output performance and economic returns. As Cohen and Levinthal said, firms can increase their output performance by expanding their acquired technological knowledge. Using the external acquisitions, a firm's internal R&D enhance its practices. Therefore, the internal R&D moderates the relationship between external sources and firm performance. Acquiring external technology has several positive aspects as the reduction on the internal development costs and also facilitate to meet the market demands. Thus, a firm will improve its capabilities and technological knowledge, leading at the end to greater performance through product or process innovation. Expanding its technological knowledge, a firm may increase its innovations and there will be an higher probability of matching between demand and supply. Furthermore, partnering with other firms which have technical knowledge expertise may allow organizations to leverage their skills and increase their competitiveness (Teece 1992, Mowery et al., 1996) . Vanhaverbeke et al. (2004) propose that a firm using technology alliances to learn from its partners can expand its existing technological knowledge base and achieve higher innovative output. As I mentioned before , the way in which the external technology affects a firm's output performance depends also on internal R&D. In fact , the external sources need an high absorptive capacity to identify the right external knowledge, assimilate it and convert it into process and product innovation for commercial ends. Sen and Rubensteins (1990) found that in-house R&D investment not only stimulates innovation but also strengthens absorptive capacity to enhance technology acquisition. Logically, the greater the level of a firm's internal R&D efforts, the stronger the positive effect of external technology acquisition on a firm's performance. All the inbound strategies, such as partnership, licensing-in, acquisition and so on, have generally positive effects on the product and process innovation through the same ways in which the acquired external sources stimulate the innovation processes.

2. The impact of open innovation to firms' innovation performance

2.1 Openness and Radical Innovation

"Organizational growth and renewal are fundamental to any firm's long-term survival" (Jelinek and Schoonhoven 1990; Morone 1993). How to renew ? There are several ways to approach the renewal . A company may act to gain new skills by acquiring or merging with a company or through the development of new lines of businesses generating with the technical capabilities matured inside. "When the promise of the opportunity are high, the technology and innovation management literature refers to that phenomenon as radical innovation." (Morona 1993; Leifer et al. 2000) Radical Innovation represent a way to generate growth to large firms that have mature businesses, where only a breakthrough innovation can provide the next platform. "Radical innovation is the ability fon an organization to commercialize products and technologies that have high impact on the market in terms of offering wholly new benefits, and high impact on the firm in terms of their ability to spawn whole new lines of business. We operationalized these impact levels as projects with the potential to offer either new to the world performance feature; significant improvement in known features, or significant reduction in cost. (Leifer et al. 2000; McDermott and O'Connor 2002). Therefore, the radical innovation competences regard the ability to commercialize it repeatedly. What must be taken in consideration is that radical innovation can require more than a decade of investment of time before financial returns are seen and also there may be other forces against the radical innovation success. (Gilbert et al. 1984, Quinn 1985) The open innovation model provides helpful answers to the radical innovation success. "If discoveries can be sourced from external parties as well as internal groups, and the innovation required to nurture those discoveries into business opportunities becomes more interactive with market and technology partners sooner, the life cycle of radical innovation can be substantially shortened." Therefore, radical innovation is searching by firms who wants to gain an advantage. Anyway, to develop a mature radical innovation capability must be considered that it RI (radical innovation) is comprised of three competencies. The first

one is the discover capability that regards the awareness of something that is new for the company. It involves activities like creation, recognition, elaboration and articulation of RI opportunities. Incubation is another competence that refers to the activities that matures radical opportunities into business proposals through experimentation and interaction. The last competence is the acceleration. This type of activities are focalized to build a business at one level where there are some predictabilities in terms of sales and operations. Therefore their are focused on exploitation as well as investigation actions (Colarelli,G. ; O'Connor (2006) Open, Radical Innovation : toward an integrated model in large established firms in Chesbrough Open Innovation : researching a new paradigm). On these three competences open innovation is manifested differently. How does differ its impact on the different competencies? First of all, the discovery activities involve not only the internal R&D unit but the external ideas and sources as well. Regarding the incubation, it demands experimenting with the opportunity such that a new market is created. Therefore, this competence cannot work without the interaction with the environment outside the firm's boundaries. For the acceleration competence, the connection with the open innovation is showed by the set of activities that characterized this competence. Projects can be commercialized once achieved an high level of communication and shared funding between the receiving unit and R&D. "It is clear that Open Innovation, if managed in a balanced way with internal capability development, can help speed RI through its emphasis on interaction and networks. In fact, RI efforts in large companies have not been sustained, and Open Innovation is quickly becoming viewed as a critical aspect to helping gain the efficiencies of learning necessary to make RI sustainable." (Colarelli,G. ; O'Connor (2006) Open, Radical Innovation : toward an integrated model in large established firms in Chesbrough Open Innovation : researching a new paradigm)

2.2 Strategic orientation and innovation performance

Firms cannot possess all the valuable knowledge useful for their business. However, they can acquire the needed knowledge though outbound activities and create new offering based on the combination between internal and external technologies. Generally, the open innovation activities positively impact on the innovation performance. Anyway, the internal R&D capabilities and the ability to absorb the external

sources affect the innovation performance. Other aspects that should be considered based on their influence on the relationship between the OI practices and the innovation performance are the strategic orientations. Gatignon and Xuere defined strategic orientations as the strategic directions implemented by a firm to create the proper behaviors for the continuous superior performance of the business. These are a part of the organizational context in which openness is adopted. Strategic orientations could be considered as moderators within the relation between open innovation and innovation performance, because the accomplishment of competitive advantages may rest upon strategic orientations in utilizing distinctive innovation capabilities. In the study, conducted by C. J. Cheng and Eelko K. R. E. Huizingh, are analyzed three types of strategic orientation to detect their impact on innovation performance, which are : entrepreneurial orientation, market orientation, and resource orientation. "Entrepreneurial orientation is a firm's attempt to pursue new market opportunities and to renew existing areas of operation (Hult and Ketchen, 2001). "Firms with strong entrepreneurial orientation tend to constantly scan and monitor their environment to identify new opportunities to strengthen their competitive positions" (Covin and Miles, 1999; Lumpkin and Dess, 1996). Firms with an high entrepreneurial orientation pay attention to the continuously changing opportunities and conditions, monitoring and scanning carefully the external environment. Through these type of activities, firms may gather information to better meet the costumers needs, manage their risks and challenge their competitor. Their willingness to adopt innovative ideas and constant searching for new information enable these entrepreneurial orientated firms, performing outside-in and inside-in activities, to explore more external sources in greater depth and a boost to use new approaches, which advances innovation development and may lead to greater innovation performance. Based on the risk tolerance correlated with the entrepreneurial orientation, they may overcome some barriers in performing open innovation, such as integrating different but related knowledge bases among alliances. Therefore entrepreneurial orientation positively moderates the relationship between open innovation activities and innovation performance. On the other hand, firms with the market orientation have better insights in customer needs, and offerings and strategies of competitors. Narver and Slater defined the market orientation as the the organizational culture that most effectively and efficiently creates the necessary behavior for the creation of superior value for buyers. Openness plays an important role in market orientation. The core of the concept consists of acquiring, disseminating, and using market information (Kohli and Jaworski, 1990).

There's a most strong attention on the costumers' issues that lead to a better way to meet their needs. In fact, having a strong market orientation allows to collect easily market information performing inside-

out activities. It enables the increasing of the firms' innovation performance, the improvement also the exchange and use of market knowledge within the firm and ultimately the open innovation. Anyway not all the consequences of the market orientation have a positive effect on the innovation performance. For instance, R&D collaboration with customers not really affect product innovation (Un et al., 2010). "Environmental scanning in open innovation has not only a broader scope, and it is also not limited to identifying opportunities in current markets. In particular, inside-out activities may lead companies to exploring and identifying opportuni- ties in markets that are distinct to its own markets" (Colin C. J. Cheng and Eelko K. R. E. Huizingh (2014) When Is Open Innovation Beneficial? The Role of Strategic Orientation). For these evidences, ,market orientation may strengthen the relationship between open innovation and innovation performance, but its moderating effect will be less strong than that of entrepreneurial orientation. The last orientation is the resource orientation. It refers to the strategic use of the resources to increase firm performance in dynamic competitive environments (Collis and Montgomery, 1995). Developing and deploying unique resource within the firm could be a way to gain more than competitors in the external environment. "Compared to the other two strategic orientations, resource orientation is more internally oriented because its focus lies on the deployment of unique bundles of firm's internal resources. In addition, it is concerned with accumulating a unique resource base that is immobile and heterogeneous (Barney, 1991)" (Colin C. J. Cheng and Eelko K. R. E. Huizingh (2014) When Is Open Innovation Beneficial? The Role of Strategic Orientation). The internal development through copyrights and patents have positive effects on firm's performance. Anyway the focus of this orientation is not only internal., but this orientation may fit well with open innovation too. Assuming that each firm has unique resources, there may be possible that other firm is better then us in producing an innovation. Therefore, the openness could speed up the innovation project, enhance its output and reduce its costs. Furthermore, a successful commercialization requires complementary assets that may be heterogeneously distributed. Thus, it enhances the openness. Based on that, resource orientation positively moderates the relationship between open innovation activities and innovation performance. However, this type of orientation hasn't the same effect as the market orientation and also as the entrepreneur orientation. It must be considered that not these tree orientations have the same influence on the open innovation-innovation performance relationship. Entrepreneurial orientation moderates the relationship between open innovation activities and innovation performance most strongly, followed by market orientation, followed by resource orientation. Firms that have a entrepreneurial orientation tend to better able to adjust their operations in dynamics environments. Due to the fact that open innovation works in these types of environments, it has a powerful impact on the outbound and

inbound activities. Furthermore, entrepreneurial-oriented firms are more willing to try out new offerings and markets (Covin and Slevin, 1991). Basically, this orientation fit very well with the open innovation system. But this is not the only positive influence. In fact, entrepreneurial oriented firms performing open innovation are greater in firm performance. That's why the moderation effect is stronger in this orientation rather than in market orientation and resource orientation.

