CHALMERS

The Role of Patents in Venture Capital

A Case Study in Silicon Valley

Master of Science Thesis
in the Management and Economics of Innovation Programme

Erik Gidlund
Jonatan Roos

Department of Technology Management and Economics
Division of Innovation Engineering and Management
CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sverige 2016
Report No. E 2016:075

MASTER'S THESIS E 2016:075

The Role of Patents in Venture Capital

A Case Study in Silicon Valley

ERIK GIDLUND
JONATAN ROOS

Tutor, Chalmers: Marcus Holgersson
Tutor, Chalmers: Henrik Berglund

Department of Technology Management and Economics
Division of Innovation Engineering and Management
CHALMERS UNIVERSITY OF TECHNOLOGY

Göteborg, Sweden 2016

The Role of Patents in Venture Capital
A Case Study in Silicon Valley

Erik Gidlund

Jonatan Roos

Master's Thesis E 2016:075

Department of Technology Management and Economics
Division of Innovation Engineering and Management
Chalmers University of Technology
SE-412 96 Göteborg, Sweden
Telephone: + 46 (0)31-772 1000

Cover:
[Golden Gate Bridge, San Francisco]

Chalmers Reproservice
Göteborg, Sweden 2016

Acknowledgements

This master thesis was written for the department of Technology Management and Economics at Chalmers. We wish to thank our two supervisors, Marcus Holgersson and Henrik Berglund for giving us this opportunity and guiding us through this project with intelligence, enthusiasm and helpfulness. Another special thanks to the Sten A Olsson Foundation for Research and Culture whose scholarship made it possible for us to travel to California.

We would also like to express our deepest gratitude to everyone who has made this study achievable either by helping us with introductions or by taking time off busy schedules to participate in interviews. While anonymity constrains us from naming you here, it has been an incredibly inspiring journey to meet all of you and we wish to thank you for your time and generosity.

Finally a special acknowledgment must be made to Staffan Nilsson who has been invaluable to this project. Staffan, you are truly a friend of Chalmers.

Chalmers University of Technology

Gothenburg, Sweden

2016-06-07

Erik Gidlund Jonatan Roos

Abstract

In this master thesis we examine the role of patents in early stage venture capitalist investing. While several studies have quantitatively found correlations between venture capital and patents (i.e Kortum & Lerner, 2000; Mann and Sager 2007; Graham et al. 2009; Haeussler et al. 2009; Audretsch et al., 2012; Hsu & Ziedonis 2013; Munari and Toschi 2014; Kalaitzandonakes et al. 2014; Smith & Cordina, 2014) little research has examined the process regarding how venture capitalists actually use patents. From interviews with 13 representatives for venture capital firms we have found a great heterogeneity in how venture capitalists view and use patents in their evaluations. Patents are rarely considered by investors to have a key role in the investment decision and patent documents are generally not used to reduce information asymmetries since few investors read patents. However, patents are usually discussed with the founders and are almost always regarded as something which adds value to the startup. Other than evaluating the patents through discussions with the founders, the evaluation of patents mostly takes place in the extensive due diligence after the term sheet has been signed. It is then done by external parties, such as lawyers, to confirm what is said in the discussion. Our findings thus contrasts previous research which has hypothesized that patents have an important signaling function and greatly reduce information asymmetries between investors and startups seeking finance.

Table of Contents

1. Introduction

There have been a multitude of studies examining what criteria venture capitalists use when evaluating startups, the motives for startups' patenting and the correlation between venture capital and patents. However, little research has been conducted on how venture capitalists use patents. A venture capital fund raises money from institutions and wealthy individuals to invest in early-stage businesses that offer high potential reward and high risk (Sahlman, 1990). In exchange for investing in these companies they receive equity or equity-linked stakes in the companies (Gompers & Lerner, 2001). The companies that are being invested in typically own few tangible assets and engage in rapidly changing markets (Zider, 1998) they are small and young with high levels of uncertainty and a great deal of information asymmetry between the founders and investors (Gompers & Lerner, 2001). Venture capital has developed to be an important part in the financial system by supplying financing to companies that would otherwise have trouble getting it. Notable examples of VC-funded companies include Apple Computer, Intel, Microsoft, Sun Microsystems and Compaq Computer (Sahlman, 1990).

One of the distinctions of venture capital compared to other forms of financial intermediations is the governance and value-addition that the investors provides to the investee(s) (Kanniainen & Keuschnigg, 2004). The founders have often limited business competence and will be advised and helped by by the VCs who can assist in building business relations, hiring competent personnel, market products etc. (Kanniainen & Keuschnigg, 2004). Typically, venture capitalists will become members of the board of directors in the startups they invest in (Sahlman, 1990).

Venture capitalists does not invest all capital a startup will require to accomplish its business plan at once but rather invests at various stages in the firm's development (Ross et al., 2008). These stages are reasonably well-defined stages ranging from seed to mezzanine (Sahlman, 1990). Cumming & MacIntosh (2001) states that despite venture capitalists being experts at resolving information asymmetries, it is likely that valuation errors are greater for early-stage investments. For example, in the seed stage the quality of management and the strength of the company's product or technology may be untested while that is less of a concern later on (Cumming & MacIntosh, 2001).

One piece of information that may be available early on to investors is the granted or pending patents a startup may have acquired. A patent is not an invention or a technical document per se, but a legal right which gives the holder the right to exclude others from, among other things, making, using or selling what the patent protects (Granstrand, 1999). Patents are thus a negative right in that it gives the right to exclude others, a right which is enforced by suing infringers. However, a patent is not a positive right in that it does not provide the patent holder the right to commercialize the invention. The drawback of patenting is that the patentee must publicly disclose information about the invention. In order for something to be patentable it has to be 1) technical in nature 2) novel and 3) non-obvious (Granstrand, 1999). This means that for a patent to be granted the invention has to be industrially applicable or useful (technical in nature) previously non-disclosed (novel), and exceed a certain minimum inventive step for the professional practitioner (non-obvious). However, just because a patent has been granted by the patent office does not mean that it will be held valid in court. In fact, Lemley (2001) reports that in litigated cases the patents are held invalid forty-six percent of the time. Further, an overwhelming majority of patents are never licensed or litigated (Lemley, 2001). However, rather than patenting for licensing technology many startups do so because they believe it will help them receive funding (Holgersson, 2013).

Aligned with such a patenting behavior, Long (2002) challenge the view that the value of patents is confined to the exclusive rights granted; instead of considering publicly disclosing the invention as a setback of patenting, it is hypothesized that patents may have value in that they are able to credibly convey information. Patents can thus serve to reduce information asymmetries between startups and investors. This signaling value may be of more value to the holder than the protective value granted because investors will be able to gather information about the invention and the firm at a low information cost (Long, 2002). However, as a patent could be held invalid in court the receiver of the signal does not know whether the patent is "good" or "bad" without actively evaluating it. While several studies has been conducted examining what criteria VCs use when evaluating startups (e.g Kollmann & Kuckertz, 2010; Zacharakis & Meyer, 1998; Shepherd & Zacharakis, 1999; Mason & Stark, 2004; Carlos Nunes et al., 2014) there is a lack in knowledge regarding how VCs regard and use patents. However, a number of studies have been conducted quantitatively, covering the relationship between venture capital and patents.

Haeussler et al. (2009) found that startups with high quality patents received VC funding faster and Munari and Toschi (2014) found that startups with core patents correlated with higher VC valuations. This has been interpreted as confirming the importance of patents to VCs and that they pay attention to patent quality. Further, Kortum & Lerner (2000) and Graham et al. (2009) found that startups associated with venture capital held more patents than otherwise and Hsu & Ziedonis (2013), Mann and Sager (2007) and Kalaitzandonakes et al. (2014) found that patenting increased VC valuations. However, both Audretsch et al. (2012) and Mann and Sager (2007) found that patents did not increase the chances of getting funded. It is thus of interest to explore this dynamic between venture capital and patents and *the purpose of this study is to investigate how venture capitalists use patents when evaluating early-stage startups*.

1.1. Limitations

One limitation of this study is that the results are based on interviews, where the interviewees were asked about their own processes. It can be hard to assess exactly what the basis of one's own decision rests upon, especially if there are several factors involved in the investment decision. Part of the decision process might also be subconscious and hard to assess through interviews. This is supported by research by Zacharakis & Meyer (1998) who found that venture capitalists were bad at introspecting about their own decision processes. However, interviews were considered the most suitable way to gain insight of the venture capital investment process.

Another limitation to the study is the sample size. Thirteen venture capitalists and four non-venture capitalists were interviewed. Further, the interviews were conducted by following a semi-structured approach which means that it is harder to compare them than if for example a structured interview or questionnaire was employed. As such the research should be seen as qualitative, explorative and hypothesis-driving rather than generalizable and decisive.

2. Literature Review and Research Question

This chapter will present and comment upon earlier adjacent research. Several quantitative studies have been conducted finding correlations between venture capital and patenting. Based on these studies researchers have hypothesized about the role of patents in venture capital. However, there is little research confirming or rejecting these hypotheses.

2.1. The Venture Capital Process

Every year most venture capital firms in the U.S receive somewhere from hundreds to a few thousands of requests for funding from startups (Cumming et al., 2010). Out of those only a selected few, in the range of a dozen, will be offered a deal from each firm (Sahlman, 1990). To decide on what to invest VCs assess the probability of success or failure by evaluating information surrounding the ventures (Zacharakis & Meyer, 1998). They will scrutinize business plans, meet with the founders and the team, valuate the business, determine market scalability, consult with market experts and discern whether the product or service meets an everyday need (Blum, 2015). The process consists of first an initial screening, typically a review of the business plan, followed by months of due diligence (Zacharakis & Meyer, 1998).

Tyebjee and Bruno (1984) first conceptualized the entire VC process and their model is still considered accurate (Kollmann & Kuckertz, 2010), though other scholars have expanded upon it. Tybjee and Bruno (1984) separate the process into five different sequential steps: 1. Deal Origination, 2. Deal Screening, 3. Deal Evaluation, 4. Deal Structuring and 5. Post-Investment Activities. Fried & Hisrich (1994) expanded upon this model by distinguishing between first-phase evaluation and second-phase evaluation as well as firm-specific screen and generic screen, see figure 1 below.

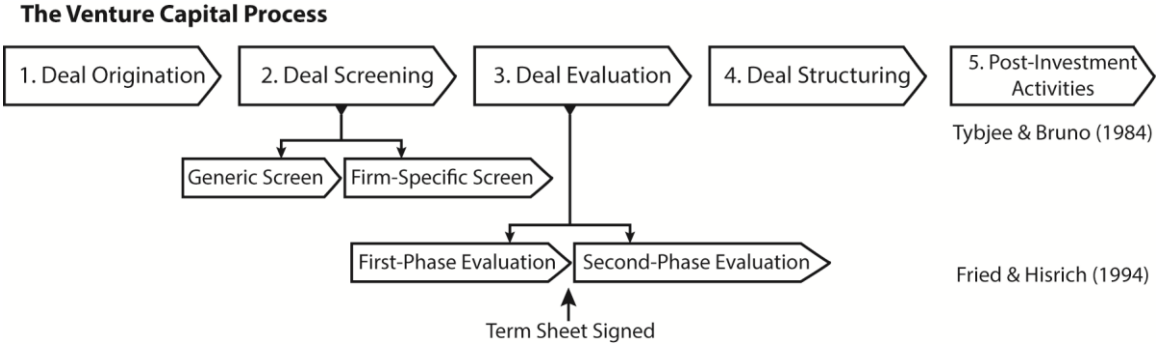

Figure 1. Illustration of the venture capital process

Through cold contacts, referrals or technology scans venture capitalists enter into the first step, deal origination, which is where potential deals are brought to their attention.

The next step, the deal screening, is where broad criteria will be applied to filter out deals that does not fit the venture capital firm's investment policy. Because the deal evaluation step is costly in terms of VC time the deal screening will have eliminated most investment proposals through just a brief chat with the founders or a review of the business plan (Fried & Sapienza, 2006). In this meeting the entrepreneurs will 'pitch' their ideas and there will often be extensive questioning by the VCs. The meeting is also important to determine whether there is 'chemistry' between the VCs and the founders (Fried & Sapienza, 2006).

The third step, the deal evaluation, is a more detailed evaluation where the VCs will apply several criteria and based on detailed characteristics of the startups determine whether to

invest or not depending on the relative levels of the perceived risk and the rate of return (Tyebjee and Bruno, 1984). This stage is usually referred to as the due diligence (Fried & Sapienza, 2006).

