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Does the patent system protect innovators?

Challenges for small firms in infringement litigation

Master's thesis in Management and Economics of Innovation

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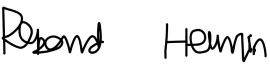
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ROBERT HEURLIN

Does the patent system protect innovators?
Challenges for small firms in infringement litigation
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ABSTRACT

A patent is a type of intellectual property right (IPR) that provides the patent holder the right to exclude others from commercializing the patented invention. To maintain this right, the patent holder must actively identify any infringements and enforce the patent. Enforcing patents is expensive, and due to the legal and technological complexities involved patent litigation is considered one of the most complex forms of civil litigation. Against this background, there has been some previous research indicating that small firms might have a disadvantage compared to large firms in patent litigation. This study investigates this issue in detail, and aims to examine if and in what way small firms have a disadvantage compared to larger firms in patent conflicts and identify potential causes to and consequences of the disadvantage. The study complements previous research by providing insights from patent attorneys, rather than only from small firms themselves. The data consists of rich interview material from semi-structured interviews with 16 patent attorneys with significant experience from Swedish patent cases. The findings indicate that small firms are at a disadvantage compared to large firms in patent conflicts. The findings further highlight that the causes of the disadvantage are not limited to only the litigation process itself but relate back to much earlier stages in the patent process, already from the decision to get a patent. Overall, the disadvantage is caused by attributes that are unique to small firms, rather than a fundamentally unjust patent or litigation system. Specifically, the disadvantage is caused by economic constraints, knowledge and resource constraints, and lack of foresight in small firms. Overall, the study highlights the complexity of the issue and implies that a broader perspective than only focusing on the litigation process is needed to remedy the problems small firms face.

Keywords: patent, patent litigation, patent infringement, small firm, intellectual property, innovation.

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1. Introduction

In 1990, the newly formed Arizona based company Research Corporation Company (RCT) filed a first patent application for its Blue Noise Mask technology¹. RCT, being a spin-off from the University of Rochester, developed the technology, that would significantly improve halftone rendering of images for displays and printers, right from the lab at the university. In the decade that followed the invention, the technology was successfully licensed out to numerous companies. RCT developed the technology further and was granted several more patents. At this point, RCT's business model was entirely based on licensing out rights to the patented technology. Therefore, RCT did not hesitate to take action when it was revealed that the tech-giant Microsoft was unlawfully using their patented technology without permission or any licensing agreement.

RCT filed a lawsuit against Microsoft in 2001 for infringing six of its patents for the Blue Noise Mask technology and the consensus in court was that Microsoft was indeed infringing some of the patents. Microsoft did not argue against the infringement per se, but their Seattle based lawyer tried different strategies to win the case anyway. After successful attempts to invalidate some RCT patents, the Seattle lawyer tried to stall the process and avoid an appeal from RCT by accusing the RCT inventors of inequitable conduct. The attack was based on the argument that RCT had failed to disclose certain test results to the USPTO. Despite the fact that the tests had been conducted after the patent filing, as a part in completing a PhD thesis, Microsoft's lawyer managed to get what he intended. This did not only stall the process but also put the reputation of a young PhD student on the line, because there is certainly nothing flattering about having an inequitable conduct stamp in the forehead when trying to build a career as a young STEM PhD. The Seattle based Microsoft lawyer further made aggressive attempts to have RCT pay for his fees and other court-related costs. The absurdity of Microsoft's claims was evident, yet it would take years of negotiations in different courts for Microsoft to finally agree to put down its battle axe and take a licensing agreement from RCT in 2010, 10 years after the initial lawsuit.

Only one year before RCT was formed in 1987 and four years before they filed their first patent application, David Teece of UC Berkeley had published a now well-known article with significance to this case. In his article, Teece (1986) outlines factors and circumstances that determine who will profit from technological innovations, such as RCT's Blue Noise Mask. The first factor, according to Teece (1986), has to do with what he calls the *appropriability regime*, which refers to external factors that govern an innovator's ability to capture profits generated by an innovation. The appropriability regime is determined in part by the nature of the

¹ The example of RCT vs Microsoft in the two first paragraphs has been described by Parker, K. J. (2020). Infringement Battles: A case study illustrates the need for reforms. *Technology and Innovation*, 21, 237-241. Doi: <https://doi.org/10.21300/21.3.2020.237>

technology and in parts by the efficacy of legal mechanisms of protection, which commonly relates to Intellectual property (IP) rights. If an innovation is relatively easy to imitate, and it cannot be protected well by IP-rights, other factors than who first invented the technology will determine what actors can capture value and profit from the innovation. Most notably according to Teece (1986), complementary assets needed to commercialize the technology, which might be for example production capabilities, distribution, sales, and existing customers, will play a vital role.