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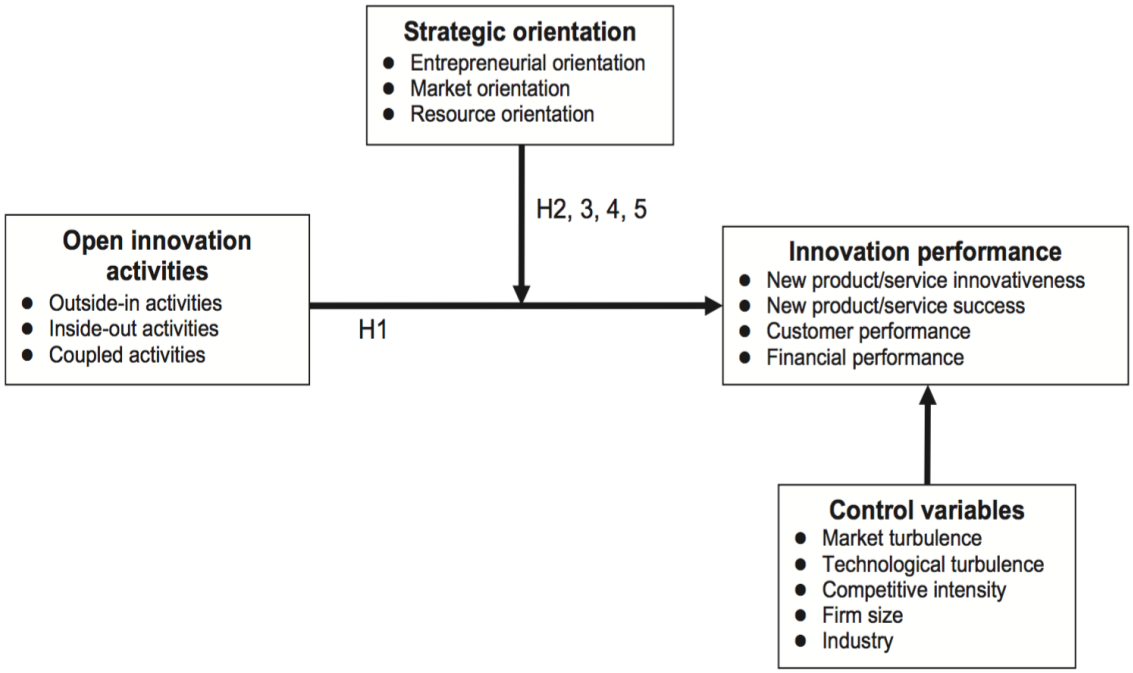

Figure 1. The Conceptual Model

(Colin C. J. Cheng and Eelko K. R. E. Huizingh (2014) When Is Open Innovation Beneficial? The Role of Strategic Orientation)

2.3 Absorptive capacity and OI

The open innovation model strikes the cost side by leveraging external R&D resource to preserve the innovation saving money and time and attacks the revenues side by broadening the number of markets addressable by the innovation. The external knowledge accessibility for the open innovation practices does not imply an easy internal assimilation of information. The integration of the external sources happens through the firm's internal competencies that facilitate OI processes and competitive advantage. Developing the abilities to explore, retain and enhance external knowledge, firms will complement the open innovation efforts. Firms should evolve capacities to pursue developments outside boundaries and benefit from spillovers. In fact, Absorptive capacity (AC) constitutes one of the fundamental learning processes in a firm and can be a source of competitive advantage, as it represents its ability to identify, adapt and incorporate external knowledge within its routines (Cohen and Levinthal, 1990; Lane et al, 2006). Therefore, absorptive capacity facilitates the creation of radical innovations by enabling the exchange of existing knowledge and learning, and combining it with new sources of knowledge, as Ritala and Hurmelinna-Laukkanen indicated. Zahra and George viewed AC as a dynamic capability formed by a set of organizational routines and processes by which firms acquire, assimilate, transform and exploit knowledge, and, as a matter of fact, distinguish between potential and realized absorptive capacity. "Whereas potential absorptive capacity represents the knowledge-seeking capacities a firm has developed, but which may or may not be used to produce innovations, realized absorptive capacity represents its ability to develop products and services based on this stock of knowledge" (M. Luisa Flor, Jose Antonio Alfaro, Hugo Zarco, Maria Oltra, (2013) Inbound Open Innovation, Absorptive Capacity and Innovation Performance : an Empirical Research on Spanish Firms). Potential AC is useful to track changes in their industries and make easier the timely development of essential capabilities, such as production and technological competencies. A firm's AC, however, is not merely directed outward through a focus on the acquisition and assimilation of external knowledge, but also encompasses a firm's ability to process knowledge internally (Rothaermel and Alexandre, 2009). Potential AC is necessary to discover and detect relevant external knowledge and brings it into the firm,but a competitive advantage in innovation only materializes if the firm also possesses realized AC, as Fosfuri and Tribó wrote. At this point, the knowledge acquired must be shared across the firm's members, and transformed and integrated with internally generated knowledge. Realized absorptive capacity manifests itself through the processes of transformation and exploitation. The transformation regards a firm's ability to develop and improve

the routines that help the integration through existing knowledge and new external assimilated knowledge; it consists in the addiction or elimination of knowledge or just the interpretation of the same knowledge differently. Instead, exploitation could be considered as an organizational capability. In fact, it is based on routines that are able to refine, extend and leverage firms' competences or simply create new ones through the incorporation of the acquired and transformed knowledge into their operations. Therefore, potential and realized absorptive capacity allow firms to enhance their own performance through different organizational structure areas. Citing a study of M. Luisa Flor, Jose Antonio Alfaro, Hugo Marco and Maria Oltra , potential absorptive capacity, as realized AC, will exert a positive effect on a firm's innovation output. A balance between potential AC and realized AC depends on the balance between open and closed innovation. The closed innovation model emphasized the potential AC, while open innovation get stronger the realized AC. In this field, inbound open innovation requires different types of AC: inward-looking AC for closed innovation and outward-looking AC for open inbound innovation.

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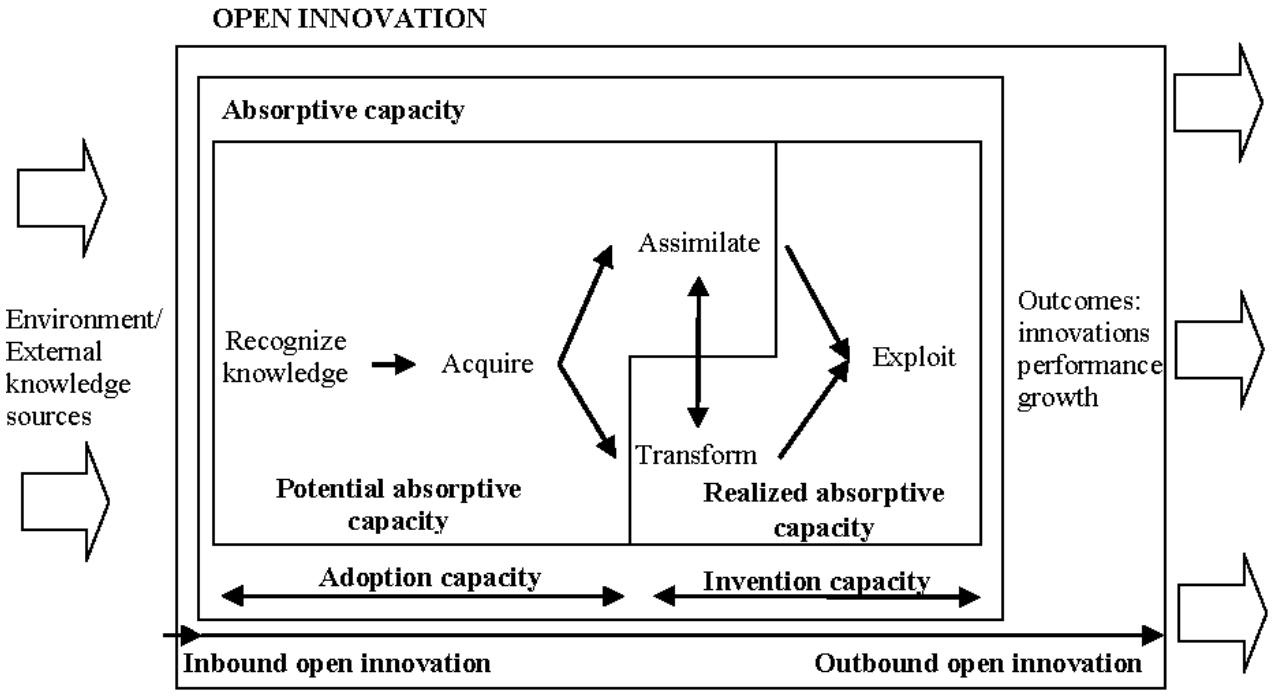


(Lis, A. ; Sudolska, A. (2015) Absorptive Capacity and Its Role for the Company Growth and Competitive Advantage: The Case of Frauenthal Automotive Toruń Company)