After the decision to invest, the deal is in the fourth step structured in respect to the amount to be invested, the equity to be obtained and the covenants of the deal in the deal structuring phase (Tyebjee and Bruno, 1984). Examples of covenants may be the composition of the board of directors, the mechanisms which allows the VC to force a future exit event, the terms of the top management's employment contracts, the types of spending that require VC approval, the requirement of VC approval before issuing or selling shares etc. (Fried & Sapienza, 2006). Unlike in Tyebjee & Bruno's (1984) model, these major terms of the deal are commonly negotiated before the VC starts the extensive due diligence, i.e. after the deal screening stage (Fried & Sapienza, 2006). In Fried & Hisrich's (1994) model there is a first-phase evaluation and a second-phase evaluation and the deal structuring occurs after the first-phase evaluation, where the VC will have developed an emotional commitment to the investment. In the second-phase evaluation the VC changes objective from trying to determine whether to invest or not to trying to figure out what the obstacles are and how they can be overcome (Fried & Hisrich, 1994). The terms that are deal breakers will then be identified before the second-phase evaluation begins and if the outcome of the due diligence there is favorable the VC will invest according to the terms already decided upon (Fried & Sapienza, 2006). The document outlining these major terms of the potential investment is referred to as the 'term sheet'. While it is not a binding legal document it is rare that 'deal breakers' arise in the extensive due diligence that causes the deal to fall through (Fried & Sapienza, 2006).

After the investment the investor engages in the fifth step, the post-investment activities (Tyebjee and Bruno, 1984). Here the VC will provide value to and monitor the startup (Fried & Sapienza, 2006). Activities include assisting in key recruiting, strategic planning, locating financing for subsequent stages and assisting in an IPO or merger or acquisition (Tyebjee and Bruno, 1984).

While Kollmann & Kuckertz (2010) report that VCs will sometimes have due diligence checklists with up to 400 different criteria previous research suggests that four categories are considered the most important: 1. entrepreneur/team capabilities, 2. product/service attractiveness, 3. market/competitive conditions and 4. potential return if the venture is successful (Zacharakis & Meyer, 1998). These categories are generally the same as the categorization made by Kollmann & Kuckertz (2010). They considered five categories and 15 investment criteria. The five categories in their model are 1. Personality of the entrepreneur, 2. Experience of the entrepreneur, 3. Product or service, 4. Market characteristics and 5. Financial characteristics, and these categories are considered to largely cover the criteria that VCs will consider. Out of these criteria studies have found that the most important ones are around the entrepreneur and the management team (Shepherd & Zacharakis, 1999; Mason & Stark, 2004; Nunes et al., 2014; Kollmann & Kuckertz 2010). Silva (2004) found that VCs' focus primarily was on the entrepreneurs, their professional and personal characteristics and their commitment to the business idea. Further, Macmillan et al. (1985) found that regardless of the product, market or financials it is the entrepreneurs that determines whether venture capitalists will invest or not.

Other factors found to be evaluated by VCs is the sustainability of a venture's competitive advantage (Silva, 2004), the competition, the nature of the industry and the level of product differentiation (Shepherd & Zacharakis, 1999). Kollmann & Kuckertz (2010) consider patentability one of the criteria under the category product or service and they find that VCs consider it easy to evaluate in the evaluation phase. They included patentability in their study

because two studies had previously mentioned it as an investment criteria. One of those were from the previously mentioned study by Tybjee and Bruno (1984) who found that the patentability was not evaluated in 30% of the cases. They believe the reason for this is because venture capitalists and entrepreneurs believed that by publicly disclosing the information about the product design they would face more, rather than less, competition. The other study by Macmillan et al. (1985) found that venture capitalists regarded it as important that the product was proprietary or could otherwise be protected. However, little other research has been done regarding how venture capitalists view or use patents.

Zacharakis & Meyer (1998) has critiqued the research around VC's decision making. As much of the research relies on data from post hoc methodologies such as interviews and surveys, it is assumed that VC's can successfully relate their own decision process. However, Zacharakis & Meyer (1998) found that VCs are not good at introspecting about their own decision processes and lack understanding about how their own decisions are made. People are inclined to report using more information than they do and frequently believe they use all relevant information, when in reality relying mostly on only three to seven factors or cues (Zacharakis & Meyer, 1998).

As previously mentioned, venture capital firms will not invest all capital required by a startup to execute its business plan at once. Rather a common practice is that they invest at different stages of development across multiple rounds of financing (Fried & Sapienza, 2006). Such stages of development may include the completion of a design, the first pilot product, reaching profitability, introducing a second product or an initial public offering (IPO) (Sahlman, 1990). Sahlman (1990) distinguishes between 8 stages: 1. Seed investments, 2. startup, 3. first stage – early development, 4. second stage – expansion, 5. third stage - profitable but cash poor, 6. Fourth stage – rapid growth toward liquidity point, 7. Bridge stage – mezzanine investment and 8. Liquidity stage – cash out or exit. However, a more recent stage distinction by Fried & Sapienza (2006) only distinguishes between four different stages: seed-financing, startup financing, expansion financing and buy-out financing. Some venture capital firms specialize at certain venture stages while other firms have different funds for different stages (Fried & Sapienza, 2006). While much research treat venture capital firms like a homogenous group, research by Berglund (2011) has revealed substantial regional differences between venture capitalists. The generalizability of previous research can therefore be questioned.

2.2. Startups and Patents

Several studies have shown that startups patent because they believe it will increase their chances of attracting venture capital financing. A study by Holgersson (2013) revealed that high-tech entrepreneurial firms largely did not consider patents to have a great impact on the firms' competitiveness and growth. However, a majority of them, many being VC financed, believed patents were crucial for attracting venture capital. This was found to be the most important motive for why startups patent. Another study by Veer & Jell (2012) had similar results, finding that 51 % of small companies believe that signaling to investors is a very important function of patents. However, they found that more startups would consider the traditional motives of blocking competition (54%) and preventing imitation (72%) to be important motives for patenting.

Similar to these two studies Graham & Sichelman (2008) found that startups will sometimes file for patents not because they believe the patents will protect their revenues or reduce competition but because they think patents can help them when trying to acquire funding. They argue that if such is the case there are several possibilities to why. One explanation is

that either the investor or the patentee is incorrect in their assessments of the value of the patents; either the investor wrongly believes the patents to be important for the patentee's business or the patentee wrongly believes the patents to be unimportant. Another possible explanation is that patents serve as signals to investors regarding startups' underlying qualities (Graham & Sichelman, 2008). This latter argument is in line with Long's (2002) view that patents' value can reside in its signaling qualities and as tools for reducing information asymmetries. A third explanation is that the patents, while not valuable to the startup's business, would be valuable to other entities (Graham & Sichelman, 2008). That could explain why investors value them as they would become important to an exit. This argument goes in line with the findings of Holgersson (2013) that managers of startups considered patents to be important for mergers and acquisitions. The role of patents for startups in the pharmaceutical industry has been studied by Holgersson et al. (2016). It was found that there patents typically play a critical role and were important both to attract venture capital and to enable exits (Holgersson et al., 2016).

Graham & Sichelman (2008) found several other reasons for why startups patent such as: to use in cross-licensing, for defensive use, instead of non-disclosure-agreements (NDAs), for generating licensing revenues and to maintain monopoly on its innovative products. Both the use of patents instead of NDAs and to secure financing are relative to venture capital, as Siegel et al. (1988) showed that an obstacle to venture capital financing is that entrepreneurs sometimes fear their ideas will be stolen from venture capitalists. To use patents rather than NDAs may be more suitable sometimes since it can be difficult to prove an NDA has been breached as well as getting external parties to sign NDAs (Graham & Sichelman, 2008).

Another motive for why investors may value patent and why startups patent could be because patent gives some downside value to the investment. If the venture fails investors stands less to lose if there are assets that can be used to capture salvage value, such as patentable technology (Sena et al., 2014).

2.3. Patents and Venture Capital

There is much research around venture capital and patents, especially so around patents as signals to investors. Kortum & Lerner (2000) found that venture capital was associated with increased patenting. The study was done by statistically analyzing data gathered from twenty manufacturing industries over a time period between 1965 and 1992. The authors hypothesize that companies that seek venture capital or are already venture capital financed may patent for two other reasons than companies that are not affiliated with venture capital. Either out of fear that the venture capitalists will exploit their ideas or because it will increase their chances of getting funded. In line with Kortum & Lerner (2000), the Berkley Patent Survey found that venture capital backed startups held more patents regardless of industry than non-backed startups and that patenting may serve an important function in helping startups secure financing (Graham et al., 2009). The report further finds that startups were selected by venture capitalists because of their patents. However, patenting patterns and motives were found to be highly industry, technology and context specific with patents considered more important in the biotechnology and medical field than in the software and internet fields.

Aligned with the theory that startups file patents to attract funding, Conti et al. (2013) considered patents signals that can convey the quality of an invention and made a theoretical model of conditions for examining the optimal match between a startup's quality of invention and the non-financial capital investors can provide. The model is based on the assumption that the quality of the invention is known only to the startup and that the startup can signal this value by filing patents. Further, Conti et al. (2013) state that their results imply that if external

investors judge the quality of inventions based on patents they observe, startup founders strategically use patents to convey this information. However, whether external investors judge the quality of inventions based on the patents a startup has and if patents thus serve as signals of an invention's quality to investors is not established. Such knowledge could therefore ratify or disprove these assumptions. According to Lemley (2001), who discusses the non-litigious use of patents, venture capitalists use startup patents or applications as a way to see that the company has a defined and carved out market niche, is well managed and is at a certain stage in development. This thus speaks in favor of Conti et al.'s (2013) analysis.

Similar to Conti et al. (2013), Audretsch et al. (2012) consider information asymmetries likely to be a severe problem for startups seeking external finance, especially so in the earliest stages. Their study argues that startups can use both patents and prototypes as signals to investors, thereby reducing information asymmetries. The theory is that patents serve to display appropriability while prototypes display the feasibility of an invention. Their empirical results, based on an online survey with 906 observations, suggest that startups with prototypes and patents have a higher probability of being financed by venture capitalists and business angels. However, their results show that only having patents and not having developed a prototype does not significantly correlate with getting funded. The sample in this study consisted of geographically dispersed entrepreneurs from all sectors and the study did not make a distinction between granted and pending patents. A similar study by Mann and Sager (2007) suggests that there is little significance in having patents before the first round of financing. They found correlations between patenting behaviour and a number of factors considered to represent success for startups in the software industry: investment rounds, total investment, exit status, receipt of late stage financing and longevity. Their data suggests patents have the most value at the later stage when the startup is generating revenue. However, while being a relatively recent study the data used was on firms that received their first round of venture financing during 1997, 1998 or 1999. It can thus be questioned if the results are still relevant as today's tech landscape may be different from the one back then.

A similar quantitative study by Hsu & Ziedonis (2013) had different results. It was conducted with data from 370 venture capital backed semiconductor startups and the results suggest that patenting activities boosts VC valuations. The study found that patents were more important if the founders lacked previous success in securing initial funds from distinguished VCs, that patents led to higher valuations in the earlier rounds of VC financing and that the patents were beneficial for bridging information gaps for public investors in an IPO when the startup lacked prominent VC investors. Their findings thus differ compared to the studies of both Mann and Sager (2007) which suggested that patents have little signaling value before the first round of financing and Audretsch et al. (2012) that found no significant correlation between funding and patenting if there was no prototype. However, likewise as Mann and Sager's (2007) research Hsu & Ziedonis (2013) relied on historical data with startups founded before the 2000's. Their sample comprised of U.S semiconductor device firms that were founded between 1975 and 1999. It is therefore once again possible that these findings do not reflect the current state of venture capital financing. A similar correlation in another industry was found by Kalaitzandonakes et al. (2014). The study was quantitatively done and comprised of 580 U.S based biotechnology firms. Their findings reported that having pending patents significantly increased the level of funding which startups received for their first round of financing. However, pending patents and granted patents had no effect on the second round of financing. Their findings is thus aligned with the theory that the signaling value of patents is reduced as the information asymmetries between firms and startups shrink, which was the objective of the study.

