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Start-Ups and Licensing Agreements: An Exploratory Case Study

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Abstract

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Introduction

In Europe, there is increasing attention devoted to practices that could enhance the creation of new companies in high-tech sectors for example by adopting “measures to support the commercialization of innovation, research and development projects taking into account the special challenges of newly established firms” (European Commission, 2013). These new companies can represent an important asset in increasing the economy of a region by providing new products/processes to the market (Audretsch, 1995). In recent years we have indeed seen an ever-increasing amount of start-ups are being created through licensing-in of technologies from third parties which can be Universities, Research Centers and Firms.

This paper aims to understand which factors, related to the technology which is transferred to a new venture via licensing, may contribute to its success, giving useful feedback also to prospective licensors, licensees and policy makers. Licensing agreements can exist between established companies or can give rise to start-up companies, built around the technology which is being licensed. If the licensor is also involved in the creation of the licensee, these are called technology spin-offs. The licensor may retain partial ownership of the new firm, become a client or supplier of the new firm, gain royalties from the licensed technology or a combination of the above, however the spin-off operates on the market independently. A well-known example of this practice is Xerox Corporation, which had a very active spin-off creation program from its’ Palo Alto Research Centre (Chesbrough 2003b). Other cases exist where the licensee is a start-up company whose IP comes from a licensing agreement with an established firm. For example the network of European Space Incubators hosts independent start-ups who are dedicated to commercializing technologies, developed by leading Aerospace companies, in other sectors¹. Even more cases are present if we consider private and public research centers whose technology transfer programs are often actively involved in encouraging entrepreneurship activities in order to transfer their technologies to the

¹ See http://www.esa.int/esaMI/Business_Incubation/

marketplace. Therefore it is well established that licensing can both support existing firms but also new start-ups.

However, there is currently a dearth of research regarding how licensing affects budding companies and which are the most ideal conditions under which licensing can support new ventures. In particular, no in-depth qualitative study has thus far been conducted to examine the processes at work as a licensing agreement is negotiated and implemented and as the start-up moves towards the market. Therefore it is interesting to examine under which conditions licenses should be granted to start-ups and which factors surrounding the licensing are important for both parties involved.

Under which conditions can technology licensing between a licensor and a start-up be beneficial to both parties?

This paper is a first attempt at identifying the key factors which influence this type of technology exchange and their relationships and suggesting, through the examination of more and less successful cases, the optimal strategies for licensing-out to start-ups both for public sector licensors (Universities, Research Centers) and private firms. Given the complexity of the phenomenon, an in-depth qualitative study has thus far been conducted to examine the processes at work as a licensing agreement is negotiated and implemented and as the start-up moves towards the market.

Theoretical Background

Licensing-out a start-up company

The licensing of proprietary technology, registered under a patent, to third parties, so that they may exploit the technology with the necessary modifications, is an affirmed practice among technology firms, research centers and universities. It is widely established in literature that licensing increases the spread of ideas and innovation in the economic system and also increases the licensors' return on their innovation efforts (Bessy et al., 1998). For the originator firms, licensing can be a tool to fully profit from their R&D efforts (Arora et al., 2001; Fosfuri, 2006), a means to explore

alternative markets for a particular technology (Cesaroni, 2004), and an opportunity to foster organisational learning (Ceccagnoli et al 2014). The demand for technology licenses can come from firms already operating on the market and indeed this has been the focus of taps research on licensing agreements (e.g. Gans and Stern, 2002; Ceccagnoli and Jiang, 2013). However potential technology acquirers are also start-ups that need technology to bring a product idea to life, or start-ups who have original ideas on how IP could be used in a novel way and this segment of the market has been thus far neglected. Several studies have highlighted how companies and R&D laboratories only ever manage to license out a fraction of the technologies which have been earmarked for licensing schemes, whereas most of these technologies remain on the shelf for lack of potential buyers (Arora & Gambardella 2010, Kani & Motohashi 2012). As well as representing a missed opportunity for revenue by the owner of the technology, this shelved Intellectual Property (IP) also presents a cost to society by constraining the possible paths of experimentation, in multiple fields, that could follow on from the technology if it was more widely available for exploitation (Murray et al 2009). By studying the start-up segment of the markets for technology we aim to enrich the debate on how to foster these types of technology exchanges, thereby increasing the awareness of the opportunities available to IP owners.