2.4 Inbound strategies and innovation performance

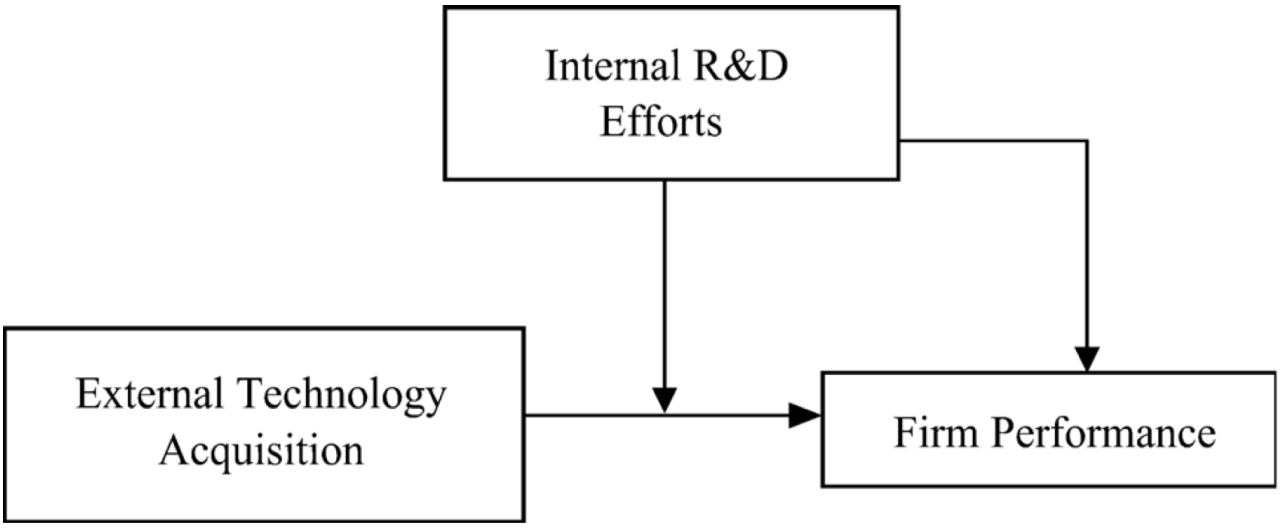
2.4.1 Inbound practices for enhance innovation performance

It has been suggested that a firm generally can improve its innovation performance though the interaction with partners such as suppliers, customers, competitors and research organizations. Collaboration and cooperation with suppliers, for instance, are beneficial for firms due to the fact that the combination of complementary capabilities and the common goals between firms and suppliers lead to a high innovation degree. Researchers found that collaborations with research institutes and universities increase firm's product innovation performance as well as financial performance. These institutions have systems and mechanisms that facilitate the access to new and complex knowledge. Belderbos et. al. (2004) and Inauen and Schenker-Wicki (2011) reveal that openness towards universities in r&d processes has a positive impact not only on product innovations but also on the percentage of innovative product sales over total sales. Generally, many studies found that collaborations with external parties tend to be beneficial for firms, not only in terms of financial performance , but also in terms of innovation performance. One of the most practices used as inbound activities for external technology acquisition is in-licensing. Indeed, relying on external already developed technologies enables a firm to improve both its innovation and financial performance since it decreases, for example, new product development time, and improves its preemptive advantage or limits a competitor's first-mover advantages (Tsai and Wang, 2009). Basically, its general expected that inbound OI practices influence both innovation and financial performance. Firms invest money, time and other resources searching for new innovative opportunities and ideas with a commercial potential. The use of different knowledge sources by an individual firm is partly shaped by the external environment, including the availability of technological opportunities, the degree of turbulence in the environment, and the search activities of other firms in the industry (Cohen and Levinthal, 1990; Klevorick et al.,1995). Firms are forced by the modern innovation processes to master highly specific knowledge about different users, markets and technologies. The innovation performance is deeply influenced by the inbound strategies. In fact, Laursen and Salter suggested that searching widely and deeply across a variety of search channels can provide ideas and resources that help firms gain and

exploit innovative opportunities. Anyway , over-search may hinder innovation performance. Searching is not costless, but involves several costs that must be controlled. The possibility of over-search helps to create a more nuanced view of the role of openness, search and interaction (Laursen and Salter, 2006). Furthermore, firms who have open search strategies tend to be more innovative.

2.4.2 External sources acquisition and innovation performance

To encourage and support innovations, firms should incorporated technical inventions and external knowledge. Acquiring external technologies may help firms to gain higher economic returns in an era of intensive competition and increasing technological complexity. It enables and increases the firms' output performance and therefore their innovation performance. First of all, firms should recognize external sources of innovations and then bring them into the firm's internal r&d. The acquired external innovations add or complete the firm's internal knowledge base.



(K.-H. Tsai, J.-C. Wang, (2008) External technology acquisition and firm performance: A longitudinal study)

This figure shows that a firm's external technology acquisition and internal R&D efforts affect its output performance levels. The internal research and development efforts moderate the relationship between the external sources and firm performance. Using external technology has strategic benefits and may facilitate innovation to meet market demands. Anyway, when a company brings in external technologies must verify whether it has the legal ability to use that technology without infringing the legal rights of another company. Furthermore, the scope of patents may not cover the use that the company wishes to do, even if the are a patent for that technology. Everyone should be aware of their legal status. "A patent is a legal right to exclude others from practicing a technology when you own a patent that covers that technology. It does not actually grant you permission to practice the technology yourself. In order to have what industry calls "freedom of action", you must be sure that no other companies' patents cover your technology." (Chesbrough, H. (2006) Open Business Models How to Thrive In the New Innovation Landscape, page 85). This ability to exercise external technologies was present in a closed innovation model. But in that field, the company knows effectively the entire history of the internal knowledge. The external sources are suppliers, customers, competitors or universities. Firms can identify or search for external sources of innovation by collaborating with variety of external stakeholders or seeking out specialists with useful knowledge (e.g. Ili, Alberts, and Miller, 2010; Nieto and Santamaria,2007; Tether and Tajar,2008); firms may also passively obtain innovation that is "pushed" by external stakeholders (Spaeth, Stuemer, and Von Krogh,2010). A firm's use of intellectual property (IP) rights, such as patents, seems to conflict with the pursuit of open innovation. However, IP protection can be an enabler of open innovation activities because negotiating IP contracts increases the interactions of companies with suppliers, competitors, or other stakeholders (Chesbrough, 2003a; Alexy et al., 2009). Internally , the use of the external sources must be correlated with r&d capabilities and complementary assets. As showed in the picture, the extent to which the acquisition of external technological knowledge affects a firm's output performance may also depend on the internal R&D efforts. "The greater the level of a firm's internal R&D efforts, the stronger the positive effect of external technology acquisition on a firm's performance" (K.-H. Tsai, J.-C. Wang, (2008) External technology acquisition and firm performance: A longitudinal study). Nowadays , innovations can be recovered easily through the growing availability of information and communication technologies. The several ways in which firms can gather external sources have decreased the costs of searching and increased firms' potential. Despite the great chance of reducing some costs, there can be important costs involved as well. Even if the searching costs are almost zero, there may be problems of search effectiveness. Laursen and Salter (2006) found that beyond an

optimal level, firms that rely on an increasing variety of external sources of innovation have decreasing returns in terms of innovation performance. Other costs that firms can meet could be related to communication and control. Basically , firms must confront a trade-off between the benefits and costs of obtaining innovation from external sources by aligning search breadth and depth, which potentially allows them to overcome some of the impediments of relying on external sources of innovation (Keupp and Gassmann, 2009). The external supply of innovations can be boosted through third party actors such as intermediaries. Different types of brokerage can serve as a means to balance the incentives of internal and external stakeholders and thereby promote linkages across the value chain (Benassi and Di Minin, 2009 ; Jacobides and Billinger, 2006 ; Sandmeier, 2009). A way to incentive external innovation may be though monetary incentives, such as awards and innovation context, or with non-monetary incentives. Establishing formal tools and processes to share innovations may encourage external innovators. Once the external innovations are created, the firm's challenge is to effectively identify the most valuable innovation useful for them. Externally sourcing innovations could change the R&D competencies of the firm, both directly and indirectly. On the one hand, resources allocated to sourcing innovations from external sources could directly reduce the resources made available for internal innovation. On the other hand, external sourcing can improve internal R&D capabilities (Ceccagnoli et al., 2010). Firms need integrative competencies to absorb external sources and develop internal innovations. Firms acquire external innovation through contracts and licensing agreements, whose effectiveness depends on factors such as the strength of the intellectual property protection regime. Acquiring external innovations tends to be done by less innovative firms, although these acquiring firms tend to become more innovative after the acquisition (Ceccagnoli et al., 2010; Zhao, 2009). Anyway as I mentioned before, identifying and acquiring are not the only steps firms should cross. In order to benefit from external sources, these should be fully integrated into the firm's r&d activities though the absorptive capability and the cultural compatibility. In fact, the organizational culture represent one of the principal aspects of the firm's willingness and ability to absorb external knowledge and technologies. " Not invented here" is a barrier of many successful r&d organizations. Cultural changes may be needed to correctly utilize external innovation, shifting the focus from " not invented here" to an outlook that views the external environments as the firm's technology base (Witzeman et al., 2006) and is more tolerant of entrepreneurial risk taking (Herzog and Leker, 2010). The firm's absorptive capacity represents a crucial point on the external sources integration. Firms with a high absorptive capacity are more likely to use and success with external knowledge and technologies. Absorptive capacity amplifies the benefits of external innovation sourcing both on innovativeness and financial performance (Rothaermel and

Alexandre, 2009). It speeds the assimilation of external knowledge and commercialization of such knowledge (Fabrizio, 2009) and provides more benefits for firms seeking knowledge from customers rather than from competitors (Grimpe and Sofka, 2009).