The case of RCT against Microsoft beautifully illustrated the dynamics that Teece (1986) outlines. RCT, fundamentally lacking complementary assets for anything other than licensing out its technology, was highly dependent on establishing a *tight* appropriability regime to protect their invention and be able to profit from it. Since the technology evidently was susceptible to imitation, they had to rely on the efficacy of the legal mechanisms protecting the innovation. Otherwise, chances were that Microsoft, with their well-established set of complementary assets, would be able to commercialize the technology more efficiently and capture most of the profits from the innovation. The case also illustrates some issues with relying on patents to establish a tight appropriability regime. Patents exist to incentivize innovation by creating temporary monopolies, but they only give the right to exclude other actors from using the technology (Granstrand & Holgersson, 2014). In order to have use of the patent for this purpose, the patent holder must actively sue any alleged infringer and win over them in the following process (Yang, 2019). As is evident in this case, this is not necessarily a straightforward process. Except for the fact that it costs money to apply for and own a patent, it often requires enormous efforts and resources to actually use it for its main purpose which is to have the exclusive right to commercialize an innovation. The cost for litigation is highest in the US, ranging up to \$6 million, while in most European countries, costs range from \$60.000 to \$250.000 (Helmers, 2018).

Ironically, the complications related to defending patent rights seems to be most detrimental for the actors that would arguably benefit most from patents as a means to create a tight appropriability regime. There is a respectable amount of literature indicating that small actors (firms and individuals), such as RCT, struggle a lot with obtaining and defending patent rights compared to large actors. There is evidence that suggest small actors are more affected by cost constraints in litigation than large firms (Athreye et al., 2021) and are subject to greater risk and disadvantages in general when they are in a patent litigation process (Lanjouw & Schankerman, 2004). Further, studies indicate that small firms are less likely to patent in the first place, due to cost constraints (Athreye et al., 2021) and lack of knowledge about patents (Holgersson, 2013; Olsson & McQueen 2000). Recent studies in a Swedish context testify about detrimental consequences for small firms that have been involved in patent litigation processes (Burkhardt & Dilexit 2021; Bjurgren et al., 2017). Burkhardt and Dilexit (2021) conducted an interview study with small and medium sized enterprises (SMEs) and found that SMEs involved in patent litigation had an overall negative view on the patent system. The SMEs suffered from the high costs of litigation and in many cases had to compensate by, for example, decreasing R&D spending. Further, a lot of the firms lacked a specialized legal department and therefore the litigation process did take a lot of time and focus from the main business for many firms. Bjurgren et al. (2017) presents similar findings from a survey study

of SMEs involved in litigation, and further found that the litigation negatively affected the companies and their products on the market.

The fundamental purpose of patents is to encourage innovation, and this incentive is arguably particularly significant for small firms who often lack complementary assets for commercialization. Against this background, there is an ongoing debate in Sweden about what can be done to help small actors defend their patent rights. The recent studies that have been conducted in a Swedish context (Burkhardt & Dilexit 2021; Bjurgren et al., 2017) highlight some challenges that small actors face when defending their patent. These studies have examined the perception that small actors themselves have, which does give important insights about the challenges the small actors are subject to. However, such statements from small actors that have recently been involved in taxing litigation processes will inevitably be biased and should not be used as a standalone argument for making any changes to the patent (litigation) system or other significant recommendations. Further, there is no data indicating that larger actors have a more positive experience than small actors when defending their patents. Therefore, these studies cannot be used alone to conclude that small actors are at a disadvantage in litigation compared to large actors. Finally, these studies only include cases that have actually gone to litigation and do not consider cases that for some reason were settled or abandoned before litigation. It is reasonable to assume that small firms might face challenges already before involvement in litigation, that might stop them from even going to litigation in the first place. Therefore, it is relevant to examine small firms in the entire patent process, from getting a patent to involvement in litigation, and to do that from an outside perspective to reduce bias related to the respondent's recent involvement in litigation.