Industry-level conditions that may favour the creation of new firms starting from a licensed technology include the strength of the appropriability regime, the novelty of the technology, the segmentation of the market and how essential complementary assets are to the success of the product or service (Shane 2001). However, alongside market level factors, there are also inter-firm and firm-level attributes which affect the likelihood of the start-up bringing a product/service to market which includes the licensed technology, thereby guaranteeing a return to the licensor. Whether this happens can depend on many factors, some of which have been examined individually by literature such as the importance of engaging the inventor (Agrawal, 2006), the importance of the business model (Chesbrough & Rosenbloom 2002) or the signaling effect that licenses can have for the start-up (Hsu & Ziedonis 2008). What is missing is a process view of how the licensing agreement within the spin-

off unfolds and which aspects are important in setting up this agreement to define the basis for the firm's success.

Key Constructs Examined

The existing literature gives us already some insights on the important factors to consider when evaluating licensing towards start-up companies.

Studies on licensing agreements between firms have identified a superior invention performance of companies licensing-in new technologies w.r.t companies not part of licensing agreements (Leone & Reichstein 2012). It may be, though, that established companies who have a higher degree of complementary assets will draw greater benefits from licensing-in new technology, (Lowe & Tailor 1998). Instead regarding start-ups, their initial resource endowments are critical to its success, and the more resources a firm owns at the outset the more likely it is to succeed (Levinthal 1991). Among these, in-licensed Intellectual Property can be an extremely important asset for a firm to possess, influencing both its capability to compete on the market, as one Venture Capitalist commented: "IP is IP, obviously there's a respect for that", but also its ability to access funding (Cao & Hsu 2011). As several start-ups highlighted: "the license is important because for raising money for example everyone asks you "do you have the license, the license is OK?". As many start-ups do not have the funds to develop their own technology entirely in-house, they can use licensing in order to gain access to IP and its benefits. In this context, it is important to understand *the role that the licensed technology plays in the product/service of the start-up* and the ensuing benefits this can bring. The technology may be at the core of the licensee's product and service offering and without it the advantages of the product w.r.t the competition would be nonexistent. Other companies could have, instead, an entirely different and more complementary role for the licensed technology. In these cases their product already exists independently from the licensed technology, however the technology plays a role supporting their manufacturing, service or distribution. In both cases there is a potential for opportunism conduct by the licensee. At any moment, the licensee may decide not to

exploit the licensed patent in their product or service if is not obliged to do so, that is if the product or service specifications ultimately do not require the use of the knowledge contained in the IP. This introduces a further element of risk for the licensor who is diffusing valuable information into the market without the assurance of receiving a return beyond an eventual up-front fee (Ziedonis 2007). In the case of start-ups, funding can be scarce at the outset, therefore the possibility for the licensor to raise upfront fees, thereby ensuring a significant return on the licensing deal from the beginning, may also be more limited. Therefore it is clear that licensing-out technology can represent a risk as well as an opportunity for any licensor. In particular, there is a trade-off between additional revenues that can be gained from the licensing agreement, and the costs related to the transfer itself as well as the risks of opportunism by the licensee (Fosfuri 2006). Depending on the role that the licensed technology plays in the product/service of the start-up, there is more or less risk of the licensee not using the technology in their product/service and so less risk of the technology being shelved. If the in-licensed technology is core for the development of its own business we expect the risk to be lower; in case it is complementary to the core business, the effective use of the license will depend more on the price and the conditions that are offered by the licensor, as it is not essential to bring the start-up's product to market.

Recent studies have explored one of the most critical bottleneck in licensing, which is the potential buyers' cost of integrating external technologies (Ceccagnoli & Jiang, 2013). In case of the start-up, this depends on the additional knowledge of the founding team to the technology and it can therefore be interesting to look at *the source of the knowledge regarding the licensed technology which is present within the start-ups*, differentiating between a demand-pull and technology-push approach (Di Stefano et al. 2012). Each of these approaches presents distinctive challenges. In fact, studies have shown that the two sources of innovation, demand-pull and technology push need to be combined in order to achieve successful innovation (Di Stefano et al. 2012). Therefore it would seem that licensors should pay attention to the background and skills of their licensees, but also to their role in supporting their achievement of the missing skills necessary for the start-up to arrive to market.