A more nuanced study by Munari and Toschi (2014) attempted to assess whether and how VCs differed when evaluating technological portfolios. It was done through a multivariate regression analysis with a sample of 332 nanotechnology startups that were financed by venture capitalists between 1985 and 2006. The statistical analysis checked whether the amount of VC financing correlated with the number of patents, the scope of the patents and the number of core patents. Similarly to Mann & Sager (2007) the study found that the sheer number of patents applied for before the first round of financing had very little impact on the amount of financing. However, it was found that the number of core patents correlated with higher valuations. Munari and Toschi (2014) interpret the results as confirming the importance of core technology patents to the venture capital decision process. However, it is questionable if such a conclusion is justified. The study did not investigate the venture capital investment process per se but rather found a correlation between a certain kind of patent and the amount of funding received. It is therefore quite possible that the reason startups with core technology patents received higher valuations was due to a number of other factors correlating with these patents, such as having better or more unique technology.

Similar to Munari and Toschi (2014), Haeussler et al. (2009) found a correlation between high quality patents and VC funding. Apart from conducting a statistical analysis their data collection included in-depth interviews with five venture capitalists from Germany and the United Kingdom. The statistical analysis revealed that VC financing occurs earlier for biotechnology startups that have applied for patents. It further revealed that startups which turns out to have high quality patents, as defined by number of citations later received, received VC funding faster. Haeussler et al. (2009) interpret this as an indication that venture capitalists pay attention to patent quality. Their qualitative research showed that both the quality signaling function of patents and the protection gathered from patents was of great importance to VCs. However, as VCs found patents difficult to read they would often let experts and patent lawyers evaluate the patents for them. The interviews further revealed a great heterogeneity in how VC evaluate patents. Unfortunately, it is not clear in what industries these VCs invested. As the sample size was so small, only five interviews, the authors encourage a large scale study to be undertaken to draw further conclusions regarding how VCs evaluate startups through patents. Table 1, below, shows a condensed summary of previous research.

Findings	**Industries**
Venture Capital associated with increased patenting (Graham et al., 2009; Kortum & Lerner, 2000)	All; manufacturing industries
Correlation between patenting and early VC valuations (Hsu & Ziedonis, 2013; Kalaitzandonakes et al., 2014)	Semiconductors; biotechnology
High quality patents correlate with higher valuations (Haeussler et al., 2009; Munari and Toschi, 2014)	Biotechnology; nanotechnology
Little correlation between number of patents and early funding (Audretsch et al., 2012; Mann & Sager, 2007; Munari and Toschi, 2014)	All; software; nanotechnology

Table 1. A condensed summary of previous research

Contrasting a high emphasis on patents from investors, a study by Huang and Pearce (2015) found that early stage angel investors will rely on a combination of intuition and formal analysis, and that the intuition trumps the analysis. It is therefore possible that venture capitalists follow a similar approach and that patents do not serve a big a function as reported

by the literature. Research by Smith & Cordina (2014) suggests so. From questionnaires with 21 representatives for venture capital in the UK they gathered data about venture capitalists' own views regarding patents. They found that four fifths did not view patents as a sign of a profitable investment opportunity and that less than one fourth believed there to be a link between granted or pending patents and the amount of funding received. However, Smith & Cordina (2014) interpret this as the investors being reluctant to admit to using patenting information because they want to retain an edge over competitors as they are playing a strategic game (cf. Holgersson, 2013). To put the findings of these, in many cases contradicting, earlier studies in a context and fill the current gap about how investors view patents more research is thus needed. The research question of this study is therefore:

What is the role of patents in VC investments in early stage tech-companies?

3. Methodology

This chapter describes the methodology used to gather and analyze the data of the study. It also describes the sample of investors interviewed.

3.1. Procedure

Data was collected in this study through semi-structured interviews which allows for flexibility, rich data and the interviewee's own perspective to shine through (Bryman et al., 2003). A list of topics was prepared along with sample questions which served as the interview guide and the basis for the discussion. As the interviews were semi-structured, questions could be asked outside of the template. This way, any topic of interest could be more deeply probed into. This is a methodology proposed by Bryman et al. (2003). According to Bryman et al. (2003) all questions should generally be asked in a similar wording during the interviews. However, Taylor et al. (2016) emphasizes similar themes rather than similar questions, regarding it as the researchers' task to get the participants to talk about their experiences and perspectives without overly structuring the conversation. The researcher should thus lead the subject to talk about certain themes, not towards certain opinions about the theme. The way these interviews were conducted was a combination of the two; some questions were generally asked in similar wording while follow up questions were mostly improvised.

Taylor et al. (2016) suggest starting the interview with open-ended descriptive questions without structuring what the responses should be. In order to achieve clarity in answers and avoid introducing biases the researcher should avoid leading questions, multiple questions in one and yes-and-no questions (Merriam and Ebrary, 2009). Leading questions reveal assumptions made by the researcher, which put pressure on the interviewee to answer favorably and share the researcher's point of view. "How do you use patents" is thus a bad way to phrase a question, as this puts forth the assumption that the interviewee uses patents in his or hers work, which may not be true. Further, questions should not contain multiple questions in one as this creates confusion regarding what question the interviewee actually answered, leading to interpretation issues. Yes-or-no questions should also typically be avoided when wanting to get rich, useful data. Rather, questions should be asked open-endedly. This tends to produce detailed and descriptive data. The goal should be to ask as few open-ended questions as possible and to influence the interviewee as little as possible. The researcher should listen rather than talk. While it was attempted to follow such an approach deviations happened owing to the fast and reactive nature of semi-structured interviews.

According to Taylor et al. (2016), at the outset of the interview the interviewer should focus on creating rapport and start with non-direct questions rather than directly approaching the topic of research. By asking structured or forced-choice questions too early the researcher risks putting the informant in a mind-set regarding what things would be right and wrong to say, making it hard to get to their real experiences. The beginning of the interview sets the tone and here the researcher should rather come across as someone who has not yet decided upon what questions will be most relevant, showing him or herself as being willing to learn from the participant about what questions will be most relevant to his or hers experiences. This was done by first asking the broadest questions not directly connected to the research subject and then approaching the subject of study. Thus the interviews began by asking about the interviewee's personal background and how they became a venture capitalist followed by what factors they look at when evaluating startups. If something was mentioned there that appertained patents, follow up questions would be created spontaneously to dig deeper into

the process. If nothing was mentioned about patents then the question would be asked about what the investor's general attitude was towards patents. More specific questions would then slowly be introduced. See appendix A for more information about the questions.

The interviewees also need to be informed and agree regarding how the collected data will be used and regarding confidentiality, anonymity, publication, the right to review the transcript and to be recorded (Gillham and Ebrary, 2005). All but one of the interviewees agreed to be recorded. The recorded interviews were transcribed while notes summarizing what had been said was taken when recording was not an option.

After having transcribed the interviews the next step was to begin analyzing the data. The analysis began by first codifying each transcript. Coding involves reviewing the transcripts and labeling component parts that are considered to be of potential theoretical significance (Bryman & Bell, 2003). Codes are convenient to use for labelling, separating, compiling and organizing data (Bryman & Bell, 2003) and that was how it was used in this study. The process used was to first label all quotes that were considered relevant to the study. These codes were then sorted into themes based on their similarity. The next step involved reading the quotes in each theme and summarizing the findings based on what the investors had said in that category. The themes that emerged from this analysis is what forms the basis for the headings used under 'findings'.

3.2. Participants

Data from this study was collected through interviews with 13 representatives for venture capitalists firms and 4 experts within intellectual property. One investor was stationed in the UK while the rest were around Silicon Valley, USA. At one firm two venture capital representatives were interviewed simultaneously. Most of the venture capitalists in our sample had backgrounds either as founders, early employees or advisors to startups before joining venture capital. All investor invested in tech with a majority predominantly investing in software and IT. The non-investors interviewed were two lawyers doing due diligence for venture capitalists, and two intellectual property strategists working with venture capital. Table 2, below, outlines the years of experience, background, investment focus and stage of investing for each of the interviewed venture capitalists. To preserve anonymity, the details have been obscured. After the table follows further descriptions of the investors interviewed.

Investor	Years of experience as venture capitalist	Background	Investment focus	Series
VC-1A, VC-1B	1-5	Tech, pharma, life sciences, startups	Tech, fin-tech, healthcare	Seed-D
VC-2	20-25	Financial	Software, tech	Seed
VC-3	15-20	Business school	B2B software	A & B
VC-4	10-15	Tech, business, startups	Software	Seed, A & B
VC-5	1-5	Engineering, finance	80% IT, 20 % tech	A
VC-6	5-10	Marketing, tech startups	Enterprise software	Seed
VC-7	5-10	Electrical engineering, startups	Software, tech	Seed & A
VC-8	15-20	Law, consulting, internet provider, startup	75 % IT enterprise, 25 % material science& consumer	Seed & A
VC-9	15-20	Business, software, startups	Everything	Seed
VC-10	10-15	Business, engineering, research, startup	Enterprise software, IT, semiconductors	A & B
VC-11	1-5	Finance, software startup	Consumer & enterprise software.	A-C
VC-12	1-5	Software, startup	Software	Seed & A

Table 2. A summary of the interviewed VCs

VC 1A, VC 1B

At this firm two representatives of a venture capital firm were interviewed simultaneously. Both had previous experience from startups and their background includes experience in industries such as law, life science, pharmaceutical and tech. The firm's investment focus is on cutting edge technologies with new markets and 60-70% of the portfolio consists of tech investments defined as "anything other than life sciences". The firm invests in all stages.

VC 2

This venture capitalist had invested in over 300 companies during his 20 plus years of experience. Before he became a venture capitalists he worked in the financial sector. The investment focus of the fund is predominantly on software but all tech is considered. The investment stage is generally seed, but series A and B also occurs.

VC 3

This investor reviewed about 200-300 companies a year and went directly into venture capital after graduating business school. He had over 15 years of experience within the field and his

area of expertise includes software and semiconductors. The firm only invests in B2B software enterprise companies in early to mid-stage.

VC 4

This venture capitalist had over 10 years of experience in the field and has an educational background in both engineering and business as well as experiences within startups. The fund invests in seed stage to series B and the investor focuses on enterprise and consumer software with a heavy angle towards mobile. The investor has exclusively done software investments.

VC 5

This venture capitalists has an educational background in electrical engineering, went from there to working for a hedge fund and later consulting until he ended up in venture capital. At the time of interviewing he had 6-7 months of experience working there and was involved in investments all over the spectra. The fund's investment focus lies in approximately 80% IT and 20% tech. They are series A investors and our interviewee reviewed about 10 startups and 10 pitches a week.

VC 6

After having worked for two startups this interviewee joined a venture capital firm in which he has worked for 5-10 years. He has an educational background from marketing and gained experience around patents when working for two tech startups. The fund invests primarily in enterprise software in seed stage. The investor reviews between 1000 to 2500 companies a year and out of those 5 to 10 gets funded.

VC 7

After graduating electrical engineering this interviewee started working with industrial research, became an advisor to startups and then went into venture capital. Since having joined venture capital he now has more than 5 years of experience in the field. The fund invests in "anything between semiconductors and digital content" but a dominant share of that is in software. The firm reviews about 500 startups a year and are early-stage investors.

VC 8

Since having joined venture capital this investor has amassed over 15 years of experience. His background includes law, consulting and working with a tech startup before founding his own company. The fund's investment focus is 75% in IT enterprise, both applications and infrastructure and 25% in material sciences and consumer. The fund invests in early stage and the investor personally reviews about 300-400 startups a year.

VC 9

This investor has a background from business and consulting and went from there to found two companies. After doing so he founded his own venture capital firm where he has worked for 15-20 years. The fund invests in seed stage and has no clear investment focus but rather invests anywhere and everywhere they may see potential.

VC 10

With a background in engineering and business this investor later went on to work within research. From there he went on to work for a tech startup and then joined venture capital where he has been for 10-15 years. The investment focus of the fund is on technology but the interviewee is primarily focused on enterprise software and IT, however, he has done some investments into semiconductor companies. The investment stage is series A or B.

VC 11

Originating from the financial sector and a tech startup this founder later joined venture capital. He has worked as a venture capitalist for a strategic fund for 1-5 years. The investment focus is on software, both consumer and enterprise. Over the last four years the fund has invested in about 30 startups and can invest in series A-C.

VC 12

Having a technical background within computer sciences and having founded two startups this investor, with 1-5 years of venture capital experience, primarily invests in software. He reviews about 5 to 30 startups per week.

4. Findings

This chapter consist of the empirical results. To illustrate the great heterogeneity among investors, quotes are included. Quotes are presented with "VC-X" where X is the investor's number under the methodology section, and "I" which means interviewer.

4.1. Venture Capitalist Criteria

Almost all VCs considered the three main factors presented in the literature review when evaluating an investment. These were: team, market potential and technology. Some investors also considered a fourth aspect; defensibility. However, it differed whether they viewed defensibility as strictly under the technology category or if it also affected the team and the market potential. In the coming sections it will be discussed under technology. No VC in our sample regarded patents or intellectual property as a main factor in the investment decision, it was usually regarded in the defensibility or technology factor. However, it could also affect the team and the other market factors.