This study aims to do just that by extending the data collection with interviews with patent attorneys that have experience from the entire patent litigation process involving both small and large actors. This provides a reasonably unbiased view on differences in the challenges that large and small actors face in litigation. Further, it allows for insights about cases that did not go to litigation. The view of patent attorneys will be combined with the findings from previous research about SMEs perception to pinpoint what challenges small actors face that large actors do not, and what challenges are more severe for small actors. Taken together, the data will be used to increase the understanding of the challenges small actors face in the patent process. Therefore, the overarching purpose of this study is to examine if and in what way small firms have a disadvantage compared to larger firms in patent conflicts and identify potential causes to and consequences of the disadvantage.

The next section in the report outlines some theoretical background about intellectual property rights (IPRs), patents, litigation, and previous research about small firms and patents. The section after that describes and further motivates the methodology of the research leading to the empirical findings in section 4. Finally, the previous research on small firms in litigation is combined with the findings from this study to discuss causes for and the consequences of the challenges small firms face, and the viability of different proposed solutions to help small firms.

2. Literature

The literature section provides an overview on the basic function of intellectual property, patents, the patent system, infringement, and litigation. Further, the section contains a summary of relevant previous literature on the topic of small firms and the challenges they experience in the patent system. The literature section does not cover all existing literature on IP or small firms and patents, rather literature with relevance to the empirical findings and analysis have been selected in conjunction with the empirical study.

2.1. Patents, Infringement & Litigation

Intellectual property rights (IPRs) are legal rights that are designed to give an inventor or creator exclusive rights to their creations for a limited period. A patent is one type of intellectual property right that is typically used to protect technological innovations. The main purpose of patents is to incentivize innovation and protect inventors' moral rights to their inventions. However, to make use of the right to exclude others from using the patented innovation, the patent holder must actively find and take actions against infringers. This section outlines the fundamentals about IPRs and patents in more detail and explains how patent holders can go about enforcing their patent rights.

2.1.1. Intellectual property rights and patents

Intellectual property rights (IPRs) are legal constructions designed to give an inventor or artist exclusive rights to their work (Granstrand & Holgersson, 2014). Although the exact laws differ between countries, IPRs typically give a temporary right for their owner to exclude other individuals or firms from commercializing an intellectual creation (Granstrand & Holgersson, 2014). The main purpose of IPRs on a societal level is to incentivize investment in innovation and intellectual creation, but there is also a moral aspect in giving the creator the right to their creation. The main categories of IPRs are trademarks for brand names and logos, copyright for artistic creations, design rights for design of physical artifacts, and patents (Granstrand & Holgersson, 2014).

A patent is an intellectual property right that is used to protect technological innovations, and they provide the patent holder with the right to exclude others from commercializing the patented invention (Crampes & Langinier, 2002). Just as for IPRs in general, the purpose of patents is partly to protect the innovators moral right to their creation, and to incentivize investment in R&D and innovation on a societal level (Crampes & Langinier, 2002). A further purpose of patents is to encourage disclosure of information, since the patentee must disclose technical details about the innovation when applying for a patent (Granstrand & Holgersson, 2014). For the individual innovator, the main reason to get a patent in most cases is to get a temporary monopoly on the market to extract value and maximize profits generated from the innovation. This is highlighted by Teece (1986) who establishes the importance of creating

tight *appropriability regimes* to appropriate value from a new technical innovation, in particular for actors that lack significant complementary resources for commercialization. Teece (1986) states that appropriability regimes are determined in part by the technical nature of the innovation, and in part by legal mechanisms of protection, such as patents. In practice, firms can extract value from the rights by commercializing the innovation themselves, license out the right to use the innovation to other actors, or by selling the patent or technology dependent on the patent to another actor.

In order for an invention to be patentable it must be considered new to the world, “non-obvious” for a person with technical knowledge in the area and be useful for at least some purpose or application (Granstrand & Holgersson, 2014). A patent is typically valid and provides exclusive rights to commercialize an innovation for 20 years from the day the patent application is filed (Granstrand & Holgersson, 2014). In order to apply for a patent, the inventor has to turn a patent application into the patent authority in the jurisdiction in which they want the patent to be valid. In Sweden, this would be the Swedish Intellectual Property Office (PRV), while in the US the inventor would have to turn to the United States Patent and Trademark Office (USPTO). After filing for a patent in one jurisdiction, the inventor has 12 months to apply for protection in more jurisdictions, for example in EU countries by applying at the European Patent Office (EPO). The patent application needs to provide technical details about the invention and fulfill certain requirements and it is typically recommended to involve a patent attorney in the application process (USPTO, 2021). There is also a need for strategic considerations when formulating the *patent claims*, which defines the scope of protection, since they can either be formulated widely to increase the scope or narrowly to ensure accurate specifications of the core of the invention (Crampes & Langinier, 2002).