Mounting literature (Anand and Khanna, 2000; Bessy et al. 2012) suggests that Licensing contracts should be regarded as more complex than other forms of contracts between firms, because they involve the exchange of tacit knowledge alongside the contents of the patent and because the enforcement of user rights on the knowledge exchanged may require complex governance structures to be put in place (Bessy et al. 2002). In order to mitigate the uncertainty of licensing contracts, the licensor or licensee can moreover utilize contractual clauses to its advantage. Clauses such as grant-back (Leone & Reichstein 2012) as well as scope and exclusivity of the license (Somaya et al. 2011) can influence a firm's strategy and performance and the former have already been shown to shift incentives to further develop the technology from the licensee back to the licensor (Leone & Reichstein, 2012). Moreover in the case of a start-up who is seeking access to funding, this could be a negative signal, limiting their possible returns on the licensed technology, which are carefully scrutinized by possible investors (Hsu & Ziedonis 2013). Anti-shelving clauses, which can take the form of "maximum time to market" limitations or "minimum yearly royalty fees" (Dechenaux et al. 2009), are also often applied to licensing contracts. Due to the high uncertainty that start-ups face on the market, these clauses could potentially cause the failure of the start-up if they cannot get to market fast enough and cannot re-negotiate terms. Therefore the *contract which is set up in order to manage the licensing agreement* and *the relationship which is created between the two companies* can greatly influence the overall outcome of the deal.

We argue the model which is set up in order to manage the licensing agreement and the relationship which is created between the two companies can greatly influence the overall outcome of the deal. Therefore, the four key aspects that this research will consider as a starting point are the role of the licensed technology in the final product/service offering, the demand-pull versus technology-push perspective, the contractual clauses present in the licensing agreement, and the relationship between the licensor and the licensee.

Research Design

The research question relates to the process through which a licensing agreement plays out within a start-up company. For this purpose, a case-study approach was used, with the selection of start-ups who set out to introduce a product or service to the market based on a licensed technology, both those with an agreement already in place and those with an agreement still to be negotiated. The start-ups were licensees from Universities, Research Centers and Private Firms. Among those that concluded a licensing agreement we looked for firms who successfully went to market and also firms who struggled to do so. The licensors were based in two different countries, The Netherlands and Italy, which are respectively in the “Innovation Followers” and “Moderate Innovators” categories of the Innovation Union Scoreboard 2014² classification. This was to check whether a larger experience with innovation could influence also licensing to start-ups.

The start-ups are distributed in five different countries and operate in different sectors. The founders/CEOs were interviewed. In all cases but two there was a single founder, only in one case two co-founders were interviewed. In order to complete the picture, on the licensors’ side key personnel managing the licensing process was interviewed and finally we connected with external investors who were evaluating those types of firms.

Some of the interviews, especially with Technology Transfer Managers, Incubator Managers and Venture Capitalists were open-ended, requesting to describe their experience with licensing to start-ups. Instead, for the start-ups, who are main the object of the research, a standard questionnaire was elaborated in order to consistently request the same information and enable the comparison of results across different interviews. The interview questions were based broadly on the four key aspects identified within the theory, however each interview had a different set of follow up questions, expanding on the aspects that emerged as most important to the entrepreneurs in each case. Each interview lasted between 30 and 60 minutes. The questions included in the conversation are listed in appendix 1.

² http://ec.europa.eu/enterprise/policies/innovation/policy/innovation-scoreboard/index_en.htm

The starting point for this data collection was the “European Space Agency Technology Transfer Program”. This program has been running since 2004 Europe-wide, and its objective is to foster the creation of new ventures by transferring technologies developed for space missions to other sectors. A series of 7 incubators spread across 5 European countries (The Netherlands, Germany, Italy, Belgium, and UK) selects and hosts start-ups, who transfer these space technologies, for the first two years of their lifetime. This was considered an excellent starting point as it enables to contact start-ups in many different European countries, who are subject to the same contractual framework and deal with the same technology licensing office. During the last 10 years, around 20 companies were born out of licensing agreements. Out of these companies, four agreed to be interviewed. The main difference with the ones who did not was the founding date, meaning the participating companies were all currently still within the incubator program or had very recently exited it. This ensured a greater consistency with startups interviewed in other settings, who were also still being incubated or supported in some way by the licensor.