Team came up as a factor in every interview and several investors considered it the most important factor. There are lots of factors that investors said influence the way they perceive the founders and most of them recurred throughout the interviews. The most commonly mentioned ones were personal interaction, background, references, and, if applicable, talking to customers of the startup. When talking about the three factors, VC-1A said that if the team was considered weak an investment would not happen, no matter how strong the other criteria were:

> *VC-1A: But I will tell you what surprised me witnessing how these decisions get made and companies are evaluated when they come through the door. You can have great technology and you can have a huge potential market, but if the team is weak we will not, we will not invest.*

This view was held by most VCs though the degree to which they held it differed. One investor stated that he thought that there was a greater emphasis on team in Silicon Valley than in other places. Furthermore, some investors stated that the team increased in importance the earlier the investment was.

Market was also mentioned as a main factor by all the interviewed VCs. This factor basically boiled down to if the customers craved a startup's product so much that they trusted the startup to supply it to them and if the market potential was large enough to support the amount of return that the VC wanted from a company. Some of the mentioned ways of estimating the market size were through market sizing exercises and talking to potential customers and industry experts.

Most of the investors mentioned technology as one of the main factors. A recurring theme was that the VCs wanted a differentiated core technology with some form of defensibility, or sustainable competitive advantage. Differentiated core technology basically meant that there was unique and novel technology incorporated as an important part in the main product of the startup. The defensibility could take several different forms such as network effects, intellectual property, a rare skillset of the team, or speed of innovation.

The investors that did not talk about technology were mainly investing in the seed stage and most of them predominantly in software. This could explain their lack of focus on technology since it was not certain that a team had completed their technology by seed stage, nor is it certain that the technology is as clear of a differentiator in software, especially so in consumer

software. However, even the ones that did not consider it a main factor talked about both technology and defensibility as criteria. Figure 2, found below, illustrates the different criteria and how patents relate to these.

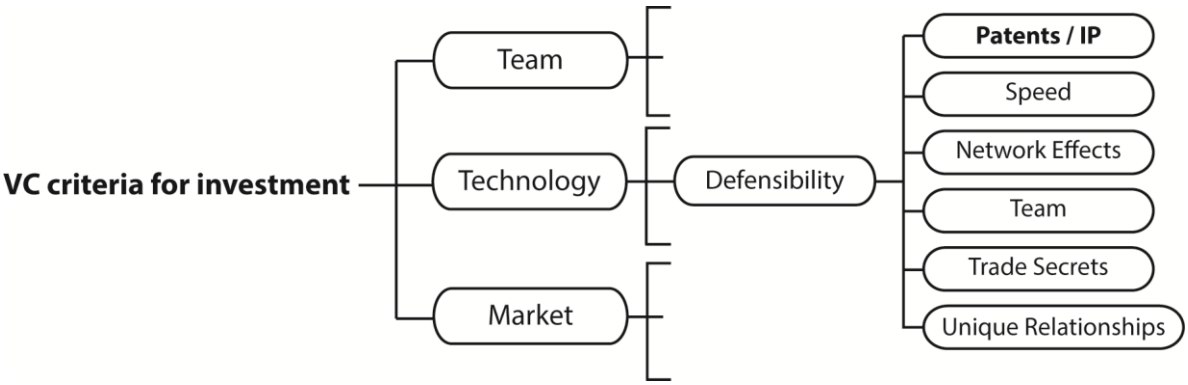

Figure 2. An illustration of patents' role in the VC criteria for investment.[1]

[1] These defensibility methods have previously been discussed in appropriability literature, c.f. Holgersson (2013) for a review of that literature stream.

4.2. Investors' Outlook on Patents

The following sections presents in what cases the venture capitalists come in contact with patents, their attitude towards patents, how they view the signaling of patents and which factors that make patents more important.

4.2.1. Circumstances around startups and patents

This part deals with in what cases startups have patents when approaching venture capitalists. It is provided to highlight the context in which the investors of this study were making investment decisions.

Startups did frequently not have granted or even pending patents when they approached investors. The investors stated different reasons for this, but the most common one was that they invested in the startups so early that they had not filed yet. VC-6, a seed stage investor, said the following about the lack of filed or granted patents:

> *VC-6: Often times, because we're the first institutional money in, people may not have filed yet. They may be waiting for their A round to actually file. We just want, we're more interested in the - "Ok, if you were to write a patent on this, what do you think your claims would be?" It's a way to do technical due diligence.*

However, it differed between startups and sometimes the investors would fund "three guys and 10 slides of PowerPoint" while at other times the startup would already have filed a dozen of provisional patents. Further, many investors considered patents something which will naturally happen down the road and some have hypothesized that it is something which becomes more important in later stage investing. VC-1A stated that he thought that because the patent process in the U.S. has become so burdensome and you have to publicly disclose the patent, founders are increasingly choosing to only patent a few things and use the trade secret route instead.

Some investors experienced that a majority of the startups that approached them had pending or granted patents. When asked about how many startups had patents when approaching him, VC-8 said that around two thirds of the startups had patents which they usually had filed when they incorporated:

> *VC-8: Maybe two thirds. [...] And we're series A investors too, so usually what happens is these founders typically will incorporate and file IP right away. So they do it, but it's only one or two patents so it's not huge portfolio stuff. But just enough to cover the basic idea.*

When asked the same question, VC-10 said that somewhere around 80% of the startups that approached him had filed for patents with fewer having a granted one.

4.2.2. Investors' attitude towards patents

The following section deals with investors' attitudes towards patents. It begins with outlining the commonalities and then goes into specific differences between investors. After follows a sub-section dealing with when patents can be considered negative.

The investors' general attitude towards patents varied greatly between individuals. On one end of the spectra were the investors who considered patents to almost always be irrelevant and on the other end those who would value and evaluate it to a great extent. However, a commonality among all was that patents were not considered a main factor or something which alone served as the basis for the investment decision, rather, they were considered one

bit of a bigger puzzle. This is both because patents were not considered to be what builds a startup into a big business and because a small company cannot protect itself against larger companies by using patents. Instead, what builds a big business was considered to be a great team attacking a big problem with a great solution:

> *VC-6: I wouldn't, again, if I'm an entrepreneur the first thing I want to know is I'm attacking a really severe pain point in a really big market. And a market that is screaming for pain relief, ok? That's the kind of market I want to go sell to. And if I got something novel there, well of course I'm going to go and patent it, but that was, notice I said really big pain point, really big market and they're screaming for relief - those three things are vastly more important in the investment decision than "Is there something patentable here?".*

However, in some cases patents could play a big role in the decision process and impact the main factors investors considered in such a way as to greatly impact the investment decision. One such role patents can play is to be beneficial to a potential acquirer such as a big company. Patents can then bring up the price, secure the deal or make the deal happen in the first place. Another example is if the patents are necessary to have a defensible market:

> *VC-12: So the patent may not be that valuable on its own. But if that's a necessary stepping stone to having a defensible market which has like 3 billion in annual sales for a diabetes drug then it's really valuable as part of the company. Right?*

In a similar fashion, VC-2 stated that patents are mainly important when investing into new areas where core IP can be developed which will then lead to a defensible market. When asked about his general attitude he answered:

> *VC-2: Generally, indifferent. Not, if there is a brand new area with core IP being developed, and that would be typically around hardware or typically around semi-conductor, then I'm a little more interested. If it's software patents I consider it to be a waste of time.*

A common view shared by many investors is that patents owned by startups were almost exclusively considered to be positive and would only be considered negative if done to the extreme or in a bad way. As such they served as bonus points or something which was "nice to have". However, the absence of patents would usually not be considered negative:

> *VC-3: So the question of patents is basically like bonus points. Having patents can give bonus points to the startup, but the lack of patents will not subtract from the investment. It will just not give bonus points.*

As discussed in 4.2.1 Circumstances around startups and patents, some investors did not consider the patents necessary to have yet due to the early stage of investment. Especially in seed stage, companies were not expected to have filed patents yet. In some cases investors would therefore be more interested in the patentability and that the technology could be patented further down the road.

Furthermore, when asked how they evaluated the team VC-11 stated the he thought that if the founders had previously filed relevant patent this was a sign of quality:

> *VC-11: So when we evaluate the team, yeah I would say. So when you look at sort of the CTO or the technical guys behind a lot of these companies, you know I think their qualifications, whether they have a PhD and whether they've been CTO at other tech firms is very important. But if they have interesting patents, you know you see a lot of them put it on their LinkedIn profiles, you know we'll look at that as a reflection of*

their quality, right. So it's not about the patents themselves, it's like "This guy actually creates real patents" but once again, it's in the context of those patents, right.

4.2.2.1. When patents are considered negative

As previously mentioned, patents in themselves would seldom be considered something negative. However, if founders patented to the extreme or in illogical ways some venture capitalists considered it a negative signal regarding the founders:

> *I: So it's not about the patents, it's about their thinking about keeping it defensible then?*
>
> *VC: Yeah, about building a big business. If they're just putting random patents on stupid shit then you get annoyed. That's a waste of their time, it's a waste of my time by looking at it and that's not building a business.*

This scenario seemed to be something that was very rarely encountered though.

When VC-11 was asked about if he thought startups patented just to show the investors that they had patents, he replied that he would consider such behavior overcompensating and that only having patents without traction is a bad signal from a company. The same investor considered someone filing random patents a negative signal:

> *VC-11: I mean if you're creating patents just for the heck of creating patents and we do know people that are not even technical that have a lot of patents and it's just like, it's kind of a red flag from our perspective. So, this guy doesn't have a computer science degree but he's creating [...] a bunch of software patents, it doesn't really add up in our perspective. So it's like, he's probably just [a] patent troll or [has] other ulterior motives.*

VC-7, who had some previous experience with patents, showed a high level of sophistication when it came to evaluating patents and would regard some patents as bad in themselves. However, such considerations seemed rare among investors. The following quote shows how he could consider patents negative if they were impossible to enforce or if they only protected one use scenario:

> *VC-7: So one example of that is people who file patent, you know some people say we did this, and then we drew it here, and have a very clear idea about what they are doing and all that. Whilst others submit patents, so one example is that you can have something that's complicated and the worse scenario is by explaining in the patent you only protect one use scenario where there is ten others that are obvious once you use that. And not only is it easy to go around but seeing your description somebody can implement it and it would be impossible if you look at the system from the outside [to see] whether it's been used or not. So the only thing you have accomplished by patenting is publishing your thinking and you have no means of actually checking whether somebody has actually used your invention, right? That's the most stupid patent you can ever submit.*
>
> *I: Have you seen those?*
>
> *VC-7: I've seen both, I haven't seen a worst case with both dimensions. Where you both have easy to go around and difficult to evaluate. But I've seen both separately but not both in the same mess-up.*

4.2.3. Signaling of patents

This section presents what investors gain from simply knowing that a startup has patents and if patents serve as signaling to investors, which previous research has hypothesized about.

Simply knowing that a startup has patents appeared to serve as a signal to some investors. However, according to the investors who thought that patents served as a signal, the signal was not a strong one:

> *VC-10: I have funded companies that have lots of patents and haven't done well and I've funded companies that have not that many patents that have done great so it's not necessarily, it's not a strong signal it's more of a preference, I think.*
>
> *I: Okay, but do you consider it a signal then, patents?*
>
> *VC-10: Yeah, again, we consider it a signal in the sense that the team is recognizing they are building innovative things that they want to protect.*

The signals they said that it served though, was that the startup had something; that there were building blocks, that the startup believed they were building something fundamental. VC-10 also said that it showed him that the founders definitely were technologists.