Just as IPRs in general, patents only provide the patent holder the right to exclude others from using the patented invention. The patent does not guarantee successful commercialization, and it does not automatically stop others from imitating and commercializing the same innovation (Crampes & Langinier, 2002). Further, the patent costs money to maintain since the patentholder needs to pay certain annuities to keep it valid (USPTO, 2021). Then, to actually make use of the exclusive rights that the patent gives, the patent holder must identify and take action against intruders that are unlawfully exploiting the patented invention, otherwise the purpose of the patent is undermined (Crampes & Langinier, 2002). Crampes and Langinier (2002) further highlights the fact that the value of a patent strongly depends on the competency of the innovator's legal department or external legal advisors, both *ex ante* when designing the patent claims and *ex post* when identifying intruders and enforcing the right.

2.1.2. *Infringement and Litigation*

The act of using someone else's patented invention without permission is called infringement (PRV, 2021). When a patent holder finds out that someone is infringing their patent, they need to act to enforce their rights. Enforceability of patent rights is perceived to be a backbone of the patent system (Helmers, 2018), and WIPO (2018) emphasizes that the opportunity to enforce is fundamental to ensure the effectiveness of the patent system. Enforcement of patents includes but is not limited to litigation. When a patent holder suspects that another actor is infringing their patent, they can act through informal means such as asking the alleged infringer

to stop in a cease-and-desist letter (Yang, 2019). According to PRV (2021), infringement oftentimes occurs due to ignorance, meaning that the alleged infringer accidentally uses a patented technology in their products or services. Therefore, PRV (2021) recommends first contacting the infringer, informing them about the infringement and either getting them to stop using the technology, set up a licensing agreement, or agree on damages for the unlawful use of the patented technology. Burkhardt and Dilexit (2021) found that in many cases, the infringer is a current or former collaboration partner to the patent holder, which arguably further incentivizes the parties to resolve the conflict on a non-hostile basis. However, in case the parties cannot agree and settle the case themselves, the next step is to use the legal system and file a lawsuit against the infringer (PRV, 2021).

At this stage, if the patent holder files an infringement suit against the alleged infringer, the conflict may be resolved in court through litigation (Yang, 2019). However, many cases are settled before that, either before or during trial. Crampes and Langinier (2002) found for example that 56% of patent cases are settled in Germany, while the number might be as high as 95% in the US (Lanjouw & Schankerman, 2003). The high settlement rate is not surprising, since according to WIPO (2018) patent litigation is considered one of the most complex forms of civil litigation. The proceedings are often lengthy, demanding, and costly procedures. The cost for litigation is highest in the US, ranging up to \$6 million, while in most European countries, costs range from \$60.000 to \$250.000 (Helmert, 2018).

The aim for the patent holder when suing for infringement is usually to collect damages for their lost profits, and get an injunction, forcing the infringer to stop using the patented technology (Sung, 2015). Damage levels and the likelihood of getting an injunction differs between jurisdictions, and so does the overall structure of the proceedings (WIPO, 2018). A common strategy for the alleged infringer is to countersue the patent holder in an attempt to invalidate the patent. According to WIPO (2018) a significant difference between jurisdictions is whether they follow a unified or a bifurcated system. In unified systems, the infringement case and potential invalidation case is handled in the same court and during the same procedures, while in bifurcated systems they are dealt with separately. WIPO (2018) suggests that bifurcated systems, in which infringement is usually decided first, leads to an increase likelihood of settlement and fewer validity challenges overall.

It is clear at this point that litigation is a complex and expensive procedure. However, since enforcement is a fundamental cornerstone of an efficient patent system, it is still a necessary phenomenon. Statistics from WIPO (2018) indicate that the occurrence of patent infringement cases in the US increased a lot between 2009 and 2015, to then decline slightly from 2016. However, this seems to be partly an effect of an overall increase in patenting during the same period. When analyzing the number of infringement cases per patent granted, the increase is not as significant, and after 2016 the propensity for infringement cases is similar to the same stable levels that has been the norm since early 2000s.