In addition to these firms, the research sample was broadened to include a set of European research centers that have active licensing schemes to start-ups. From these research centers four startups have so far been interviewed. Moreover, a comparison was sought with start-ups born out of leading European Universities and out of licensing schemes run by private companies.

The paper is based on a series of 10 interviews conducted and recorded for the start-up companies described in Table 1 and a comparable number of interviews conducted within the licensor technology transfer offices and among venture capitalists. All were conducted by Author 1 either in person or through a Skype videoconference. They were recorded with permission from the interviewees and were then transcribed. These interviews were also complemented with newspaper articles and information from company websites.

Insert Table 1 about here

The coding was performed independently by Author 1 and Author 2 following the methodology outlined in Weston et al. (2001) which suggests defining a coding manual at the start of the coding process, based on the theoretical constructs that need to be examined. This coding manual can be then refined as the coding proceeds to include finer categories. This strategy was selected as we shared the authors' intent to start from the constructs that emerged from the theory, and while considering each firm as its own story, to be able to aggregate the data and find patterns emerging between the different licensors and licensees. The coding manual started with the four aspects identified in the theory review and throughout the coding process, the initial broad codes were further refined in order to produce the final schema that you see in the summary tables throughout the results section.

Findings

We will start by examining the conclusions from each one of the four main constructs, highlighting also the interactions seen between them. It is useful to point out that, although the companies interviewed were based in different markets and in different countries, significant similarities were found in their answers to the questions found in appendix 2, denoting that the licensing process for these startups has several points in common across different settings.

Role of the Licensed Technology in the Product/Service of the Start-up

Regarding the role that the licensed technology plays in the final product offering of the firm, in several of the start-ups interviewed the technology was at the core of their product and service offering and without it the advantages of the product w.r.t the competition would be nonexistent. As one CEO claimed “*It’s key, it’s key [...] in this case there’s no other technology that is capable of doing it [...] our product really depends on this licensed technology*” and another “*We need that [license, Ed.] to be able to do what we’re doing and we have to use that [technology, Ed.] throughout the product*”. Other companies had, instead, an entirely different and more complementary role for

the licensed technology.: *“The product can be brought to market without the license, however this technology enables us to adapt our product to be used with many different [key component, Ed.] and so we don’t need to fix this issue early on in the engineering phase [...] we can negotiate with different suppliers without depending on any one of them”.*

Insert Table 2 about here

However, this role of the licensed technology was not only perceived as static by the startups but also had a dynamic connotation, decreasing in importance over time depending on the amount of further adaptation that was needed to bring the technology to the market and on the overall complexity of the technology: *“it’s key but it’s not all the only part because our technology is very complex so we patented other aspects of the technology so we have a broad portfolio of patents right now so as you can imagine the first patent of course is important but it’s deleted by other patents”.* This implies that over time the weight and the strategic importance of the licensed patent may be diluted out by additional R&D efforts of the start-up. Therefore, the fact that a patent is a core part of a product/service when the licensing deal is made, does not guarantee that this will still be the case once the product gets to market, and there is still the opportunity for the licensor to utilize it as a real-option even though initially the product couldn’t be conceived without the technology. In one case, the licensee eventually decided not to use the original patent, but will be potentially filing a new one based on the original idea adapted to their market. So apart from the up-front fee they have already foregone, they will not be paying any royalties on the original patent included in the license agreement although they are using an original idea from the licensor. The interviews also shed light on the very different IP strategies that firms put in place after receiving the license. Out of our sample six companies were using it to build the actual product, one was using it as a basis to build a patent pool, two were keeping it on-hold to evaluate costs vs benefits and one had decided not to use it at all. This shows that for these start-ups, IP can be seen as a dynamic tool, not only giving them specific knowledge or rights, but also additional benefits that they can leverage for instance to penetrate a

market or gain access to funding. Since the literature on Licensing concentrates on the exploitation of IP in large companies for innovation and protection strategies, these findings give us a broader insight into the use of IP within companies.