2.4.3 Partnership and collaborative networks to enhance the innovativeness

Firms that use cooperative strategies exert a positive effect on the innovation performance. Based on resources, small and medium sized enterprises, which have a strong influence on the economies of countries through their capacities to innovate processes and products timely, have been the engine of economic growth and technological progress. Cooperative networks are mainly used by the SMEs, due to the fact that networks, that lead to an increasing interaction between different actors, represent a complementary response to insecurity arising from development and use of technologies. (S.X. Zeng, X.M. Xie, C.M. Tam)

Based on these assumptions, Bullinger et al. wrote that it is necessary for SMEs to link different companies, research facilities, suppliers and customers in a dense innovation network that enables them to share knowledge and profit from complementary competencies. Cooperative networks are preferred in terms of innovation performance by the SMEs. Inter-firm cooperation, cooperation with intermediary institutions and cooperation with research organizations have positive effects on the innovation performance of SMEs. The inter-firm cooperation represents the primary and leading key to successful performance of both the single firms and the whole network. Firms pursue inter-firm cooperation in order to tap into sources of know-how located outsides the boundaries of the firm, to gain fast access to new technologies or new markets, to benefit from economies of scale in joint r&d and/or production and to share the risks for activities that are beyond the scope or capabilities of a single firm (Fischer and Varga, 2002). There is a close relationship between inter-firm cooperation and innovation performance. Furthermore, some studies found that inter-firm cooperation, including informal arrangements and formal long-term strategic alliances, can lead to incremental innovations or radical innovations. It needs to be considered that not always this strategy has the positive consequences. It depends on many factors, such as the overall strategy of the firm as well as their capabilities, knowledge, trust and innovation

intensity. Anyway, networking activities are primarily created on vertical relationships. Cooperation especially with customers and suppliers lead to new product innovation as well as new process development. When a high degree of novelty is correlated with the use of customers and suppliers into the internal processes as sources, it means that the established networking activities exert positive effects on firm's innovation performance. The cooperation with competitors is useful if they share the same problems that are outside the competitor's area of influence. Basically, the inter-firm cooperation influences positively the innovation performance. On the other hand, the cooperation with intermediary institution possibly lead to the creation of new ideas for innovation and technological productivity. The intermediary institutions include technology intermediaries, venture capital, financial and training institutions and technology transfer organizations. Several are also the various functions that these intermediaries play in innovation, such as communication, foresight and diagnostics, information scanning and gathering, commercialization, knowledge processing and combination, and evaluation of outcomes. Anyway, the external relationships with intermediaries institutions generally increase the degree of internal innovation and also a study found that are crucial for new local entrepreneurs. SMEs benefits more than the others from this type of cooperation. Nevertheless, the role of intermediaries institutions in the innovation process could be ambiguous and not clear. Overall, intermediaries institutions play an important role but have less positive effects than the inter-firm cooperation. Research organizations contribute to firms' innovation processes providing them new scientific and technological knowledge, instead of filling out the innovation process. The research organizations include universities, colleges, technical institutes and research institutions. Generally, cooperation takes place through an informal communication between firms and research organizations as well as through technology trade or technology transfer, formal r&d collaboration, training of innovative personnel and so on. Several studies found the important of universities and research institutions on firms' innovation process. Pekkarinen and Harmaakorpi found that collaboration in these networks is said to decrease transaction costs, correct market failures and decrease the risks of interacting partners leading to increase productivity. Furthermore, cooperation with ROs has a crucial role on the innovation process. Collaborating with different types of partners represents the diversity of knowledge networks needed to implement the internal innovativeness.

2.4.4 License to innovate

Licensing is a basic channel though which technologies and knowledge are disseminated and shared. As external acquisitions and collaborative networks, licensing is used to increase incentives to innovate further and thus avoid falling behind its rivals in future r&d races. Licensing is a voluntary form of dissemination whereby an inventor can enjoy at least some of the gains to trade from spreading the use of his superior technology (Carl Shapiro, 1985). “An economy full of technologies being licensed for others to use is one in which one can say there are highly developed intermediate markets for those technologies. These markets are termed “intermediate”, because one firm initiates a technology and develops it on a certain extent, and then a different firm might carry that technology from that point through to the market” (Chesbrough,H. et al. (2014) New Frontiers in Open Innovation). Once an innovation has been patented, the inventor has natural social and private incentives to license his innovation recovering some costs. Patents system are social contracts between society and inventors that dangle a temporary monopoly. Patents allow you to exclude others from practicing a technology that is covered by your patent. It may not, however, allow you to practice your own technology, if someone else holds patents that read on your approach. “Patent mapping can help identify the risks, and the opportunities that exist in the value chains in which your business model operates. [..] Areas of opportunity may help direct the entry into related products and services that benefit from the IP portfolio of the firm, enhance relationships with suppliers and customers, or generate new revenue streams.” (Chesbrough, H. (2006) Open Business Models How to Thrive In the New Innovation Landscape, page 104). Through this system, society wants to induce inventors to perform as good as they can and take all the risks that this imply to realize new technologies and carry them to the market. Offering temporary monopoly means give them prospect of gains, but on the other hand society wants to have the assurance of disclosure of the invention. “The inventor can only receive a patent on the invention if the inventor discloses the invention in sufficient detail that others “practiced in the art” could also make the invention.” (Chesbrough, H. (2006) Open Business Models How to Thrive In the New Innovation Landscape, page 7). In fact, revealing could trigger an expiration process that lead to other inventions that improved over time the earlier invention. Anyway, product patented are brought to the market only if patents are used by the inventors themselves or by the licensees . “While there is no legal requirement that the inventor receiving a patent make some practical use of it, the logic behind the social contract is broken when inventors do not use their inventions or license others to use these inventions.”

(Chesbrough, H. (2006) Open Business Models How to Thrive In the New Innovation Landscape,page 7) . Consequently, the unused patents create a substantial social loss. “A firm may have some unused IP protection at one or more stages of the value chain, which might provide an opportunity for product line extensions or external technology licensing. Unused IP protection also could be leveraged to enter into adjacent markets, or to neutralize some of the risk areas elsewhere in the value chain. The firm could also secure better terms from suppliers if it could provide some IP coverage to those suppliers in areas where the suppliers if it could provide some IP coverage to those suppliers in areas where the suppliers are exposed. Similarly, IP rights could become additional items in negotiations with customers and distribution partners to achieve better terms.” (Chesbrough, H. (2006) Open Business Models How to Thrive In the New Innovation Landscape, page 89). It should be also considered in the patents’ management that technologies change rapidly and become easily outdated. The technology life cycle model should be detected to identify in what stage the technologies are, in order to align the IP management. In the first period technologies emerge in the market and there are a wide variety of potential technologies. In the second period, one of them establishes itself as the winning, as the “dominant design” in academic words. In this period the technology takes place and stats to be used within companies’ business. Therefore the market takes off and faces a quick growth in units and in revenues. Later, the technology lose their growth and become mature. Here, the market growth slows down and the industry archives the maximum levels of technology’s revenue. The technology is completely understood and there is a little or no entry in the market. In the final period the technology become obsolete. A newer technology takes place over the earlier one and it makes its way substituting the old “dominant design”. “Just as one should not manage technology in the same way in each phase of the technology life cycle, so too one should not manage IP covering that technology the same way throughout its legal life. As with the management of technology, the management of IP should be tailored to the phase of the technology life cycle that IP covers”. (Chesbrough, H. (2006) Open Business Models How to Thrive In the New Innovation Landscape, page 92). In the first stage of the IP life cycle model, companies should invest in creating IP and determine the best way to protect it. Then, the next step is the technology development and the entrance in the market. At this point, the company should detect how to thrive in the market, through the external licensing or spin-offs as well as with strategic limitation of the outside licensing. At the end, the company handles with the exit from the market that could be caused by the entrance of a new advanced technology in the market or just by the decision of legal protection for the IP. The technology may remain useful for the original business and also for another company’s business. Based on that, we generally would expect that all the firms can benefit from licensing. There

are gains to trade from licensing, and the patentee can design contracts that split these gains between itself and potential licensees (Carl Shapiro, 1985). The general patent licensing contract used, is designed to accomplish perfectly the monopoly outcome, maximizing the pie that is to be split between the licensor and any licensees. The inventor invest resources to develop innovations, therefore licensing represents a possibility to increase the value that the inventor places upon developing the invention. Carl Shapiro found that patent licensing increases the value of winning a patent, it also increases the value of losing a patent race, and thus need not encourage innovation. Licensing may delay innovation, as each firm is more content to wait, lose the race, and become a licensee. Generally licensing is hypothesized to accelerate licensees' innovation process. Licensees are shown to be faster at inventing, but the effect is negated if the license includes a grant-back clause, shifting incentives from licensee to licensor. Also, the effect is significantly reduced if the licensee is unfamiliar with the licensed technology. The effect of the grant-back clause is offset if the licensee is unfamiliar with the licensed technology, suggesting that the licensee retains the incentives to invent under these circumstances. (M. I. Leone and T. Reichstein, 2011).

3. Patent Licensing and Innovation Performance

3.1 Licensing Propensity

An increased importance of patent intensive sectors led to a speed growth of patents. It has resulted in a major preoccupation of management, based also on the relevant legal environment changes. The more attention payed on patents should be translated into a more focus on timing whether to move faster than competitors or wait for more information that reduces uncertainty (Kim, B. ; Kim, E. ; Miller, J.D. ; Mahoney, J.T. (2016) The impact of the timing of patents on innovation performance). “Innovation is often viewed as a race, but perhaps a firm should strategically forego speed in order to wait until more information becomes available, thus enabling the firm to further refine its invention before patenting it. These strategic considerations suggest that the timing of patenting would affect returns to innovation, because the level of uncertainty changes over the technology’s evolution.”(Kim, B. ; Kim, E. ; Miller, J.D. ; Mahoney, J.T. (2016) The impact of the timing of patents on innovation performance) Therefore, it should be a firm’s innovation strategy the right time to patent, in order to be competitive and to avoid the market uncertainty. The level of uncertainty has a strong impact on the timing of the patenting decisions, which has as a consequence a final impact on the innovation performance. Knowledge spillovers from competitors can influence the timing of the patents and therefore the innovation performance. “The relationship between the timing of patents and innovation performance in the technology domain can be better explained through the concept of a “window of opportunity” (Christensen et al. 1998) rather than simply early-or late-mover advantage.” (Kim, B. ; Kim, E. ; Miller, J.D. ; Mahoney, J.T. (2016) The impact of the timing of patents on innovation performance) The tension between waiting and preemption is determined by the financial performance of R&D investment under varying uncertainty conditions. A connection between corporate finance and behavioral theories regarding R&D investment decisions is provided by the real options logic. Real options are classified into factors based on their impact on the option value. Factors that increase the option value to wait give motivations to postpone the entrance. Under high uncertainty, if the value of waiting exceeds the benefits from moving quickly, deferring entry may increase the firm value. Therefore, factors that decrease the