2.2. Small actors, patents, and litigation

The fundamental purpose of patents is to incentivize innovation. However, in practice, there are plenty of different reasons why firms decide to patent or not to patent. The reasons differ between firms and types of firms, and there are clear differences in the patenting propensity between large and small firms. This section outlines different reasons to why firms patent or choose not to patent. Further it examines the differences between the patenting propensity in small compared to large firms. Finally, it highlights findings about disadvantages and challenges that small firms face to a larger extent than large firms throughout the patent process.

2.2.1. Why patent in the first place?

The purpose of IPRs and patents is primarily to incentivize investment in and creation of new intellectual resources (Granstrand & Holgersson, 2014). The incentive provided to firms by design is that they in theory get the opportunity to exclude other actors from commercializing the invention, giving them a temporary monopoly (Granstrand & Holgersson, 2014). Firms can extract value from the rights by commercializing the innovation themselves, license out the right to use the innovation to other actors, or by selling the patent or technology dependent on the patent. In practice, this is a common reason for firms to get patents (Granstrand & Holgersson, 2014).

However, there are other reasons for having patents that are derived from this basic function. Because of patents' exclusion rights, firms run the risk of being limited in their freedom to operate (FTO) by being excluded from using an innovation patented by someone else. Therefore, one reason to get patents is to ensure FTO by preventing other firms from patenting that innovation (Holgersson & Wallin, 2017). Further, having patents, whether the firm plans to commercialize the innovation or not, can be used for negotiation with other firms to get access to their patents through cross-licensing deals (Holgersson & Wallin, 2017). Boldrin and Levine (2013) even argue that in some industries it has become a necessity to have large patent portfolios for negotiation to be able to operate with any reasonable freedom at all.

For small firms, the right to exclude others is of great importance since they often lack complementary resources to be able to compete in the commercialization of the technology if it is not protected. However, there are other important reasons why small firms get patents. Hottenrott et al. (2016) argues that information about the quality of a firm's R&D and innovativeness is usually held asymmetric between the firm and potential investors or lenders. This asymmetry raises the cost of capital for the firm and thus leads to financial constraints in R&D (Hottenrott et al., 2017). In this context a patent can act as a quality signal to capital providers, indicating that the R&D activity is effective and of high quality. The capital constraints for R&D are generally more severe for small firms than large firms, and a patent has a higher quality signaling value for small firms than larger firms (Hottenrott et al., 2017). Therefore, one reason to patent for small firms is that it decreases the cost of capital and consequently the constraints on R&D.

Continuing this topic, Holgersson (2013) found that a common reason for SMEs to patent their inventions is to attract customers and venture capital. Attracting customers and financing is of utmost importance for SMEs, and Holgersson (2013) found that in many cases this was the primary reason for small firms to patent, rather than for protecting their innovation per se. Further, Wessendorf et al. (2019) found that patents have a significant and positive impact on the valuation of a firm or technology.

It is clear that there are many reasons why firms, and small firms in particular, chose to get patents. A lot of the reasons have no or only indirect connection to the essential right that the patent gives, to exclude others from using an innovation. However, this does not necessarily mean that protection of patent rights through litigation becomes irrelevant. If a patent is infringed and no action is taken, this likely lowers the signaling value that the patent has to investors, customers, and competitors. Crapmers and Langinier (2002) highlights that a patent does lose value if the patent holder fails to identify infringement or the infringer, or if they cannot take enforcement action. The same is true if the patent holder loses an infringement case in litigation, which is indicated by the fact that firms tend to lose market value when losing a litigation, in particular if they lose against a large actor (Darhult and Eklund, 2021). Further, it goes without saying that a patent loses a lot of its benefits if it is invalidated in court.

2.2.2. Do small firms patent?

As established in the last section there are plenty of reasons for why firms would want to patent. There are reasons unique for both small and large firms, but arguably small firms, at least firms dependent on external financing, should have the strongest incentives since a patent may be necessary to acquire capital. How then does this translate to reality? To what extent do large and small firms patent respectively?

Eurostat (2014) made a comprehensive mapping and analysis of patents filed in the European Union (EU) between 1999 and 2014. According to the report, an overwhelming majority (99,8%) of the firms active in the EU can be classified as SMEs. The report further states that 66,7% of all jobs in the EU stem from SMEs. Despite these facts, the study found that only 17% of all patent applications for the period could be attributed to SMEs, while 79% could be attributed to large firms. From these statistics it does seem like small firms patent to a lower extent than large firms. This conclusion is consistent with findings from Holgersson (2013) and Athreye (2021) who both conclude that SMEs have a lower propensity to patent than large firms.