Source of the knowledge regarding the licensed technology

Among the firms interviewed, some licensing deals occurred starting from the licensees having an in-depth knowledge of a market need: *“very much we knew what the market was, the market was crying out for a solution, they had lots of solutions but they weren’t happy with that either”*. In this case, the further knowledge needed by the company managers concerns the suitability of the technology for the application: *“We performed a 15 month feasibility study [...] and afterwards we knew what it [the technology, Ed.] could do for us”* and also the in-depth knowledge of the technology itself *“I was employing the man who was the lead scientist on the initial development of the technology [...] he was the one who was doing the research for me [...] he had all at his fingertips so that was a big plus in my favor and in [the company, Ed.] favor”*. In the opposite case, technology push occurred when the founders of the start-up had a prior knowledge of and had participated in the development of the technology but did not have a precise idea of the market in which it could be applied: *“I looked at this [technology, Ed.] and I immediately made the connection that it might be an opportunity to [perform a certain task, Ed.] in certain situations. I didn’t know much about it [the market, Ed.] but this was my first clue”*. For investors, this latter scenario gave them confidence that, since the main experts of the technology were part of the new venture, there would be no risk that the licensor would develop the technology further and ultimately compete against the licensee later in time *“if the people who invent it stay behind they could develop additional inventions”*. In this case the licensee not only needs to prove that the technology is suitable for a particular need through feasibility studies, but must also correctly identify the market and confirm the need is effectively there: *“we invested more than 1M€ by now [...] doing a lot of market research and also market preparation. We talked with I think over 150 companies by now, we visited several trade shows in the*

world in Europe, [...] just to warm up the market, to see where the potential is and who our prospect customers would be.”

All technology transfer professionals interviewed were expecting their start-ups to be following the technology push model, as this gave them confidence that the correct know-how was being used within the start-up. So in a choice between market uncertainty and technological uncertainty, they prefer to gamble on the market and have a solid technology. In reality, however, the summary chart shows that there was a substantial balance between demand-pull and technology-push scenarios as reported by the entrepreneurs themselves.

Literature shows us that the ideal case for innovation would be where the demand-pull and technology push dimensions co-exist within the company (Di Stefano, Gambardella & Verona 2012). However, some startups highlighted a certain amount of conflict between the two perspectives. This was particularly exacerbated in scenarios where both were present at the founding level of the company. One company reported that a researcher and a businessman set up the company together after a co-financed feasibility study. However after one year the researcher was forced to leave the company because he *“always wanted to do more and a wide variability of things and was not used to focus on a specific topic or process and always wanted to do everything. It’s expensive, it takes a lot of time, it delays the priority projects”*. In alternative, licensees that reported that someone was working for them, so one perspective was subordinate to the other, did not have any issues in matching the two.

Contract set up in order to manage the licensing agreement

The structure of the licensing agreement had a clear impact on the licensee in all cases, confirming its importance for the success of the licensing process as can be seen in table 2.

Insert Table 3 about here

We also found evidence that contractual clauses and limitations to the use of the patent are carefully scrutinized by investors “*The value of the company is centered around the IP so I really want the company to come with the IP [...] it could be an exclusive license, that’s pretty much the same as owning the IP, but if there’s the possibility of broader licensing such that competitors can be created or potential buyers can just buy the IP then there’s no future for these companies in my view*”. Indeed in five out of six cases where the technology was reported to be at the core of the final product service offering, an exclusive worldwide license was granted to the start-up. In the one case where this didn’t occur it had a heavy impact on the company’s ability to raise funding. Instead, in the cases where the licensed technology was reported to be non-core, the licenses were limited to a particular market with no consequences on the ability of the start-ups to raise capital. Therefore understanding the role played by the technology in the licensee’s product can have an impact on the type of contractual limitations that can be set up, potentially leaving greater flexibility to the licensor to pursue other market opportunities for the same technology and at the same time limiting the licensing costs for the start-up where applicable.