option value to wait provide incentives to move quickly in the market. Patents give exclusive rights that may increase profits. Based on that the incentive for preemptive patenting may be led by the difference in profits with and without the preemption. Through the preemption, firms could take information about the competitors' similar patenting, have bargaining power in cross-licensing with competitors in patent disputes and earn licensing fees. Obtain and maintaining patents is expensive but this is cost is however less than the costs of a key patent being controlled by competitors. (Kim, B. ; Kim, E. ; Miller, J.D. ; Mahoney, J.T. (2016) The impact of the timing of patents on innovation performance) The R&D expenditure can be considered as creating real options, which give firms the right to develop and commercialize technology. (Miller and Folta, 2002, p.656) "The patenting decision hinges upon the ability to maintain "information asymmetry or other ex-ante barriers to competition" (Leiblein and Ziedonis, 2007, p. 226). The patent then creates subsequent option with appropriate timing is likely to result in a firm's best performance, which depends on the expiration date of the options and arrival of opportunities (Bowman and Hurry, 1993)." (Kim, B. ; Kim, E. ; Miller, J.D. ; Mahoney, J.T. (2016) The impact of the timing of patents on innovation performance) The literature considers both exogenous and endogenous uncertainty. The exogenous uncertainty is reduced through waiting but at the same time all the firms' actions don't have any impact on this level of uncertainty. On the contrary, the endogenous uncertainty is influenced by the firms' decisions and activities. The investment decisions, therefore, suffer two influences : the first one correlated with the exogenous uncertainty and the second one with all the rivals. The option value of waiting is high as long as exogenous uncertainty is being reduced over time. Waiting has also positive consequences based on the fact that it gives the possibility to further develop knowledge resources through R&D investment and the chance to learn form competitors and adjust to a better fir with exchange partners. Taking more time to develop proprietary knowledge could help to realize superior inventions compared to competitors and also enhance the absorptive capacity to understand and react to competitors actions. (Cohen and Levinthal, 1990) "The optimal timing requires waiting until just prior to a rival's options exercise, because waiting in the face of competition implies a loss in the expected economic value of the project."(Kim, B. ; Kim, E. ; Miller, J.D. ; Mahoney, J.T. (2016) The impact of the timing of patents on innovation performance) However, patents pools can reduce the organizations' uncertainty giving the chance to gain also an increase in the total economic profit through the alliance. Patent pools reduce uncertainty by giving a way to exchange resources (Dunford, 1987). The contractual parties in patent pools have access to each other's technologies, and they have control over the development of technologies to enhance others' dependence on their patented technologies. (Pfeffer and Salancik, 1978) "Therefore, firms will delay the entry decision in order to

learn and gain more information, but will attempt to commit before the point of being preempted by rivals, which implies that patenting will accelerate as the time approaches the patent-pool formation. Moreover, among the patents eventually chosen for the patent pool, than those filed earlier because the firm will have had more time to develop its knowledge resources through R&D investment and to learn from competitors and adjust to a better fit with exchange partners. Prior the patent-pool formation, the later the timing of the patent, the higher the number of licensees through the patent pool."(Kim, B. ; Kim, E. ; Miller, J.D. ; Mahoney, J.T. (2016) The impact of the timing of patents on innovation performance) Once the uncertainty has been reduced and it cannot be further reduced by waiting, it is time for preemption to start. The emergence of a dominant design led to an intensification of scale or knowledge barriers. In this case, namely after patent-pool formation, the earlier the timing of patent, the higher the number of licensees through the patent pool. In fact, firms can gain more revenues as soon as their patent becomes part of the licensing system after the formation of the patent-pool. The figure 1 shows the hypothesis.

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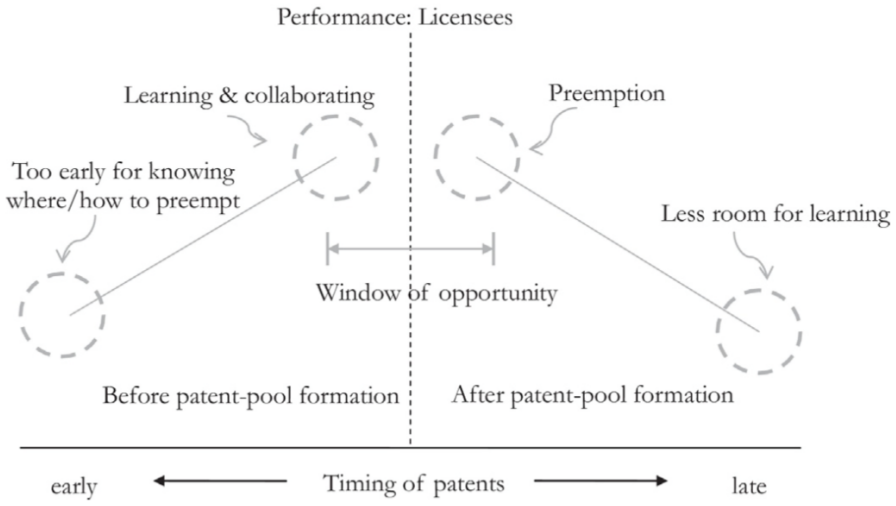


(Kim, B. ; Kim, E. ; Miller, J.D. ; Mahoney, J.T. (2016) The impact of the timing of patents on innovation performance)

"These empirical results indicate that late entry leads to higher innovation performance under a higher level of uncertainty, and early entry leads to higher performance under a lower level of uncertainty. Further, the slope of the coefficient of patent timing prior to patent-pool formation is less steep than after

patent-pool formation. This result shows not only the direction but also the magnitude of the impact of patent timing change around patent-pool formation."(Kim, B. ; Kim, E. ; Miller, J.D. ; Mahoney, J.T. (2016) The impact of the timing of patents on innovation performance) Once technologies are patented, to better capture all the positive aspects that brings with it, firms may have an incentive to license the invention. Without patent protection, a potential licensee would have little incentive to pay for an invention. Through patents, the invention can be disclosed without fear of imitation. Anyway, licensing can be possible without patents, but how this happens it is not well known. "Thus, Teece (1986) had argued that licensing is mainly recommended if the innovator enjoys strong patent protection and lacks complementary assets such as manufacturing and marketing. Implicit in Teece's prescription is the notion that access to complementary assets is difficult - typically the cannot be "rented" and acquiring them is costly and time consuming." (Arora, A. ; Ceccagnoli, M. (2005) Patent Protection, Complementary Assets, and Firms' Incentives for Technology Licensing) The patent protection has an impact on licensing that is moderated by specialized complementary assets that are required in order to commercialize innovations. Effective patents are more willing to promote licensing among firms that lack such assets compared with firms that possess them. A patent is effective when it has a strength protection. (Arora, A. ; Ceccagnoli, M. (2005) Patent Protection, Complementary Assets, and Firms' Incentives for Technology Licensing) " Patent protection can affect licensing through two routes : the patenting decision (since non patented inventions are difficult to license) and the licensing decision conditional on patenting." (Arora, A. ; Ceccagnoli, M. (2005) Patent Protection, Complementary Assets, and Firms' Incentives for Technology Licensing) Through the simultaneous analysis of a system of equations where are determined both patenting and licensing decisions, it is possible to define the impact that the patent effectiveness has on the probability of licensing and licensing conditional on patenting and also the role that the complementary assets play as moderators. " Increases in patent effectiveness indirectly affect licensing by increasing the propensity of firms to seek patent protection. However, this also decreases the proportion of patented innovations that are licensed, implying a smaller net increase in licensing propensity." (Arora, A. ; Ceccagnoli, M. (2005) Patent Protection, Complementary Assets, and Firms' Incentives for Technology Licensing) Generally, effective patents are able to increase the net benefits from licensing and this could possibly lead to an increase on the opportunity cost of licensing by enhancing the payoff from the exclusive commercialization of the innovation. The increases in patent effectiveness increase patent propensity but may at the same time increase or decrease the level of licensing in patented innovations. Furthermore, the impact that the patent effectiveness has on licensing and on the share of licensing in patenting innovation is less strength for firms with specialized

complementary assets. (Arora, A. ; Ceccagnoli, M. (2005) Patent Protection, Complementary Assets, and Firms' Incentives for Technology Licensing)

3.2 Licensing to accelerate the pace of inventions

Having the ability to introduce rapidly into the market new inventions increases the possibility for a firm to achieve first-mover advantages in terms of higher returns from innovation, accomplishment or continuation of technology leadership in the industry and greater market share. (Abuja and Lampert, 2001 ; Kessler and Chakrabarti, 1996 ; Merges and Nelson, 1990) How to develop that ability ? New acquired external sources of technology accelerate the rate of product development and based on that organizations are increasingly turning to licensing, because this practice could enhance the inventive capacity of licensees. (Leone, M.I. ; Reichstein, T. (2012) Licensing-in fosters rapid invention! The effect of the gran-back clause and technological unfamiliarity) Licensing-in leads to several positive aspects as keeping up with technological advances, increasing the licensee's likelihood of introducing new products or providing more lucrative combinations of available technologies. Licensing practices can save time deleting repetitions of stages, allowing the licensee to be more concentrated in the innovation process and reducing technology risk attention. "Time to the introduction of a new invention is shorter for licensees than for comparable non-licensees." (Leone, M.I. ; Reichstein, T. (2012) Licensing-in fosters rapid invention! The effect of the gran-back clause and technological unfamiliarity) Licensing-in practices encourage innovation through the incorporation of external knowledge into the internal mechanism. "Exploiting already developed solutions to resolve technological problems accelerates the rate at which firms can identify a technology trajectory that leads to the introduction of new invention." (Leone, M.I. ; Reichstein, T. (2012) Licensing-in fosters rapid invention! The effect of the gran-back clause and technological unfamiliarity) There are two contingencies that stimulate the licensing-in effect. First, "the benefit from licensing-in in terms of shortening the time to invention is contingent on the contractual specification of intellectual property rights." (Leone, M.I. ; Reichstein, T. (2012) Licensing-in fosters rapid invention! The effect of the gran-back clause and technological unfamiliarity) The grant-back clause, under which the licensee is obligated to reveal and transfer all the improvements made