Some investors stated the belief that quality entrepreneurs tended to patent. This could mean that patents serve as a positive signal which speaks in favor of the entrepreneurs. Others thought that patents was of little signaling value unless they were evaluated:

> *I: Knowing very little else about a startup, what does the presence of a patent or a pending patent say to you?*
>
> *VC-12: It shows me that they've done some work. They've thought about it. That they have something. It doesn't really tell me about the value of that something. It's something that they did that they put a lock around. You know, that's all. It could be really valuable, it could be you know meaningless. To your point earlier, I think there is a little bit of signaling, like at least the founders were smart enough to create something and put a lock around it. Of course it remains to be asked like what is that something. But it shows work. They are at least strategic enough to think about locking it up. That's all.*

Other investors, often the ones less interested in patents, would not consider them to have any signaling value at all. VC-8, one of the investors that evaluated patents more than most, did not consider patents to have any signaling value:

> *I: So if you know very little else about a startup, but you know they have patents, what does that mean to you?*
>
> *VC: Nothing.*
>
> *I: Nothing, okay.*
>
> *VC: No.*

Because some startups only file for patents to show investors that they have done so, the venture capitalists considered patents less telling, which thus increased the need for evaluation. VC-9 said that he thinks that a patent is rarely the basis of competitive advantage and that he does not consider pending patents to have signaling value because so many entrepreneurs file only to say that they did. When asked what knowing that a startup had patents meant to the investor, he answered the following:

VC-9: It's a throwaway line, it's the way we generally think of it. I mean because every entrepreneur says that "we have a patent pending process for bla bla bla". Yeah, I mean, and so. It's generally a waste of pixels...

[...]

I: So do your patent guys look at pending patents?

VC-9: Yeah, I mean depending on how core it is. If we think that is the basis of their competitive advantage we will spend our time on it. But rarely is the patent the basis.

I: Yeah, right.

VC-9: Frequently, for whatever reason they file the patent just because they want to say they did. And so frequently it's not really that compelling.

4.2.4. Factors affecting the importance of patents

To paraphrase one of the investors, intellectual property rights are critical in certain places and in others they do not matter. This section deals with the circumstances around when patents are important or inconsequential according to investors.

Something which all investors have agreed upon is that the importance of patents varied widely between different sectors. The consensus was that “the harder the science”, the more important patents became. Examples of such industries are life sciences, pharmaceutical, material sciences and semiconductors. On the other end of the spectrum is the software sector, frequently mentioned as one where patents are considered less important. Here, other defensibility methods seemed more popular such as network effects, trade secrets, speed and so forth, especially so on the consumer side. For example, some apps are all about usability, design and business model distribution rather than technology. In such scenarios patents would not be of much or any interest. When asked about when patents were more or less important VC-6 said that it depended on the sector and that in the life science you have to have patents, in computer networking and such it is a good idea while if you are doing ‘clever stuff’ in software it is not certain:

VC-6: Well it would, as I said at the very beginning it would vary by, as a function of, the business the startup was in, right. So if somebody's doing something in the life sciences patents are absolutely essential. If you're doing something in computer networking or storage hardware or things like that, it's probably a really good idea to have patents. If you're doing some clever stuff in software, well you know in that case, particularly if you're not open sourcing your code, you have a decision to make- you could go trade secret, right. Or you could patent the damn thing, in which case you put it out in the open but you got, you know your requisite number of years of protection once the patent is granted. It just varies on the nature of the business and the nature of the startup secret sauce.

VC-7 considered the importance of patents to follow basically the same path as VC-6. Furthermore, he also stated that patents were important when the invention both has high value and is easy to copy:

VC-7: General attitude [to patents] is that it depends a whole lot on what it is. So I think if you start by the most extreme case which is an area where we don't invest but let’s say if you look at the pharmaceutical industry. If you don't have a patent you don't have a business, simple as that. You can just forget it, it's too expensive and you have to have a defensibility. Because it's so easy to copy, it's just doing a chemical analysis and you know what to do. And if you don't protect that, A it is high value, B it

is simple to copy. It just undermines the whole business, so the other end of the spectrum which is within our investment area, it's a consumer online service on mobile service. Generally technology is easily available, it's about the value proposition and the user experience, it has nothing to do with patent at all. So, it's all about speed and network effects and what not, and other things that.

There were also investors who considered patents to be valuable even within software, and especially on the enterprise side. Still, it is acknowledged that it is much harder to get good patents in software than in hardware. One reason for that is because the field is so cluttered with patents. Further, the patents are also considered to be hard to enforce, even if you were to detect infringement, which is also difficult. Many investors have mentioned patents as potentially being valuable in new technological fields which explains why even within software they can be useful. In new technological pockets almost no patents have been filed yet which is why there is potential to claim great technological space with broad patents. In such a scenario, all of those who want to enter that area would have to license the technology or use the company's product. VC-2 was of the opinion that patents were only valuable if they were in new and emerging non-software markets:

VC-2: I think that the value of these patents are in new and emerging non-software markets, right? So technology but non-software and new and emerging. That's where patents have value, and then it is worthwhile spending some time looking at them, otherwise it is not worthwhile.

VC-4 thought that IP could be important in software as well if in a new space such as AI and machine learning:

VC-4: AI and machine learning is going to be hyper-important in computing. If you have some really good IP in the space and you patented it, well every single player can't operate without having a piece of this IP. They need to license this IP or whatever.

If a company were to infringe on a startups' patents the startup could file a lawsuit. However, in general, patents are considered by investors to only serve for defensive purpose and are almost never used offensively. This is both because startups cannot compete against big firms' resources regarding both the time and money which is required for a patent lawsuit and because investors do not want to use their limited partners' money to fund lawsuits. Here is a quote from VC-10 where he explains how patents are a defensive mechanism rather than an offensive mechanism and that he thinks of it as more of a speed bump than a complete stop for the competition:

I: Yeah, okay, so what is your attitude towards patents?

VC-10: I think they are important as a defensive mechanism. So you want to have some stuff that is hard to, that you can create some barriers to others but little companies really can't be offensive with patents because the big companies have huge patent trolls. So you can't go after HP or Apple or somebody but you can sort of protect yourself a bit, particularly against other startups to sort of create a bit of a moat so that you can defend your area. But it basically, the way I see it, do you know the concept of a speedbump on a road? It just sorts of slows down the competition, it doesn't stop it. So it just provides a little bit of protection but you still have to move really fast.

VC-6 also considered patents to mostly be for defensive purposes and thought that you should only patent up until a certain point and beyond that there is no marginal return at all:

I: So more specifically towards patents then, what is your general attitude towards patents when looking at an investment?

VC-6: We really like to see differentiable technology and so that usually will cause a patent to be filed. But, again, it's kind of like taking vitamin C, right - it's really good for you up to a certain point and after that all the body does is piss the excess vitamin C away. [...] It's one of this satisficing things, you have to do something enough, but then if you do it anymore past that there is no marginal return whatsoever. So patents need to be there from a defensive point of view but you don't want people spending tons of time on writing patents or lots of money with attorneys filing that sort of thing.

Two investors discussed the case of components that goes into other products, called embedded products, and whereas one had experienced such business as prone to failure because of the lack of offensive power from startups, the other investor considered the area to work well if the patents are in a new technological area. This investor, VC-7, elaborated how in a clear field where there are no adjacent patents, even startups can use their patents offensively. That is because when there is a good chance of winning the lawsuit the startup can partner up with a law firm which will do the case for a stake in the litigation. If there was a lack of freedom to operate, a risk of countersuit, or if they were operating in a cluttered field this would lead to smaller odds of winning the case which decreases the chance of a law firm accepting such a proposition.

Some investors have also mentioned that patents may become important if the exit is through acquisition by a big company. In such cases the IP portfolio may have great value and enable the deal to go through. VC-7 was of this view, stating that patents may bring up the price or make the deal happen in an exit to a big company:

VC-7: However, when you are going to sell the company, the patents have clear value to the buyer being a big company. If it's a good patent it has value. So I'm not saying don't do it because in that scenario it might very well help bring up the price or sure up the deal or make the deal happen in the first place.

VC-4 said that the acquirers may be interested in that the startups have patents but that the value of that IP is not explicitly stated. Rather, it is taken into account together with the rest of the business.

VC-4: I mean again on a scale of importance, most of these patents aren't really that important. A few of the harder tech companies that I've looked at, we're talking about powering, suppliers, space stations. They have some really deep technology in there, the patent side of it is more important for us, because when funding the company on, the acquirers make sure that they are building their patent portfolio but again, when I value a business and when the acquirers value a business, there is not a line that says, "Oh, and the IP is worth 400 million". It is still driven by revenue multiples, EBITDA multiples etc.

4.3. Evaluation of Patents

This section outlines how investors evaluate and use patents when making investment decisions. It starts with how VCs discuss patents with founders followed by how they internally and externally review patents. This is then followed by a section regarding the outcomes from these processes, i.e. what knowledge the investors gain from evaluating patents and IP strategy.

The general evaluation process of patents started with a discussion with the founders concerning what patents the startup had and their importance to the business. If the patents were considered important the VCs could do an internal and or an external evaluation of the patents before the term sheet was signed. The internal evaluation is defined as the VC reading through and evaluating the patents themselves. The external evaluation is defined as other people than the VC evaluating the patents. The patents were almost always looked at by lawyers in the due diligence after the term sheet had been signed whether the patents were considered important or not. This general process is illustrated in figure 3 below and is expanded upon in the following sections.

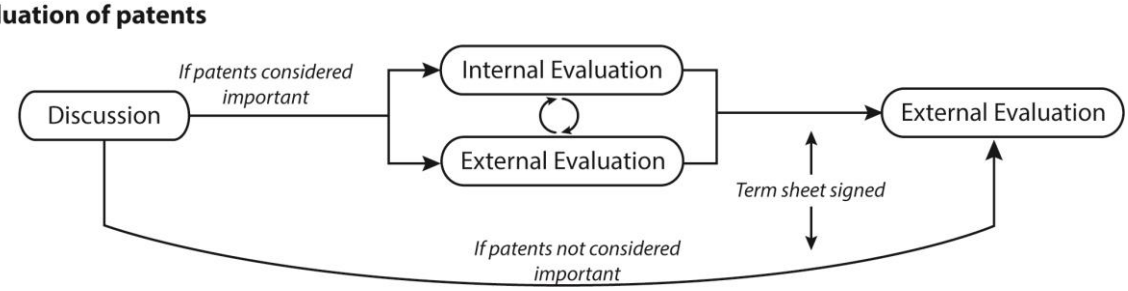

Figure 3. The general patent evaluation process

4.3.1. Discussion about patents with startups

The following is a presentation of the discussion venture capitalists have with the founders regarding their IP strategy and patents.

As discussed in 4.1 Venture Capitalist Criteria most VCs would evaluate how defensible a startup or a certain technology was, and part of that evaluation was through discussions with the founders. Often, a part of that discussion was about the intellectual property of the startup, such as patents, and the intellectual property strategy. When intellectual property was brought up, if it even was brought up, differed between investors and investments. One investor said that it was expected that IP was brought up in the first slide deck in a pitch meeting and that if it was not he would ask why:

> *I: Okay, and is that [patents] something that comes up in a discussion with founders then?*
>
> *VC-10: Yeah, sort of. You know, usually I expect in the first deck would I see, the slide deck that I see that there would be some discussion about the IP. If there is not, then I say why not? [...]*
>
> *I: And what does that discussion [about patents with the founders] usually lead to? [...]*
>
> *VC-10: Yeah, so either they haven't thought about it, or they have. If they have then we can dig into how have they thought about it and have they filed. And if they haven't*

thought about it, why not? Do they believe there is nothing protectable here so it's a first-mover only or do they believe, or are they just not attuned to the concept of IP?

Another investor said that if someone brought up IP he would tell them not to talk about it because he considered it a waste of time:

I: So will you discuss the IP strategy with founders?

VC-2: No, not even worth it.

I: Not a word about it?

VC-2: I mean, if somebody brings it up, I will tell them not to talk about it. It's like, it's a waste of everybody's time. Execution, it's all about execution.

Other VCs had a set point when they would talk about it, for example half a day dedicated to technology where IP was a sub-category, and others would discuss it when, and if, it seemed appropriate. Thus, it seems as if most investors may talk about intellectual property at some point in the process. However, as illustrated, it was hard to pinpoint a theme regarding when that discussion happened. A commonality was that the ones that placed less emphasis on intellectual property all had an investment focus on software though that is not to say that none of the investors with a software focus cared about intellectual property.

If there was a discussion about the intellectual property, the content and depth of the discussion varied significantly from investor to investor and investment to investment. Some would only ask the founders if they had patents and what the patents covered and that would basically be it. Other investors would have more in-depth discussions about patents, asking about the claims and the strength of them, when they were filed, which countries were covered, who filed the patents, the IP strategy, what the competitors had filings on and so forth. This could include discussions with the founders, the team and the person who filed the patent. VC-8 was one of the investors with a more structured approach to when he talked about patents and what that discussion consisted of. When asked about when the discussion usually came up:

VC-8: Maybe the third or fourth meeting. Usually I do a deep dive on the technology, which is probably half a day. And in there it's one of the topics to be discussed.

I: So what sorts of questions do you ask them?

VC-8: On the IP side?

I: Yeah, what does that discussion sound like?