Literature has shown us that IP can have a signaling effect on the market (Hsu & Ziedonis 2013). In the interviews it emerged that not only the presence of IP but also the status of the licensor can add to this signaling effect, which is considered very important to access new markets, to win grants and to attract investors: “*certainly to be able to walk into the room with IP with [the particular licensor, Ed.] around it, that is an advantage [...], these industries in particular are quite hard to find a way around in, and they would look at that and they would open the door that little bit quicker of course*”. However, the signaling effect could also backfire if the licensor is not well-known in the particular market. This was especially perceived as problematic for entrepreneurs considering selling their business before the licensing agreement expires, as the potential acquiring company could negatively evaluate finding themselves in a relationship with a licensor which is not well known “*The disadvantage is that I don’t know what happens with a big customer: I don’t know how they will consider [the licensor, Ed.], because they know well Stanford, Harvard, MIT and other places over*

here so I'm not sure how they will react when they want to buy your company or they want to buy your technology”.

Six cases were found with anti-shelving clauses applied to the start-ups (three already agreed and three to be agreed), mostly connected to a series of milestones to be achieved in a timeframe between 3 and 6 years. In some cases this resulted in a perceived time pressure on the start-up: *“there are anti shelving clauses [...] we now have three years [to get to market, Ed.] and [...] if I had this contract in 2011 when I first started this whole venture, it would be this year that the whole thing would be under the deadline and this is in a way too short to get to any commercialization for this kind of difficult technology [...] You can sign these things off but it hard to say what the kind of progression you can make as a start-up [...] It would be killing my business if I had signed this contract 2 years ago or 3 years ago”.* On the other side of the spectrum, however, some firms were undaunted by the same type of clause *“we have to meet some milestones starting from the 3rd year and if we are not going to meet this milestone we have to probably negotiate with them [licensor, Ed.]. We are not worried about that because it's our company developing the technology and [...] that patent without our team is just, you know, a piece of paper”.* The key difference between these two examples was the relative strength of the start-up with respect to the licensor in terms of knowledge possessed and complexity of the technology developed, which increased the opportunity cost for the licensor to change the licensee or to terminate the agreement. Interestingly, in all cases where the anti-shelving clauses were not perceived as a credible threat by the licensee, the time pressure was provided by applying in addition minimum yearly royalty fees. This approach is more expensive for the startups, who start paying independently from the revenues achieved, and they should be aware of this possibility as they plan their budgets and build their business plan. Licensors on the other hand should carefully evaluate which type of clause is more suited to the licensee if they want to encourage a reasonable time to market on the part of the start-up.

Relationship between Licensor and Licensee

In addition to the specific clauses outlined in the contract, there were a host of other exchanges that licensors and licensees entertained during the licensing phase. These varied greatly between cases and went from incubation to additional grants, from the use of specialized equipment to provision of personalized consulting services.

Unsurprisingly, in general these additional benefits were well received and in a few cases they were considered essential for the firm's early development and survival. However one of the impacts that were majorly highlighted by the start-ups was when they were constrained to be localized close to where the original IP was produced. This had both positive repercussions when the location had sufficient facilities and was a hub to enhance their competences: *"we set it up as a UK company so that we could avail of [licensor, omitted] funding as they would not be able to fund an Irish company under their present role and we set it up in Harwell in Oxford. [...] And we were based in [omitted, Ed.] which is a great place to be when you're doing science because there's a lot of people around there that are interacting."* whereas in other cases it significantly increased the firm's costs, such as one firm who was granted free access to an advanced laboratory in a remote location, and therefore incurred a high amount of travel costs every time they needed to meet clients or interact with potential investors and suffered from complete isolation, or another firm who was required to be set up in an underdeveloped region by the licensor: *"Well disadvantages are of course being located in [Omitted, Ed.] has not always been easy to handle also because for instance I said we started with an external American partner from the beginning, an industry established in the field supporting the company. We have been discussing relocation of the company that was not fitting with this agreement so there was somehow issues that we had to deal with, so finally the model of the agreement, content of the agreement related to the location of the company has been somehow an issue."*

Conclusions and Limitations

Licensing out to start-ups is by now the preferred method of bringing technology from R&D projects to the market for many universities and research centers, however private firms are

also following suit and are increasingly considering this as an option to commercialize proprietary technology. From the point of view of the licensees considered in this study the majority feels that licensing technology has brought great benefits to their venture and was a positive decision, highlighting that a market for technologies can make a positive impact on new venture creation and can contribute to innovation efforts. Moreover, all but two of the companies reported that they had no choice in taking the license. This shows that as the amount of patents increases, these licensing deals will be increasingly common.