during the licensing period to the licensed technology, due to its nature, is assumed to prolong the time to invention. In fact through the grant-back clause, the firms' interests are shifted to invest more money and resources in the further development of the technology away from the the licensee. The grant-back clause is introduced to avoid the risk of the boomerang effect of licensing, that occurs when fear of competitors reduces the propensity to license-out technologies. (Choi, 2002) In this case, therefore, the potential competitive advantages of technology improvements are decreased by the fact that all the advances are immediately transferred to the licensor. Thus, "time to invention is longer for licensees that sign license agreements that contain a grant-back clause compared to licensees that sign license agreements with no grant-back clause." (Leone, M.I. ; Reichstein, T. (2012) Licensing-in fosters rapid invention! The effect of the gran-back clause and technological unfamiliarity) Second, it should be considered that unfamiliar technologies cannot be easily integrated and assimilated from the inside. Therefore, licensing-in an unfamiliar technology may require more time to be absorb within the internal activities "The time to invention for licensees that license unfamiliar technologies will be longer than the time to invention fro licensees that license familiar technologies." (Leone, M.I. ; Reichstein, T. (2012) Licensing-in fosters rapid invention! The effect of the gran-back clause and technological unfamiliarity) " That lack of familiarity with the licensed technology leaves the licensee reliant on the licensor in terms of the learning required to assimilate it. The licensee, therefore, retains incentives to cooperate with the licensor even if the license agreement contains a grant-back clause. This shift in the incentive for commitment to the licensor moderates the effect of the grant-back, rendering the effect of such a clause trivial at best." (Leone, M.I. ; Reichstein, T. (2012) Licensing-in fosters rapid invention! The effect of the gran-back clause and technological unfamiliarity) Therefore the grant-back clause will increase less the time to invention when the licensee is unfamiliar with the licensed technology than in the case in which the licensee is familiar with the licensed technology. Basically, there are several reasons why firms should licensing-in and among these there's also the the one that it allows to reduce the time to inventions. Furthermore, also the licensor firms can gain by outsourcing further development of the technology to an external partner through licensing. Licensors will experience lower synergies if a grant-back clause is contemplated when the licensed technology is familiar to the licensee. It suggests that licensors have to find other methods to capture technological advances made by the licensee. (Leone, M.I. ; Reichstein, T. (2012) Licensing-in fosters rapid invention! The effect of the gran-back clause and technological unfamiliarity)

3.3 The dissemination's effect

The industrial performance is influenced by the static efficiency and the pace of technological progress, which is in turn influenced by the level of industrywide expenditures on research and development activities and by the rate of diffusion of new technologies. The diffusion affects the rate of technological progress through the costs of non-innovating firms (ex post effect) and the boost to invest in R&D (ex ante effect) . "Patent licensing, research joint ventures, and imitation have significant effects on both the rate of (ex post) diffusion of new technologies, and on private firms' (ex ante) incentives to develop such technologies." (Shapiro, C. (1985) Patent Licensing and R&D rivalry) The channels though which dissemination takes place are patent licensing, research joint ventures and imitation. (Shapiro, C. (1985) Patent Licensing and R&D rivalry) Licensing represent a voluntary form of diffusion in which the inventor doesn't have the ability to enjoy all the gains. In this case the inventor enjoy at least some of the gains to trade from licensing the use of his technology. Research joint ventures is another way to share the results before their realization in the research and development department. This is a type of ex ante licensing. Instead, with the imitation the patentee has little control. In this case, non innovating firms unilaterally gain some of the discovery's benefits. "Intuition suggests that licensing has socially beneficial ex post effects, and that it encourages innovation (ex ante) by increasing the rewards to the patentee. Research joint ventures also appear to have socially, if not privately, beneficial effects upon ex post dissemination, but it is not clear offhand what effect RJVs have on development incentives. Finally, one expects that imitation will have socially favorable ex post effects, but will tend to discourage or retard innovation." (Shapiro, C. (1985) Patent Licensing and R&D rivalry) Generally, the gains to trade from licensing are enjoyed by the licensor and the potential licensees based on the designed contract. In order to guarantee better results in terms of perfect monopoly (fully collusive) outcome, there might be signed a two-part tariff contract, where there are a fixed fee and a per unit royalty rate. Through this way the pie will be maximized and divided between the licensor and the licensees. "The idea is that the licensing firm can control its rival's behavior (reaction curve), through the use of the pre unit royalty rate." (Shapiro, C. (1985) Patent Licensing and R&D rivalry) There should be chosen a royalty rate that guarantee the intersection between the licensee's reaction curve and the licensor's reaction curve. Doing so, the collusive outcome can be easily achieved. There must be necessary to sign a cross-licensing contract to accomplish the fully collusive outcome, when the firms' production involves more than one

product or produced goods are heterogeneous. In order to realize a collusion also a sham innovation can be licensed with a large royalty rate and a negative fixed fee. " The licensor would reduce its rival's output by imposing a "tax" or r per unit, and then compensate the licensee for this tax with a negative fixed fee. In the extreme case, this licensing contract would be equivalent to a bribe paid by the licensor to induce the licensee to exit the industry." (Shapiro, C. (1985) Patent Licensing and R&D rivalry) To avoid this practice that it is likely to be illegal, there must be consider as a constraint that the fixed fee cannot be negative. In this case, the optimal contract should be the one in which the royalty rate takes the higher level and the fixed fee is absent. In this analysis conducted by Carl Shapiro, it should be considered that there are also limitation factors that make it difficult to achieve the licensing gains to trade. One limitation is the presence of asymmetric information, that may obstacle the licensing contract formation. There may be possible also that the innovator is not able to license his innovation without giving other information in the ongoing competition to acquire other patents. Furthermore, the licensor may be inefficient in terms of costs in monitoring the licensee's output in a way useful to profit from that. For these reasons sometimes licensing encounters oppositions. Moreover, in the case in which the licensee is less efficient than the licensor, it is better for the licensee to produce with the old technology and therefore the licensing practice is not always socially beneficial. In a oligopolistic point of view, the optimal way to license the innovation must be defined considering that the new technology reduces each licensee's magical cost and alter his reaction function. It means that in this case there is an interdependence of demands, where the one enthusiasm to pay for a license is influenced by the other firms that are purchasing licenses. When the patent is held by research joint venture. Generally, it is not optimal the use of the price system in this case. It could be used a quantity system, where an increase in the number of bidders would reduce the number of rivals, once determined the number of licenses to be sold. "Larger joint ventures have an incentive to issue fewer licenses. So, the notion that RJVs promote dissemination may be unfounded. Even if the joint venture is contractually required to issue licenses to all of its members, the independent lab will issue more licenses than will a small joint venture." (Shapiro, C. (1985) Patent Licensing and R&D rivalry) Licensing, basically, increases the use of the new innovation but at the same time may lead to less competitive industry behavior. It may reduce the incentive to create new technologies, base on the ex ante effects. In fact, when the costs of patenting are high and the licensee obtain substantial benefits from the licensing contracts, the race takes on the character of a waiting game. In this case all the firms want to wait that its rivals will develop the innovation. Therefore, licensing may delay innovation when each firm is more content to wait, lose the race, and become a licensee. It may involves incentives socially excessive. In fact, the licensor is pushed

by a desire to gain more returns that are not social returns. In addiction, the private returns reduces profits of the oligopolists, raising their marginal costs. Summarizing, “while licensing contracts serve a useful function of spreading the use of superior technologies, they may be used to facilitate collusion. While patent licensing increases the value of winning a patent, it also increases the value of losing a patent race, and thus need not encourage innovation. And, while research joint ventures avoid duplication of research efforts, they may inhibit diffusion and reduce development incentives.” (Shapiro, C. (1985) Patent Licensing and R&D rivalry)

3.4 Compulsory licensing

Licensing as an inbound strategy enhances generally the innovation performance as well as the financial performance. What should be take on account is the awareness about the compulsory licensing. “Compulsory licensing is a policy that should be used rarely, if at all.” (Rozek, R.P. (2000) The Effects of Compulsory Licensing on Innovation and Access to Health Care) For instance, a government led by a compulsory licensing scheme, may force that all the technologies are licensed. In this case innovators hardly realize the market value of the technology. It means that there may be negative consequences linked to the practice of compulsory licensing. There are sectors where a strong patent protection must be present to provide incentives to develop and commercialize innovations. One of these is represented by the pharmaceutical industry, where the developing costs are generally higher than in the other industries. In this field, countries that exact compulsory licensing may reduce firms’ propensity to innovate new medicines increasing their fear of imitation and also it may create problems related to the quality of licensed products. Therefore, compulsory licensing inhibits and undermine pharmaceutical firms’ incentives to invest in research and development and disseminate new medicines. “The TRIPS Agreement provides a framework for countries to follow in designing, implementing and enforcing mechanisms to protect IPRS. Innovators, consumers and governments will realize the benefits from implementing the TRIPS Agreement if countries adopt the TRIPS standards without imposing the additional constraints on the innovative pharmaceutical firms of compulsory licensing.” (Rozek, R.P. (2000) The Effects of Compulsory Licensing on Innovation and Access to Health Care) The Agreement