VC-8: Understanding exactly the content of their patents...

I: Like claims?

VC-8: The claims, who wrote it, what other experiences that particular patent attorney or whoever wrote it has in that space,

I: So you do a little bit of a background check?

VC-8: A little bit of a background check. And that's pretty much it.

VC-12 would discuss patents when it came up naturally and thought of patents as one of many alternatives for defensibility. When asked about when the discussion comes up and what it sounds like he said the following:

VC-12: At any stage. Whenever it comes up in conversation. So yesterday we met a founder for the first time, they were telling us about a piece of hardware they are

working on and as part of the conversation was just "What's defensible here, what's stopping a company from China from commoditizing this and selling it for half the price, and using their supply-chain to undercut you?" And it's fine to ask that. [...] The thinking is rarely around IP and patents as a separate branch of the business but more so just holistically looking at the business. How can you create and capture value in the long-term. And as part of that the conversation tends to flow to what's defensible, and what's defensible changes from trade secret to data to networks to platforms to IP to patents to all that type of stuff. But on a context-to-context case. It differs.

A commonality seemed to be that the more exposure an investor had had to patents previously, the more emphasis the investor would place on the patent discussion. As discussed in 4.2.4 Factors affecting the importance of patents, the significance of patents vary between different sectors. Therefore investors would place more emphasis on the patent discussion if the company was in an industry where patents are considered more important to the startup, which mostly was in hardware.

4.3.2. Internal evaluation of patents

This section outlines the internal process investors have for reviewing patents.

In addition to discussing patents with founders some investors also had an internal process for reviewing patents. The investors may then read the patents themselves and review the patent attorney who filed the patent. However, this was quite uncommon, with only three investors (VC-5, VC-7 and VC-8) that would somewhat regularly read patents and about half of the investors having ever read a patent. When the investors read patents it was to get information such as what the patent covered, how broad it was and to get an insight into the founders' thinking. Out of the three who regularly looked at patents, two had engineering degrees and one had a law degree. All three of them were mainly software investors though they did invest in hardware as well. It was only two of the investors that regularly read patents that might also personally contact the patent attorney or do a background check on them. When asked about if he had read the patent himself and what he got from that, VC-7 answered the following:

I: So did you look into the patents yourself as well, like read the claims? Or did someone from your team do it? Or was it only a discussion?

VC-7: I think, it was a few years ago since we did the first investment [into the company in the example] so I can't really remember what we did but I have on multiple occasions read the claims myself.

I: Okay, you do that then. And that is just to get a grip of what the patents cover, or?

VC-7: Yeah, but I think it sort of gives a pretty good idea as to the number of claims and sub-claims and how they are structured gives a pretty good idea about is this a pretty broad patent or is it a very sort of a narrow and very specific scenario where it's easy to find many other scenarios that doesn't look similar, right? So just the structure of the claims give an idea as to how broad or not it is and sort of an understanding of what you are protecting.

While VC-5, as well as other investors at his firm, would read the patents, he said that it was in a minority of the investments because not all of them have patents or they would only have provisional patents. When asked about if it is common that he and other people at his firm look into the patents he answered:

VC-5: It's part of the diligence process if it's necessary, I don't think we look at the patent, like the IP stuff, to be honest like that much. Over all. It comes up in a few of our cases but not, I'd say more in the minority of them. Just because at the early stage, I don't know, they've either issued a provisional patent or they don't have a patent yet. I can see it coming up more for later stage investments to be honest. So I mean it is, it's not only me that would do it, we would do it. But it's definitely not a big part of every investment. For a few of them it is.

All of the investors who looked at patents personally would also bring in external help, such as lawyers or someone with expertise around patents, at some point in the investment process. The investors that did not read through patents had different reasons for it. Reasons that were provided included the investor not feeling qualified to assess the patents, the startups rarely having patents because of the investor investing in the seed stage, or simply thinking that the time is better spent elsewhere. When asked about if he looked at patents personally VC-10 answered:

VC: I've never looked at patents, but I've had other people do it for me. I don't feel qualified so I will ask somebody who I think is more qualified than me to do it. Whether that be a lawyer or a scientist or somebody.

VC-9 considered patent summaries provided by external assistance to be enough information. When asked about his process of looking at patents he said the following:

J: Can you expand then upon the process of looking at that patent?

B: Can I expand of the process of looking at the patent... I have people! [laughter] To be honest, I don't read patents. I read patent summaries.

J: So you outsource it somebody else?

B: Yes.

Conclusively, most investors did not read through patents but rather relied on the discussion with founders or external help to gain an understanding of the patents and the IP. The process for this external review will be discussed in the following section.

4.3.3. External evaluation of patents

This section outlines the process investors use when getting external opinions on the patents and IP of startups'.

Most investors did at some point in the investment process have external assistance that would review the startup's patents, if the startup had any. External assistance in this case is defined as anyone who was not the investor himself, i.e. even other people inside the VC fund. At what point and who that external assistance was varied between different investors and investments. The most common case was that investors only brought in external assistance in the form of legal advisors or patent attorneys after the term sheet had been signed. In these cases the investors would mostly bring in the external assistance to confirm that the assumptions about the patents that the investors had been working with based on the discussion with the founders were true. One such example was VC-12 who would evaluate the patents by discussing them with the founders and then have legal counsel double check it towards the end of the investment. When asked about how he evaluated the patents he answered the following:

VC-12: It's talking to the founders [to evaluate the patents]. We have legal counsel. We send them like patents. We'll have them double check it and bet it. But again that's

really like… That type of stuff comes at the very end. You know it comes even after like a negotiation and the term sheet. So once you and I have agreed - OK I will invest 3 million for X percent of your company, then I'll take like your patents and your IP and pass them to my lawyers and say "Here is what they claim. Like these pieces of IP protect them. Here's what I need for these things to do for me to feel comfortable around long term value capture. Can you make sure?" It's more so double checking their story. It's less so trying to put value around the particular patents.

In other cases the investor asked industry experts or patent attorneys to analyze the patents as part of the investment decision, usually before the term sheet had been signed. VC-5, who sometimes read patents himself, would always bring in lawyers towards the end of the investment to go through legal things and patents and if it was complicated he would also bring in people from the industry such as CIOs or CEOs to gain insight:

I: Okay, do you sometimes get in some external counsel on IP and have an FTO?

VC-5: So, we do due diligence. We will hire lawyers to do due diligence when we are doing an investment and they will dig through all that stuff. So we will get help.

I: At what part is that during the investment process?

VC-5: That's towards the end actually, so we involve the lawyers towards the end of the process, also if it's a pretty complicated topic then we'll involve, so the lawyers will always come in at the end but if it's a pretty complicated process we'll reach out to our contacts and talk to like CIOs or CEOs or something to get a better perspective on some of the ideas and some of the patents.

One investor, VC-10, had a person at the VC firm who he would always bring the technology and patents to in order to get his opinion:

I: Okay, so in what cases will you do that [bring in external assistance] versus not do that?

VC-10: I always say that if there are patents I will go to our technology guy and get his sense in all cases.

[...]

I: And in what stage would that be? Of the investment evaluation?

VC-10: Somewhere before investment. It varies. You know, I'm trying to get comfortable with team, technology, and market and you know, I'm counting on him to help me assess the technology risk and I'm counting on me to assess the market and team risk.

Example of information that might be gotten from external counsel is the strength of the patents, how broad or narrow the patents are, the patent landscape and the importance of the patents to the startup. VC-9, who does not read patents but gets patent summaries said the following about what they get back:

VC-9: Whether it's strong or weak, whether it's broad or narrow, what the field is around that in terms of adjacent patents or you know. And some degree of this. We don't demand a freedom to operate search from all of our companies. I mean, after talking to a bunch of people about that it just... It's just a rat's nest. You can just totally get bogged down and it's not clear.

VC-10 said that they would sometimes get an FTO if the space was cluttered and they considered the ability to operate crucial to the company's viability. When asked about if they do FTOs, VC-10 answered the following:

> *VC-10: Sometimes, it depends on the space and how sort of cluttered we think it is with IP.*
>
> *I: Yeah, and in what cases would you do that then? Because they are quite expensive, the FTO?*
>
> *VC-10: Yeah, it would be a place where we were convinced that the company's viability was dependent on its ability to operate. So if we sort of said, okay, we can't... So if we don't believe that your IP is free and clear we think that is going to kill you as a company. We have to be able to be convinced that you are clear to operate. It's rarely in software that that's the case.*

However, doing a full FTO seemed quite rare. There was only one more investor who said that they would do it, VC-1B, and that was only for bio-based startups.

4.3.4. IP and Patents as Proxy

This section presents the ways in which patents were found to be used as a proxy for the main criteria in the investment process.

When investors evaluated patents and intellectual property, two different ways patents could be used as a proxy were found: to judge quality of the team and to assess technology differentiation. However, it was only some investors that mentioned IP as a way to judge the quality of the team and only a single investor that talked about IP as a proxy for technology differentiation. Most of the investors that talked about either of these evaluated patents and intellectual property more thoroughly than the other investors.

4.3.4.1. IP and patents to judge quality of team

Some investors used the discussions and reviews of patents to judge the startup team and their thinking. Below are quotes from three investors that all stated that the patents or the discussion about patents and intellectual property with the founders would influence their thinking of the founders. In addition to these quotes another investor who was not recorded, VC-3, stated that a way to know that the founders were good was if they had previously patented. He did not read the patents though.

The following investor, VC-2, said that while looking at patents may not give him much insight into how important the patents will be in the future because he does not think it is possible to know that, it gives him the possibility to gain an insight into the thought process of the founders and that they are able to draft good patents. This will in turn increase the likelihood that some of the patents are useful in the future. When asked about what he got from looking at patents he answered the following:

> *VC-2: Just an insight on the thought process of these founders. Again it is more a reflection on these founders because I cannot, let's say a company has 10 patents. I can read all the patent filings but you know, how do I know whether 5 years from now this one patent is going to be the one that the whole thing hangs on. I don't know that. But what I do know, again, if it is indicative of the mindset and thought process of the technical founders to be able to craft the patent in a way that give them maximum flexibility and enforceability then it's again, it gives me enough comfort to say that, okay they will file other patents in the future so that once I have a portfolio, that some sub-set of those are going to have value.*

VC-10 stated that the firm would look at the patents if the company had any because it, among others, helped them analyze the way the technical team was thinking. Further, he also said that it shows how the team is thinking about building the company in the long term:

> *I: Okay so it [patents] will not [only] be a sub-category for the technology but also for the team then?*
>
> *VC-10: Yeah it's also, you know, how does the team think about sort of building the company for the long term.*
>
> *[...]*
>
> *I: There's also some people that say that they don't bother with patents at all basically.*
>
> *VC-10: No, and we do. I mean if there's something there we'll look at it. It also helps us analyze the way the technical team is thinking. And I mean, some guys will say,*

look we are building a better version of this software product, there's nothing we can patent. Okay, do we think you can build a better version of it? That's the question.

This investor, VC-12 said that if the founders had patented useless things he may think worse of them. Moreover, lack of thinking about intellectual property and patents could also raise red flags about the founders strategical thinking, not because of the lack of patents per se but rather because it shows a lack of thinking about the long term. When asked if he also used the conversation to judge the founders he said the following:

VC-12: Oh yeah. So definitely. Like if they haven't put any thought into it - then it's worrisome. And it's worrisome not in terms of like "Oh my god they don't have any patents lawyers or they don't know how to write like a patent prospectus or they don't know how these things are done", like I could care less about that. It's worrisome in that they don't think about, strategically how to build a company that is going to maintain long term value. And that in itself is worrisome.

I: So it's not about the patents, it's about their thinking about keeping it defensible then.

VC-12: Yeah, about building a big business. If they're just putting random patents on stupid shit then you get annoyed. That's a waste of their time, it's a waste of my time by looking at it and that's not building a business.

4.3.4.2. IP and patents as a proxy for technology differentiation

VC-8, who regularly discussed patents with the founders and read patents himself, as well as often bringing in external assistance towards the end of an investment, said that he read patents because they helped him figure out who the competition is and what makes the startup's technology unique. Further, the discussion with the founders about the patents helped him understand the depth of the founders' understanding of the technology and how differentiated the technology was:

I: And what do you usually find doing that [reading the patents]? Just trying to understand the technology or also the strength of the patents?

VC-8: So I'm not a lawyer, so it's more just trying to understand the technology and the space that they're operating in, it helps me kind of frame who the competition is and what the uniqueness is of their technology. [...]

I: So what do you get from that discussion [with the founders], and what questions would you ask?