This research sheds light on the different aspects which are important to consider when licensing-out to start-ups and the fact that a licensed technology can be much more for these start-ups than an injection of knowledge or a legal instrument but that it can have a strategic role in their initial development. Moreover, the IP injected into these startups has been used in several cases as a real-option, either as a basis to create patent pools that made the initial technology obsolete or much less important, or even just using the idea within the IP to develop a different solution on the market. This further strengthens the idea that licenses are real-options that firms can acquire and exercise at a later stage.

This research has been conducted on a small sample of firms all based in Europe. Although there were no significant differences found between companies born in different countries and from different licensors, a larger sample could further reinforce the findings and support a broader generalization of the results. In particular more cases will be sought where the licensor is a private company or a university as they are currently under-represented in the sample.

Most firms interviewed are currently in their first few years of operations and only two have reached the marketplace this far. Therefore an update of this research in a few years will also enable us to draw some conclusions on firm performance in relation to the factors identified above.

Implications for Practice

The above research confirms that policies directed at enhancing SME's access to technologies and R&D results could positively contribute to strengthening the SMEs created in the years to come, as advocated for example by the European Union in its recent policies. As an increasing number of universities, research centers and private firms open up technology transfer offices, each implementing its own set of heterogeneous rules and policies, we will see an increasing number of startups whose initial assets also include licensed technologies. This article constitutes a first step in exploring this phenomenon, and pinpointing the factors which are fundamental during the licensing negotiation, agreement and implementation phases.

Starting from the licensee's point of view, we can see that having IP is not only about access to a technology, although this is known to be a crucial aspect for their success, but also about having access to additional resources and a reputation effect stemming from the licensor's reputation among investors and clients in their target market. Therefore, prospective entrepreneurs should evaluate the entire package that they can receive with the licensing agreement and the strategic options it can bring them during their initial growth, beyond the use of IP. This insight is equally important for licensors, who should reflect on their positioning and branding, especially if their licensing objectives are linked to maximizing revenue from licensing agreements. Moreover, the IP can be used in many ways by the start-ups, configuring itself as a real-option that can be exploited in different ways over time, for example being included in a final product or service, being used as the basis for a patent pool or not being used at all due to further R&D performed within the start-up. This means that the strategic implications of licensing-in IP should include also considerations on the future R&D and IP strategy of the firm from the outset, also in relation to the competitors present on the market. Finally, literature has indicated that the founding team of a startup makes a large difference in the success of the firm. We have linked this aspect to the licensing process, showing how the "technology push" or participation in the start-up company founding team by the inventors, which is often overemphasized by licensors and Venture Capitalists, is not the only successful approach to create a start-up, because in-depth knowledge of potential markets is also an essential aspect to consider when developing a

new firm. These two aspects should co-exist within the start-up, however may bring about conflicts due to differing mentalities, and should be carefully managed.

From the licensor's side, our studies have shown how different contractual clauses, such as anti-shelving and yearly fixed royalty fees, can be combined to manage information asymmetries with the licensees and to keep the pressure to reach the market on the licensee even without controlling their activities directly through ownership stakes or venture capital. Moreover, innovative licensing deals are appearing on the market, which seem especially suited to start-ups. These include fixed total fees for the License which can be repaid with variable amounts over a certain number of years, or loan mechanisms where the upfront fee is waived under a loan scheme until the products reach the market, at which moment the loan needs to be repaid. These mechanisms grant a greater flexibility to the start-ups, especially at the outset when financial means are scarce, however still enable the licensor to set up an up-front fee for the license agreement without having to depend entirely on royalties.