Holgersson (2013) states that one potential reason for the low patenting propensity in SMEs is simply a lack of competence about patents and lack of internal patent resources in these firms. The author claims that such competences are important for effective and efficient use of patents both when it comes to applying for patents, and in monitoring and enforcing them. This view is shared by Olsson & McQueen (2000) stating that small computer software firms had poor knowledge of patents, in particular about how to use patents strategically. In short, lack of knowledge about patents in general seems to be one contributing reason to why small firms don't patent as much as large firms and why they struggle in litigations.

Except for lack of knowledge, cost constraints seem to be a significant reason why small firms are more hesitant to patent than larger firms. Athreye et al. (2021) concludes that cost constraints are the largest contributing factor that deter small firms from patenting, more so than innovation quality and enforceability. This should be seen in light of the fact that concerns for enforceability indeed seem to be an important factor deterring small firms from patenting. Lanjouw and Schankerman (2004) highlights that small firms struggle to enforce their patents and have a significant disadvantage in protecting their patent rights. Further, Holgersson (2013) mentions that SMEs' lack of patent knowledge negatively influences their effectiveness and efficiency in enforcing patents. When it comes to innovativeness as an explanation for the difference in patenting propensity, Athreye et al. (2021) claims that small firms are not necessarily less likely to patent given a particular innovation than large firms. Rather, Athreye et al. (2021) argues, large firms typically have larger innovation portfolios than small firms, and thus they are more likely to develop innovations that are patentable. This last conclusion can potentially be explained by the fact that small firms, according to Hottenrott et al. 2016, usually have more financial constraints on R&D than large firms. In that case, cost constraints can arguably be seen as an indirect cause for small firms' relatively lower patenting propensity.

2.2.3. Small firms in litigation

Although there are many reasons for patenting and having patents, the fundamental purpose is still to provide the right to exclude other actors from using an innovation. Therefore, enforceability of patent rights is perceived to be the backbone of the patent system (Helmers, 2018).

There is not a lot of empirical data on the success rate of small compared to large firms in patent infringement conflicts. However, there are reasons to believe that small firms are more prone to avoid litigation in the first place, and that the consequences from being in litigation are more severe for small firms. Athreye et al. (2021) concludes that small firms are more subject to cost constraints in the context of litigation than large firms. In many cases, going to court may not even be an option for small firms because the costs are too high (UnifiedPatents, 2019). With this in mind, there is reason to believe that small firms may be forced to agree to questionable terms and settle before trial to avoid the high costs of litigation to a larger extent than large firms. Therefore, it is likely more common for small than for large actors to give up on defending their rights already before litigation. For the cases that do go to litigation, there are recent studies on Swedish SMEs indicating that being involved in litigation have several negative consequences for the firms, some of which are independent from the outcome in the process (Burkhardt & Dilexit 2021; Bjurgren et al., 2017).

The fact that small firms are subjected to cost constraints is confirmed by Burkhardt and Dilexit (2021). Most of the SMEs in the study claimed that the cost associated with litigation was very difficult to deal with. In many cases, the firms had to go long ways to finance the costs, or had to compensate by, for example, decreasing R&D spending. Another important finding from Burkhardt and Dilexit (2021) is the significance of the time and energy that had to be invested in the litigation process. The authors found that SMEs oftentimes lack a particular department or individual responsible for legal issues such as patent conflicts, and therefore the CEO or a co-founder had to deal with the trials and preparation. This had implications for the firm's day-

to-day operations, since key individuals were tied up on things not related to running and developing the firm (Burkhardt & Dilexit, 2021). Further Crampes & Langinier (2002) highlights the fact that the value of a patent, and the ability to defend it, strongly depends on the competency of the innovator's legal department or external legal advisors, indicating that small firms may have a disadvantage in this aspect.

Except from consequences for the business, Burkhardt & Dilexit, 2021 also found that there were consequences on an individual level, affecting creativity and energy. Further, Bjurgren et al. (2017) found in a survey study with Swedish SMEs that involvement in litigation indeed did negatively affect the companies and their products on the market. Although there is no explicit literature to support it, it makes sense to assume that such issues are unique to small firms, since large firms in general tend to have specialized legal departments, rather than leaving such issues to the CEO.