VC-8: You know when I ask those questions it's typically a test of understanding how deep the founders are in their technology. So it's less a questions of claim validation and more a question of - do they really understand what they're building, do they have a good grasp on it, do they have a good grasp on what other people are building in the same space, what's unique about it and what's so hard about it, that's typically what I'm looking for. So it's a proxy for technology differentiation.

4.4. Venture Capitalists' opinions regarding correlation

In the end of the interviews the reason for this study and the research found in the literature review was sometimes explained to investors. This was done in order to get their own theories regarding why there was a correlation between patenting and funding. Sometimes these theories also arose spontaneously without specifically asking the VCs. This section deals with what VCs themselves believed about the correlation between patenting and funding.

As previously discussed all investors considered the importance of patents to be sector dependent and less important in software. Some VCs believed that the discussed correlation originated from the fact that investments used to be a lot more hardware focused earlier. Furthermore, these VCs believed that the shift towards software investments may have diminished any such correlation:

> *VC: I would say that, you know, if you do research, if you look at venture backed companies before 2000, I bet over half of them were hardware-ish. I mean, and there was some IP that was very clear. In some sort of way they designed the hardware, some algorithm, something. And so in the hardware side, patents are pretty important. As you said earlier, on the software side it's harder to find defensible patents and figure out if people are infringing and so... And then if you go to the next step which is sort of the internet services side like Airbnb etc. It's really hard to patent that stuff, so I would say that if you look at historical data there's been a lot of correlation between funding and patents but it depends on what time of, what horizon you are looking at. I would argue that if you look over the last ten years it's a lot less correlated than it was the previous 15 years.*

Another speculation from some VCs was that quality entrepreneurs tended to patent more which could explain the observed correlation. The following investor, VC-7, stated that the share of companies with patents was higher among the startups that he invested in than the startups that approached him. This was explained by that a lot of the startups that approached him were of really low quality and these tended not to have patents:

> *I: So then a higher percentage of your portfolio has it [patents] than the ones that you review?*
>
> *VC: Yeah.*
>
> *I: What is the reason for that you think? Is it just random or do you want patents like that?*
>
> *VC: So, the reality as a VC you get a lot of strange stuff through the door, right? So if you say 500, you know 250 of them are not even close. So these are 10 min or 5 min evaluation.*
>
> *I: It's a no?*
>
> *VC: Yeah. So, so that means you get a lot of strange stuff, sort of idea based, or somebody who's hacked up something or other. And it's not really a quality deal flow, it's about half of it that is. Whereas if you come, the people who come with patents are generally from sort of, research based backgrounds or sort of, at least from proper industrial R&D types of environments, right? And it's just not that much deal flow, I mean, people there don't show up to VCs with shit ideas right? And certainly haven't spent the money to... I mean the guys who come with shit ideas, you know back on napkin stuff, or something hacked up. They haven't spent the time on doing*

fundamental work like patent applications so that's my theory but I haven't researched it.

A third view was that patents could serve as a differentiator towards investors. The theory was that patents was one more thing to point to, which would lead to a greater percentage of funding for those startups. When asked about how much extra weight he would put on a startup with patents compared to one without, VC-1A answered that it may give the startup some additional value as well as serving as a differentiator towards investors and the market:

VC-1A: The argument for getting a patent is "If you have an issued patent that company has some inherent intrinsic value." I always like to tell founders that the number I would put on it, it's not... But if you have an issued patent, some patent trolls are going to pay a lot of money, even if the company goes belly up and that's one of the assets for sale, a company with that as an asset versus just some soft IP, it's always going to be more valuable. And so I think that, in the abstract, the company has a far greater enterprise value with an issued patent than if it doesn't. Doesn't always hold true in every circumstance. But there is a certain amount of value to it, and it is... I think someone's amazingly still questioning people "How many patents do you have?" Right? Whereas, you don't even know what I do like I say I am a techno- I mean, patents may be wholly inapplicable to what I do but there is still this... They carry a certain amount of weight, and a certain amount of gravitas, if you will, that a company has patents, has a portfolio.

I: Would that be then towards the investors, or who do you mean that it carries weight to?

VC-1A: Kind of everybody. From investors, I see from a market differentiation perspective, if... If all four of us had four startups and we're out trying to hustle for the same customers and I say to them "I have world class leadership, I have world class investors, I have a 15 patent, patent pending portfolio" it's also a differentiator for me as a company versus my competitors. So there are a lot of those reasons as well that, that it's still... it's used that way as well.

The view that patents can serve as a differentiator towards investors is closely in line with the view that many investors had that patents served as bonus points, i.e. something which will almost always add positive value to a startup.

5. Discussion

The purpose of this study is to explore how venture capitalists use patents in the evaluation of startups. The value investors ascribed to patents and their depth of evaluation of patents differed widely. It seems that the world of venture capital is very nuanced, as has also been reported by Haeussler et al. (2009) and Berglund (2011). However, we have found that for tech and software investors in Silicon Valley patents usually play a small role in the general investment process. Three main factors were considered to be the most important for an investment. These were team, market and technology. These findings are in accordance with previous research regarding VC criteria by Zacharakis & Meyer (1998). However, while Zacharakis & Meyer (1998) considered potential return if the venture was to be successful as a fourth criteria, this was rarely mentioned as a factor to be evaluated by the VCs in our sample. Rather, the goal of the evaluation seemed to be to ensure that the venture would have a good chance of sufficient financial returns. Out of the criteria, the team was usually considered the most important. This is in agreeance with the findings of earlier studies (e.g. Shepherd & Zacharakis, 1999; Mason & Stark, 2004; Nunes et al., 2014; Kollmann & Kuckertz 2010). One VC mentioned how they could write a check for 20 million dollars just to get a good team to leave their jobs and start working on an idea. The team was judged through the interaction they had with the venture capitalists and it is likely that a big part of that evaluation was through intuition, as reported by Huang and Pearce (2015).

Unlike the team, patents would not serve as the single reason to invest. Further, many times the investors did not expect startups to have filed in the early stages and believed patents to be more important in later stages. Our findings thus agree with the findings of Mann & Sager, (2007) which showed that patents mattered less in early rounds and was more important at the later stages, and contrasts with the research of Graham et al. (2009) who reported that startups were selected by venture capitalists because of their patents.

There are many ways in which the technology will be judged and patents may be one of them, however no investor expressed the notion that the more patents the startups has, the likelier they are to invest. This is aligned with the findings of Munari & Toschi (2014) and Mann & Sager (2007) who found little correlation between the number of patents and the amount of financing received. From our research it is clear that, in the general case, patents are not the determining factor to a startup's success of acquiring funding. Furthermore, many early stage investors had a preference for heavily differentiated technology. Because core patents are likelier filed on more differentiated technologies, it is therefore not surprising that Munari and Toschi (2014) and Haeussler (2009) found a correlation between core patents and venture capital funding. However, Munari and Toschi's (2014) and Haeussler's (2009) interpretation that venture capitalists pay attention to patent quality seem to be questionable in the case of our sample. Our research would indicate that it is the technology, rather than the patents, that attracts investors and that the information regarding the technology is conveyed through discussions rather than patents. As previously mentioned though, Munari & Toschi (2014) studied nanotechnology startups and Haeussler et al. (2009) looked at biotechnology startups. According to our findings the importance investors ascribe to patents is much greater in such industries, which could mean that VCs there pay attention to patent quality.

Patents were almost never considered to be something negative, even in the cases when it was considered unimportant. Very few investors expressed opinions regarding the disclosure of an invention through patents as something negative. As such, many investors regarded patents almost as bonus points; not having bonus points does not subtract value, it can only add value. However, most investors believe that there is generally little use for a startup to have patents since they can generally not be used offensively. Some of the investors still had the preference

for startups to patent if the technology was patentable. These findings could help explain the findings of Kortum and Lerner (2000) that startups affiliated with venture capital patented more.

Some investors considered patents to serve as a signal, though not a strong one, of things such as that the founders had done some work, that they were technologists and that there were building blocks for them to evaluate. Others considered startups having patents to serve no signal at all. Further, a few VCs believed that some startups patented just to show that they had patents which diminished the signaling value of patents. These investors would therefore need to evaluate the patents in the context of the business to know if they were valuable. Our findings thus go in line with the findings of Graham & Sichelman (2008), Veer & Jell (2012) and Holgersson (2013;2016) in that startups may patent to increase their chances of acquiring VC funding. However, we find that in many cases it is not effective unless the patent has actual importance to the business. Our research thus shows that when startups patent exclusively to attract VC funding, as reported by Graham & Sichelman (2008), it is of less value than if the patents have actual value to the business.

Our findings are thus similar to Smith & Cordina's (2014) in that venture capitalists reported that they did not regard patents as a strong signal. However, while Smith & Cordina (2014) believe that their findings were caused by a reluctance to share investment methods with other venture capitalists, we consider it unlikely that the interviewees would choose to be part of the study if they did not wish to share information truthfully.

Investors primarily valued patents for the function it served to a startup's defensibility. The importance of patents therefore varied between investments and sectors depending on the defensibility granted from patents. In industries such as material science, semiconductors, life sciences, bio and pharma it was considered more likely to be important for defensibility. In software it was usually considered less important. While the VCs we interviewed would not fund startups solely because of their patents, it is possible that this occurs in some sectors as reported by Graham et al. (2009). That VCs valued patents for the defensibility granted is also in line with Audretsch et al.'s (2012) theory that patents can show appropriability. Typically, patents were considered more valuable the less prior art there was, for example in a newly discovered technological area. There the startup could get broad patents with a higher degree of enforceability. Some VCs also mentioned that patents could be valuable in a future exit. This fact combined with the small degree of offensive use from startups' patents could be interpreted similarly to Graham & Sichelman's (2008) theory that patents may help in acquiring funding not because they are valuable to the startup's business but because they would be valuable to other entities.

In the cases when investors evaluated patents, the process included up to three different phases: discussions with the founders, internal evaluation and external evaluation. The investors generally started with a discussion with the founders and therein evaluated the importance of the patents to the business. The discussion would typically cover what patents the startups had, the content of them and their significance to the overall business. If patents were considered critical to maintain long term value the VCs would spend more time evaluating them.

After having discussed patents some investors would internally review the patents. This internal evaluation consisted of the venture capitalists reading through the patents themselves. It was in part done to get an understanding of what the patents covered and to get an insight into the founders' thinking. Few investors read patents themselves as most relied on the discussion with founders followed by an external evaluation.

In the external evaluation the venture capitalists used assistance by experts or lawyers to help them evaluate patents. Depending on the perceived importance of the patents it was either done before or after the term sheet was signed. The most common case was after the term sheet had been signed by having lawyers confirm that the information gained from the discussion about the patents was true. In these cases, the actual patent documents are therefore not used by the VCs in the decision process. When external evaluation was done before the term sheet, it was usually part of the decision process and the VCs then received information such as the patent landscape, how broad the patents were and the value of the patent to the startup's business. In these cases it was usually either patent lawyers, experts from the industry or technology experts within the VC fund that did the evaluation. Our findings thus go in line with Haeussler et al.'s (2009) that VCs often used external counsel rather than reading patents themselves. Our research further adds upon this by emphasizing the importance of the discussion about patents with the founders.

These findings further imply that there has been an overemphasis from the literature on the signaling value of patents. Both regarding the evaluation of patents to reduce information asymmetries and the signaling from knowing a startup has patents. Most commonly patent documents did not serve to reduce information asymmetries and were not evaluated before the investment decision. Conti et al.'s (2013) assumptions regarding that startups strategically use patents to convey information about the quality of the invention is thereby arguable. However, our findings imply that patent documents can be used to reduce information asymmetries if the investors actively evaluate patents. In such cases investors may consider patents to be a way of judging the quality of the team and as a proxy for technology differentiation. This is similar to Lemley (2001) in that venture capitalists can use patents to see that the startup has a defined and carved out market niche.

In the investors' experience there has been a shift in the investment landscape from hardware to software. The investors believed that this has led to a weaker correlation between patenting and venture capital, as patents are generally considered less important in software. Further, some investors thought that quality entrepreneurs tend to patent more; usually entrepreneurs with poor or badly thought out ideas would not have spent money or time to patent those ideas. Another view was that patents could serve as a differentiator towards investors, basically being one more beneficial factor to point to. These theories can help explain the previously found correlations between venture capital and patents (i.e Kortum & Lerner, 2000; Mann and Sager 2007; Graham et al. 2009; Haeussler et al. 2009; Audretsch et al., 2012; Hsu & Ziedonis 2013; Munari and Toschi 2014; Kalaitzandonakes et al. 2014; Smith & Cordina, 2014) and contribute to our understanding of venture capital and patents.