Appendix 1 - Tables and Graphs

Table 1 - Companies Interviewed

Firm	Founded	Country	Market	Technology Role	Founding Team	License Conditions	Incubation (Y)	Technology Source	Exclusivity
A	2013	NL	Data-centres	Core	Push	Up-front fee + Royalties + Antishelving 3 years to market	1	Research Center	N
B	2012	UK	Oil & Gas	Core	Pull	Annual Fee + Royalties + Antishelving 4 years to market	1,25	Research Center	Y
C	2013	NL	Pharmaceuticals	Core	Pull	Up-front fee	2	University	Y
D	2009	NL	Renewable Energy	Non-Core	Pull	To be negotiated	1	Research Center	N
E	2011	NL	Transportation	Non-Core	Pull	Royalties	1	Private Company	N
F	2012	IT/USA	Electronics	Core	Push & Pull	Annual Fee + Royalties + Antishelving 3 years to market	0	Research Centre	Y
G	2012	IT	Nanoparticles	Non-Core	Push	To be agreed after 3 year period	3 including use of lab equipment	Research Centre	Y

Table 1 - Companies Interviewed

H	2012	IT	Renewable Energy	Core	Push	To be agreed after 3 year period	3 including use of equipment	Research Centre	Y
I	2013	IT	Renewable Energy	Core	Push	To be agreed after 3 year period	3	Research Centre	Y

Table 2 Role of the Licensed Technology in the product/service of the startup

Construct	Categories	Attributes	Findings
Role of the Licensed Technology in the product/service of the startup	Core	Change over time	-The more complex the product structure, the less the original licensed tech weighs over time
		Static	-The simpler the product the more stable the value of technology over time
	Non-Core	Signaling Tool	-License is used as a signaling device or to obtain access to grants and funding -Licensing used to add modularity or flexibility

Table 3 - License Agreements and Contractual Clauses

Construct	Categories	Advantages Licensee	Disadvantages Licensee	VC Point of View
Relationship between Licensor & Licensee	Agreement	-Correct Legal Framework -Protection of market -Signaling (if Licensor has strong reputation in the market)	-Cost -Negative signaling (if - Licensor is not well-known in the market) -Opportunism by licensor	- Must be in place
	Exclusivity	-Attract investors/ -Raise Capital -Save money -Access grants	- Often accompanied by anti-shelving	- No interest in investing if the license is split per market or sector
	Antishelving	- Not perceived as an issue when licensee has key skills related to tech or market	- Time pressure	—
	Upfront Fee	- Pushes you to think critically about the actual use of the IP	- Cost	—
	Yearly fixed fee	—	- Cost	—
	Royalties	—	—	—

Appendix 2 - Baseline interview questions.

These questions were covered in each interview, however based on individual interviewee responses, additional clarification and exploratory questions were asked.

1) Can you describe your company, the key markets you operate in and your main product/service?

2) Can you describe the role the licensed technology plays in your final product/service offering?

3) Can you explain how you identified the technology that was available for license and at what stage this happened of your product/service development cycle?

4) What type of agreement do you have for the license (up front-fee, royalties, grant-back clauses, anti-shelving clauses, etc.?)

5) How did you develop the licensed technology further once you acquired it? (E.g. further R&D, additional patent applications, engineering, industrialization, marketing etc.)

6) Which are the key advantages you feel you obtained by licensing in this technology?

7) Would you have experienced the same advantages if you were not a start-up?

8) Which are the key issues you experienced by licensing in this technology?

9) In what part were they due to you being a start-up?

10) Can you describe the relationship you had with the licensor and how this influenced your company?

11) Are there any other factors that influence the success of the licensing deal that you haven't mentioned so far?

12) Did you ever think you would have been better off not taking the license in the first place and why?

Appendix 3 - List of Technology Transfer Officers and Venture Capitalists Interviewed

Venture Capitalist, Prime Ventures, Amsterdam, NL

Patent Pool Manager, European Space Agency, Noordwijk, NL

Manager, Business Incubation Centre, Noordwijk, NL

Technology Transfer Officer, Joint Research Center, Brussels, BE

Technology Transfer Officer, Rotterdam School of Medicine Incubator, Rotterdam, NL

2 Technology Transfer Officers, Istituto Italiano di Tecnologia, Genova, IT

3 Technology Transfer Officers, European Space Agency, Noordwijk, NL

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