on Trade Related Aspects of Intellectual Property Rights is an international agreement where are reported minimum standards for many forms of intellectual property regulation issued by the world trade organization. Licensing is a voluntary practice that requires the willingness of both licensee and licensor. No party should be involved without a clear willingness to participate in the licensing agreement. Therefore, the role of the government is not to force firms to license but provide the legal framework required to negotiate into the market. Within the pharmaceutical industry the intellectual property rights are viewed as a resource to gain more profits and to recover the sunk costs of R&D, based on the fact that they give a monopoly power to charge higher prices on the medications. "Using compulsory licensing as a price-control mechanism does not necessarily increase welfare in the country. The government will have to incur some level of costs for regulatory review of applications for licenses and quality of products produced by licensees." (Rozek, R.P. (2000) The Effects of Compulsory Licensing on Innovation and Access to Health Care) The patent protection may have a negative impact on the local firms, which are not able to survive if they cannot copy a product under the law. Based on that, local firms should invest in R&D and adjust their activities to the rules established by the patent protection. Through this process, local firms may encounter benefits from this internal investment, generating innovations and increasing employment. Compulsory licensing is not even an answer for the essential drugs. Rather than improve the access to those medicines, it provides more opportunities for firms to obtain more profits. The access to these drugs is undermined in many countries by several factors as financial hurdles, physical factors, information asymmetries, certain social and political conditions and costs and prices of health care goods and services. But also even when the medicines can reach these countries easily, the compulsory licensing may produce a reduction in the quality of these drugs. Therefore, it does not represent a solution to those issues correlated with essential drugs. "Innovative pharmaceutical firms will be reluctant to introduce products in countries with compulsory licensing laws. Such countries will receive new medications later than countries without compulsory licensing since innovators do not want to create additional sources of supply of products in a given country that potentially could be exported to other countries. Compulsory licensing as a response to differential prices is, thus, inefficient and harmful to consumers." (Rozek, R.P. (2000) The Effects of Compulsory Licensing on Innovation and Access to Health Care) Licensing an innovation reduces firms' propensity to invest in the resource and development department to satisfy unmet medical needs. It is an inefficient policy where the incentives to innovate are undermined and the technologies tend to be undervalued by replacing voluntary negotiation over licensing with forces sales of technologies. Anyway, when there is a voluntary contract between the licensor and the licensee, license a pharmaceutical technology may be

a relevant tool to manage the intellectual property. “Compulsory licensing does not improve access to health care and, in fact, makes it more difficult for consumers to gain access to pharmaceutical products. Compulsory licensing forces innovators to relinquish their technologies and destroys their incentives to conduct R&D. Consumers suffer because they are denied access to the new, improved medicines that would have been discovered and developed as a result of R&D conducted by pharmaceutical firms.” (Rozek, R.P. (2000) The Effects of Compulsory Licensing on Innovation and Access to Health Care) In fact, problems like AIDS in Africa and other may be solved or at least helped through the intellectual property protection. By the patent system the development department is stimulated to discover new medicines for these diseases. Furthermore, the protection of the intellectual property rights enables firms’ progress and economic growth, because a great extent depends on investment in resource and development. Therefore, there are not only social benefits correlated with patenting practices but there are also private gains that induce firms to invest in R&D unit. Compulsory license represent just an interference that reduce the firms’ financial rewards, and as a consequence the intention to create new innovations, but also the quality of the licensed products once this practice is used. “Alternative policies that are more likely to be successful are to encourage preferential access and donation programs while providing assurances against parallel trade. Vigorously enforcing antitrust and consumer protection laws,while encouraging local firms to form voluntary alliances with the innovative pharmaceutical firms, is likely a more productive use of a country’s resources than imposing broad-based compulsory licensing requirements.” (Rozek, R.P. (2000) The Effects of Compulsory Licensing on Innovation and Access to Health Care) Basically, in terms of innovation compulsory licensing may be an obstacle. Although patent encourages monopoly and overpricing, it is required to prompt the development of new innovations. It represents an imperfect but effective instrument in terms of innovation. It should be consider anyway that there are those who argue, as in this analysis, that in the pharmaceutical industry through the patent protection firms are able to recover the sunk costs of production and at the same time to finance new innovation. On the contrary, there are also those who argue that compulsory licensing is required in developing and least developed countries to avoid monopoly issues and to protect human right to health through the diffusion of necessary medicines. But it should be considered also that firms who don’t have patent protection in one country won’t be pleasure to sell their products in that country. Based on that, the compulsory licensing effect should be considered negative in terms of innovation. (Abbas, M.Z. (2013) Pros and Cons of Compulsory Licensing : An Analysis of Arguments)

3.5 The “catching up” effect and its dilemma

A new technology diffusion could happen through the patent licensing that guarantee the long-run industrial performance. Firms that don’t license are the ones that remain attached to their existing innovation technology, losing supposedly the rate in future R&D with rivals to innovate. “To catch up with its rivals in the race for the next generation of innovations, the patent holder may license its current technology so as to create more competitive pressure from the rivals and therefore enhance its incentive to innovate further. By giving up its dominance through patent licensing, the current leader may, in effect, improve its position in the next battle of technological rivalry.” (Lin, P. (1997) License to Be More Innovative) In order to analyze the “catching up” effect, it must be taken on account an asymmetric version of the R&D race model of Lee and Wilde (1980), considered in the study conducted by Ping Lin (1997). At time 0, the current leader (the low-cost firm) has a chance to license its technology to a rival firm. Once the licensing decision is made, it triggers a race between the engaged firms where emerges then the winner that becomes the monopolist in the market. In fact, firms do not compete just in order to discover superior innovations, but also through licensing contracts trade information and rights related to the use of more efficient technologies. The innovation process requires a complex set of competition in research and cooperative agreements to share the information realized through researching. (Gallini, N.T. ; Winter, R.A. (1985) Licensing in the theory of innovation) In this race, all the firms involved in the competition contest between each other in the pre-innovation product market with the existing technologies. “Licensing occurs if and only if when post-licensing industry profits exceed a threshold equal to pre-licensing industry profits minus a term measuring the “catching up” incentive.” (Lin, P. (1997) License to Be More Innovative) From this it follows that a technology may be licensed also when this practice reduces current industry profits. Considering the current leader at time 0 has a strategy opportunity to license. “ Licensing, although reducing its current market share, enables the leader to avoid being in an otherwise disadvantageous position in a future R&D race. Due to this “catching up” incentive licensing may occur even when it reduces joint profits of the licenser and the licensee in current market.” (Lin, P. (1997) License to Be More Innovative) Licensing agreement may decrease firms’ profits. In this case the licensing practice is motivated by the “catching up”. Furthermore, the licensing agreement that is pushed by the “catching up” effect has as a consequence the inhibition of the innovation process, it reduces the pace of innovation. Through licensing its rival, the current leader has a possibility

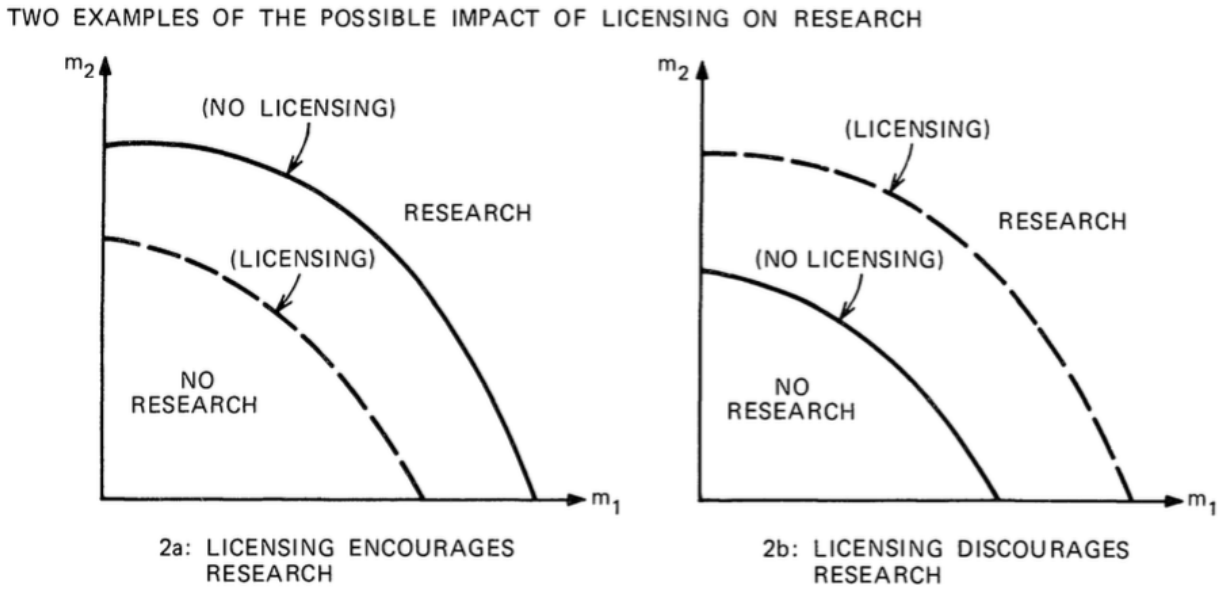
to enhance its R&D propensity. To avoid its lack of innovative incentive, the leader may put part of its pre-innovation profits into a trust fund, to be paid out only in the case in which it wins the R&D race. It probably increases the leader's attention on the race as it reduces its profits. "But such a scheme works differently in other aspects from a licensing arrangement. Unlike a licensing agreement, setting up a trust fund does not reduce the laggard's R&D incentive. In fact, its equilibrium R&D expenditure will increase as it must respond to the increased R&D effort by the leader, which may hurt the leader. Furthermore, the leader does not get the benefit of a licensing fee in the case of a trust fund. It is not clear a priori which arrangement yields higher payoffs for the leader. While licensing may work better for the leader in certain situations, establishing a trust fund may be a favorable choice in others." (Lin, P. (1997) License to Be More Innovative) It should be considered that the leader and the laggard are assumed to be equally efficient in the analysis, but it could be different for instance for drastic innovations, where the leader may exceed based on the successes achieved in R&D. Furthermore, the possibility of success may be greater for the leader than for the laggard at given R&D cost. In this analysis is considered just one R&D race, but in reality it may be different. An analysis with other races will lead to different results. In fact, with another R&D race, the potential licensor or the initial leader is less interested in licensing the technology, based on the fact that losing the race now is less costly.