6. Conclusion

This study examines how venture capitalists use patents when evaluating early stage tech companies. From interviews with 13 venture capitalists we find that there is great heterogeneity in how investors evaluate and regard patents. As such, the content and depth of their evaluations differ; some investors almost never value or evaluate patents while others always evaluate them. Given these vast differences it has not been possible to find a generalizable approach followed by VCs in all situations. However, some commonalities between investors are found. None of the investors consider patents or intellectual property to be a main factor in the general investment decision. However, patents are sometimes considered critical. The importance of patents increases in new technological fields and if the exit strategy is to be acquired by a large company. It also depends on the most suitable defensibility method for the startup, which varies widely. The preference for defense mechanisms differs both between and within sectors. Generally, patents are considered least important in software investments, important in hardware based investments and critical in bio-based and pharmaceutical investments. Further, even in the case when investors consider patents to be unimportant to the defensibility of the startup, they will almost always consider patents positive. Hypothetically, investors could consider patents negative if patenting was done to the extreme or in a very illogical way. This had almost never been experienced by the investors.

Apart from gaining insight about the patents in themselves through evaluation, some investors also use patents as an assessment of technology differentiation or the quality of the founders. However, only knowing that a startup has patents seems to have little signaling value towards VCs, most investors need to know the business and the context of the patents for them to gain any information from them. Part of that is because VCs know how easy it is to get patents and that startups may do it only to say that they have patents to the VCs. However, having patents can convey that the founders have done some work and that they believe they are building something valuable which they want to protect. Further, it can signal that the founders are technologists, and some believe that quality entrepreneurs tend to patent. Our research implies that there has been an overemphasis from the literature on the signaling value of patents. Most commonly, patents were not evaluated before the term sheet was signed other than through discussions with the founders and as such the patent documents did not serve to reduce information asymmetries.

As many of the investors in our sample have been software-focused we call for a similar study exploring how venture capitalists in industries where patents are considered more important, such as pharma, use patents when making investment decisions. We further suggest that, because of the great heterogeneity among VCs, researchers should distinguish between different groups of VCs rather than generalizing their findings. Moreover, we propose future research to be conducted to examine what factors influence said heterogeneity, such as stage, industry, location, background and fund size. Such knowledge would be valuable when trying to generalize other research about venture capital.

7. References

Audretsch, D.B., Bönte, W. & Mahagaonkar, P. 2012, *Financial signaling by innovative nascent ventures: The relevance of patents and prototypes*, Research Policy, vol. 41, no. 8, pp. 1407.

Berglund, H., Chalmers University of Technology, Chalmers tekniska högskola, Department of Technology Management and Economics, Innovation Engineering and Management & Institutionen för teknikens ekonomi och organisation, Innovationsteknik 2011, *Early stage venture capital investing: comparing California and Scandinavia*, Venture Capital, vol. 13, no. 2, pp. 119-145.

Blum, D.A. 2015, *Factors Contributing To Independent Venture Capital Successful Exits*, Journal of Business & Economics Research (Online), vol. 13, no. 1, pp. 1.

Bryman, A., Bell, E., BOOKS24X & BOOKS24X, I. 2003. *Business research methods*, Oxford;New York;, Oxford University Press.

Carlos Nunes, J., Gomes Santana Félix, E. & Pacheco Pires, C. 2014, *Which criteria matter most in the evaluation of venture capital investments?*, Journal of Small Business and Enterprise Development, vol. 21, no. 3, pp. 505-527.

Conti, A., Thursby, J. & Thursby, M. 2013, *Patents as Signals for Startup Financing*, The Journal of Industrial Economics, vol. 61, no. 3, pp. 592-622.

Cumming, D., Schmidt, D. & Walz, U. 2010, *Legality and venture capital governance around the world*, Journal of Business Venturing, vol. 25, no. 1, pp. 54-72.

Cumming, D.J. and MacIntosh, J.G., 2001. *Venture capital investment duration in Canada and the United States*. Journal of Multinational Financial Management, 11(4), pp.445-463.

Easterby-Smith, M., Thorpe, R. & Jackson, P. 2012, *Management research*, 4.th edn, SAGE Publications, Thousand Oaks, Calif.

Fried, V.H. & Hisrich, R.D. 1994, *Toward a Model of Venture Capital Investment Decision Making*, Financial Management, vol. 23, no. 3, pp. 28-37.

Fried, V.H. & Sapienza, H.J. 2006, *An Entrepreneur's Guide to the Venture Capital Galaxy*, Academy of Management Perspectives, vol. 20, no. 3, pp. 90-112.

Gillham, B. & Ebrary 2005. *Research interviewing: the range of techniques*, New York;Maidenhead;, Open University Press.

Gompers, Paul, and Josh Lerner. *The venture capital revolution*. The Journal of Economic Perspectives 15.2 (2001): 145-168.

Graham, S. J. H.; Merges, R. P.; Samuelson, P. and Sichelman, T. M., 2009, *High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey (June 30, 2009)*, Berkeley Technology Law Journal, 24(4), pp. 255–327.

Graham, S.J.H. & Sichelman, T.M. 2008, *Why do start-ups patent?*, Berkeley Technology Law Journal, vol. 23, no. 3, pp. 1063.

Granstrand, O. 1999, *The economics and management of intellectual property: towards intellectual capitalism*, E. Elgar, Northampton, Mass;Cheltenham, UK;.

Haeussler, C., Harhoff, D. & Mueller, E. 2009, *To be financed or not: the role of patents for venture capital financing*, Centre for Economic Policy Research, London.

Holgersson, M. 2013, *Patent management in entrepreneurial SMEs: a literature review and an empirical study of innovation appropriation, patent propensity, and motives: Patent management in entrepreneurial SMEs*,R&D Management, vol. 43, no. 1, pp. 21-36.

Holgersson, M., Phan, T., Hedner, T. 2016 *Entrepreneurial patent management in pharmaceutical startups*, Drug Discovery Today, Available online 3 March 2016, ISSN 1359-6446.

Holgersson, M.J. 2013, *Patent management in entrepreneurial SMEs: A literature review and an empirical study of innovation appropriation, patent propensity, and motives*.

Huang, L. & Pearce, J.L. 2015, *Managing the Unknowable: The Effectiveness of Early-stage Investor Gut Feel in Entrepreneurial Investment Decisions*, Administrative Science Quarterly, vol. 60, no. 4, pp. 634.

Hsu, D.H. & Ziedonis, R.H. 2013, *Resources as dual sources of advantage: Implications for valuing entrepreneurial-firm patents*, Strategic Management Journal, vol. 34, no. 7, pp. 761-781.

Kalaitzandonakes, N., Schoenmakers, W., Hoenen, S. & Kolympiris, C. 2014, *The diminishing signaling value of patents between early rounds of venture capital financing*,Research Policy, vol. 43, no. 6, pp. 956-989.

Kanniainen, V. & Keuschnigg, C. 2004, *Start-up investment with scarce venture capital support*, Journal of Banking and Finance, vol. 28, no. 8, pp. 1935-1959.

Kollmann, T. & Kuckertz, A. 2010, *Evaluation uncertainty of venture capitalists' investment criteria*, Journal of Business Research, vol. 63, no. 7, pp. 741-747.

Kortum, S. & Lerner, J. 2000, *Assessing the Contribution of Venture Capital to Innovation*, The RAND Journal of Economics, vol. 31, no. 4, pp. 674-692.

Lemley, M.A. 2001, *Rational ignorance at the Patent Office*, Northwestern University Law Review, vol. 95, no. 4, pp. 1495.

Long, C. 2002, *Patent Signals*, The University of Chicago Law Review, vol. 69, no. 2, pp. 625-679.

Macmillan, I.C., Siegel, R. & Narasimha, P.N.S. 1985, *Criteria used by venture capitalists to evaluate new venture proposals*, Journal of Business Venturing, vol. 1, no. 1, pp. 119-128.

Mann, R.J. & Sager, T.W. 2007, *Patents, venture capital, and software start-ups*, Research Policy, vol. 36, no. 2, pp. 193-208.

Mason, C. & Stark, M. 2004, *What do Investors Look for in a Business Plan?: A Comparison of the Investment Criteria of Bankers, Venture Capitalists and Business Angels*, International Small Business Journal, vol. 22, no. 3, pp. 227-248.

Merriam, S. B. & Ebrary 2009. *Qualitative research: a guide to design and implementation*, San Francisco, Jossey-Bass.

Munari, F. & Toschi, L. 2015;2014;, *Do patents affect VC financing? Empirical evidence from the nanotechnology sector*, International Entrepreneurship and Management Journal, vol. 11, no. 3, pp. 623-644.

Ross, S.A., Westerfield, R. and Jordan, B.D., 2008. *Fundamentals of corporate finance*. Tata McGraw-Hill Education.

Sahlman, W.A. 1990, *The structure and governance of venture-capital organizations*, Journal of Financial Economics, vol. 27, no. 2, pp. 473-521.

Sena, V., Rogers, M., Hall, B.H. & Helmers, C. 2014, *The choice between formal and informal intellectual property: A review*, Journal of Economic Literature, vol. 52, no. 2, pp. 375-423.

Shepherd, D.A. & Zacharakis, A. 1999, *Conjoint analysis: A new methodological approach for researching the decision policies of venture capitalists*, Venture Capital, vol. 1, no. 3, pp. 197-217.

Siegel, E., Siegel, R. & MacMillan, I.C. 1988, *Corporate venture capitalists: Autonomy, obstacles, and performance*, Journal of Business Venturing, vol. 3, no. 3, pp. 233-247.

Silva, J. 2004, *Venture capitalists' decision-making in small equity markets: a case study using participant observation*, Venture Capital, vol. 6, no. 2, pp. 125-145.

Smith, J.A. & Cordina, R. 2014, *Patenting and the early-stage high-technology investor: evidence from the field*, R&D Management, , pp. n/a.

Taylor, S. J., Bogdan, R. & Deault, M. 2016. *Introduction to Qualitative Research Methods: A Guidebook and Resource*, US, John Wiley & Sons Inc.

Tyebjee, T.T. & Bruno, A.V. 1984, *A MODEL OF VENTURE CAPITALIST INVESTMENT ACTIVITY*, Management Science (pre-1986), vol. 30, no. 9, pp. 1051

Veer, T. & Jell, F. 2012, *Contributing to markets for technology? A comparison of patent filing motives of individual inventors, small companies and universities*, Technovation, vol. 32, no. 9/10, pp. 513.

Zacharakis, A.L. & Meyer, G.D. 1998, *A lack of insight: do venture capitalists really understand their own decision process?*, Journal of Business Venturing, vol. 13, no. 1, pp. 57-76.

Zider, Bob. *How venture capital works.* Harvard business review 76.6 (1998): 131-139.

Appendix A - Interview Questions Template

General Investment Approach

Can you tell us a little bit about your background and how you became a venture capitalist?

- What type of industries and companies do you usually invest in?
- Can you briefly explain what main factors you consider when you evaluate a startup for a potential investment?
- Briefly, how do you evaluate those factors?

Patents in evaluation

- What is your attitude towards patents?
    - Are they something you consider when making investments?
- Do you consider patents when evaluating the previously mentioned main factors? How?
- How does it differ how you use patents when evaluating a startup depending on the circumstances?
- Knowing little else about a startup, what does the presence of a patent or a pending patent say to you?
    - The opposite then, if you know much about a startup, (for example if you have worked with the founders before) how important is the patent?
    - Are patents something you specifically look for when evaluating?
- How does it differ if the patent is pending vs if it has been granted?

Process of evaluation

- Do you evaluate patents in themselves?
    - How do you do this?
    - Do you judge the quality of the patents?
        - What about pending patents?
    - Do you look at the timing when the patent is applied for?
- Do you discuss patents with the founders?
- How does the conversation with the founders about IP and patents look?
    - What do you aim to gain from it?
    - Main topics?
    - How important is that conversation compared to the patents in themselves?

Environment / circumstances

- Does the use of patents when evaluating startups differ between early-stage and later stage investments? (Mann & Sager, 2007)
- Are there any circumstances in which patents become very important for evaluating?
    - Opposite - when are they not important?
- Do you look at the IP landscape around a startup technology (FTO/novelty etc.)?
    - How do you assess it?

Other

- Why do you think early-stage startups apply for patents? Main reasons?
- A lot of research points towards a correlation between patents and funding, the theory is that patents serve as signaling which will increase the chance of funding. What do you think about that?