3.6 Licensing incentives

Licensing is useful based on its impact on researches: increasing researches when the existing technologies in the market are closed in costs, and decreasing them in markets where firms face widely divergent production costs. "The availability of licensing neither increases nor decreases unambiguously the extent of innovation" (Gallini, N.T. ; Winter, R.A. (1985) Licensing in the theory of innovation) The incentives that guide and motivate licensing practices could be divided into two. The first one is correlated with the rents that provide (ex post incentive) and is relatively strong when costs of production under existing technologies are close. The rents prospecting will stimulate additional researches to achieve lowest cost position in the market. On the contrary, when the costs are far apart, an ex ante incentive will stimulate better the licensing practice instead of the previous one. "A licensing contract

offered by a firm with a very efficient production technique can provide a high-cost firm with a technology at its reservation cost, the maximum production cost this high-cost firm would tolerate before undertaking research, without any research expenditure at all. At the same time, by reducing the licensee's incentive to do research, licensing in this case prevents the possible erosion of the low-cost firm's market position by its rival's discovery of a superior technology. Where the ex post incentive reflects rents from the elimination of (privately) wasteful research expenditures by high-cost firms. In short, because of the ex post incentive, licensing encourages research when costs are symmetric, but because of the ex ante incentive, licensing discourages research when cost differences are large." (Gallini, N.T. ; Winter, R.A. (1985) Licensing in the theory of innovation)

11



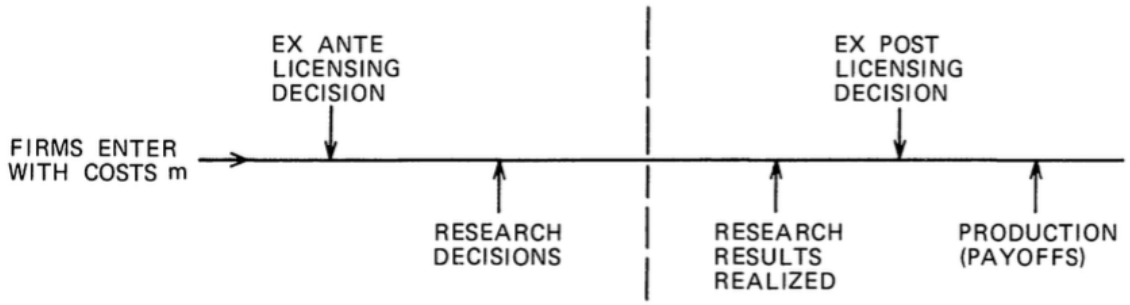
(Gallini, N.T. ; Winter, R.A. (1985) Licensing in the theory of innovation)

This picture shows how the two licensing incentives act in terms of research. "Innovation decisions and consequent changes in industry costs are the outcome of an entirely non-cooperative game." (Gallini, N.T. ; Winter, R.A. (1985) Licensing in the theory of innovation) In this analysis should be taken on account that patent protection does not reduce the incentive to patent licensing, because without any protection the innovator won't be willing to license. Therefore, the intellectual property rights protection

open up the market for trade in information or existing technologies. The licensing agreement may be signed prior to the research results or after their realization. The ex ante licensing agreement takes place in the ex ante period and permits the use in the ex post production of the more efficient current technology. The ex post licensing agreement struck in the ex post period for the use of the more efficient technology.

12

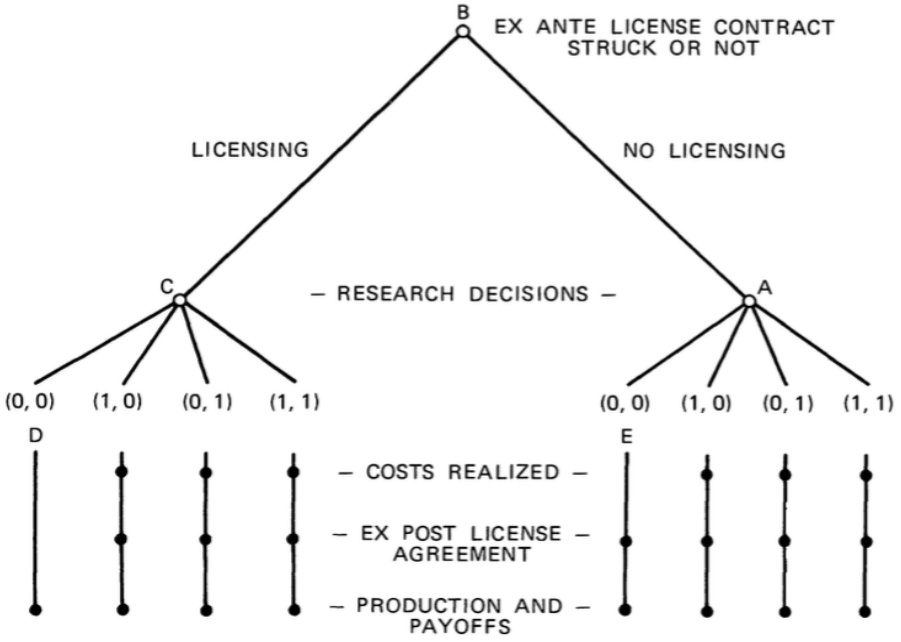
TIMING OF LICENSING, RESEARCH AND PRODUCTION DECISIONS



(Gallini, N.T. ; Winter, R.A. (1985) Licensing in the theory of innovation)

“An ex ante license contract effectively provides the high-cost firm with an option to use the licensor’s existing technology in the future production at the specified royalty, if a better technology is not discovered. Actual license contracts combine elements of both ex ante licensing (licensing existing technology for future production) and ex post licensing (licensing for current production). As it turns out, the incentives for the use of each type of licensing differ sharply; it is therefore useful to analyze them as distinct contracts.” (Gallini, N.T. ; Winter, R.A. (1985) Licensing in the theory of innovation)

SUMMARY OF INNOVATION GAME WITH LICENSING



(Gallini, N.T. ; Winter, R.A. (1985) Licensing in the theory of innovation)

Assuming the noncooperative game framework and the concept of Nash equilibrium, this figure shows the condition under which no research takes place when licensing is possible. Based on this picture, no research may be an equilibrium in point D, when an ex ante licensing agreement is offered, or in point E, when an ex ante contract is not offered but other researches are unprofitable. Must be considered anyway that point E can be ignored as an outcome of the game, based on the fact that if an ex post contract occurs when E is the equilibrium of the game with royalty R, then the player hasn't any incentive to determine in the first period the license contract at R. Branch D (0,0) may be an equilibrium when D is the equilibrium of the subgame beginning at C and also when is the equilibrium of the subgame beginning at B, under the assumption that D will be the outcome at C. (Gallini, N.T. ; Winter, R.A. (1985) Licensing in the theory of innovation) Given these two conditions, it can be analyze which is the impact of the introduction of licensing current and future technologies on the set of initial costs under which no research occurs. Licensing is viewed to not increase or decrease the no research set. This results came from the presents of the two known ex ante and ex post incentives. These influences the overall effect of licensing, that promotes further research when costs are symmetric but downsizes research in the case in which costs are asymmetric. So basically, the impact of licensing is given by a balance between the ex ante and the ex post effect. Instead, the effect of licensing on the equilibrium market price depends on

costs and price. “For asymmetric initial costs, the final costs and price under licensing exceed the expected values in the absence of licensing; in a market with small variation in production costs, the expected final costs and price will fall with licensing. Licensing increases the difference in expected final production costs when initial costs are asymmetric, suggesting a dampening effect of licensing on the natural tendency towards equal-sized firms.” (Gallini, N.T. ; Winter, R.A. (1985) Licensing in the theory of innovation)

Conclusion

The analysis deals with the field of innovation, showing which are the relative methods that could be used to create a new technology. In a world where the knowledge is widely diffuse, the closed innovation model can't be used anymore to find winner innovations. A more open model needs to be applied to capture all the relative technologies and information useful to develop new innovations and to gain more profits through the out-licensing and the selling practice of internal sources. The ways to increase the financial rewards as well as the firms' innovation performance are raised due to the awareness of many others profitable technique presented in the market. It doesn't exist anymore just one way to discover a product or service and commercialize an innovation and this awareness must be used to gain a competitive advantage. The analysis starts from the slow process that led from the closed innovation model to the open innovation model. Then I defined the open innovation paradigm analyzing all the types of positive and negative aspects that influence the single open innovation practices. I showed all the relevant outbound and inbound practices and their effects on firm's financial performance and on their innovation performance. Detecting their impact, I have to sum up some obstacles that these practices may encounter during their applications. There are internal efforts that may delay the external sources acquisition, applied by the employees, as the "not invented here" syndrome. In my opinion, the most relevant obstacle of the external sources integration within the internal units is the absorptive capacity. Regardless the way in which the external knowledge is incorporated, that may have been occurred through the in-licensing or the acquisition, the internal departments should have to be willing to accept the assimilation. Firms should stimulate the development of this absorptive capacity to those already hired employees who are reluctant to accept changes through different ways as courses or base programs. Certainly, during the hiring process firms should detect this capability and decide to hire those potential employees who really can embrace the direction change through a more open model. Having internally open minded employees is important as well as recognizing the right external sources that we need. Without a certain ability to assimilate the external technologies, all the efforts spent to capture the needed external sources will have been unnecessary. As I mentioned, there are several ways to integrate external technologies as licensing, partnership, networks, acquisition and more over. But the main focus in this analysis was posed on the licensing practices. Licensing is a strategic inbound activity that could have extremely positive influences on the firms' performance as well as negative impacts. In fact, compulsory

licensing is not the right choice to obtain a competitive advantage. The in-licensing decision have to be well studied prior to their adoption. I showed which is the firms' licensing propensity and its impact on the diffusion of knowledge. Basically, the divulgation process encourages inventions. The problem was to detect if and when the licensing practices enhance firm's innovation performance. The results showed that generally the licensing practices intensify the innovation process through the increase of the dissemination of information that stimulate to innovate. My final suggestion is to intensify the study on the connection between the inbound practices and the internal unit assimilation of external sources to maximize this potential relationship that is still lacking. There is a need of a clear plan to control and stimulate the employees' willingness to accept changes, and also at the same time of a specific system that could help to integrate sources. It should be changed also the system itself when it does not fix well with the open innovation process. There is, as I mentioned in my analysis, a strong influence of the organizational structure on the open innovation effectiveness to create innovations. So basically, a willing system to absorb external sources and a sure employees' ability to accept the acquired technologies are a potential combination to use efficiently all the possessed relevant knowledge to develop new innovations.

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