3. Methodology

The research is of qualitative nature and is based on semi-structured interviews with patent attorneys. All participants were based in a Swedish setting. In total, 16 patent litigators (attorneys and patent agents) were interviewed. The interviews were conducted either physically, by phone or using a video meeting software (Zoom, MS teams) and they were guided by the interview guide that is attached in appendix A. All interviews were recorded and transcribed. The analysis of the interview followed a coding approach in multiple steps to arrive at concepts describing challenges small actors face at different stages in the patent process.

3.1. Research design

The overarching purpose of this study is to examine if and in what way small firms have a disadvantage compared to larger firms in patent conflicts. Further, the study aims to pinpoint causes to and consequences of this potential disadvantage. On the surface, it seems as though a quantitative examination of litigation outcomes could shed light on the question about whether small firms in fact have a disadvantage or not in patent litigation. However, this question, and the study in general, is not limited to determining whether small firms have a lower or higher tendency to lose in litigation processes. Rather the study aims to understand the broader context of litigation and patent conflicts in relation to small firms. This includes the entire process, from the occurrence of an alleged infringement to the financial and emotional consequences of being involved in a patent conflict. For example, a lot of infringement cases do not go to litigation (Crampes and Langinier, 2002; Lanjouw & Schankerman, 2003) and potential disadvantages could therefore hypothetically be expressed already before litigation if for example small firms tend to give up before litigation more often than large firms. Further, the study aims to understand the challenges that small actors face in the process and the consequences that the involvement per se has for the firms and individuals in it, independent from the outcome of the potential litigation.

The purpose of examining these questions, and therefore the *raison d'être* for this study, is to be able to contribute to knowledge that can help policy makers change the rules of the game and to help small firms understand how to better play it. For this study to add any value in this context, it does make sense to appreciate these actors' subjective experience. The concept of there being a “disadvantage” in the first place assumes that actors in the system attach meaning to the process and its outcomes, rather than simply accepting it as a consequence of objectively existing externalities. Therefore, the ontological assumptions that underlie this research are of constructivist nature, meaning that the studied reality is assumed to be made up of the views and understandings of the individuals in it (Bell, Bryman & Harley 2019). From this follows, according to Bell et al. (2019), an interpretivist view of knowledge, meaning that the subjective experiences of the studied actors, rather than objectively measurable phenomena, make up the foundation of the data. Given these assumptions, it does make sense to follow a qualitative research design rather than a quantitative design (Bell et al., 2019).

3.2. Empirical context and target group

As stated in the introduction, there already exists a reasonable amount of research on the topic of small firms in patent conflict (e.g., Burkhardt & Dilexit 2021; Bjurgren et al., 2017). These studies have been based on either interviews or surveys with small firms that have been involved in patent litigation. Since this research exists, and the authors of the studies claim to have reached a reasonable level of saturation, it would be redundant to conduct yet another study with the same target group for the data collection. Therefore, this study aims to complement the existing data with other perspectives, to then combine these perspectives to pinpoint the challenges small actors face in patent conflict and how that differs from large firms. The previous studies conducted on small firms provide a good understanding of the challenges they experience in patent litigation. However, statements from small actors that have recently been involved in taxing litigation processes will inevitably be biased, and there is no data indicating that larger actors have a more positive experience than small actors. Further, these studies only include cases that have actually gone to litigation and do not consider cases that for some reason were settled or abandoned before litigation. Therefore, there is a need for complementary research that addresses these gaps. In particular, there is a need to expand the perspective with views from actors that are not directly affected by the patent conflict to reduce bias, and that have experience from conflicts involving both small and large actors. Further, there is a need to capture conflicts that did not go to litigation.

To cover these gaps, this research is centered around the perspective of patent attorneys. Patent attorneys are involved both in writing patent applications, and in conflicts from start to finish, whether they go to litigation or not. Further, experienced attorneys have likely been involved in cases with small as well as larger actors and thus offer a comparative perspective. Therefore, the perspective of patent attorneys is a good complement to the existing data from the perspective of small actors themselves. This complements the pre-existing data well and aids fulfilling the purpose of pinpointing challenges small actors face from a practical perspective.

Specifically, the research is aimed at patent attorneys working in a Swedish context and in Swedish litigation trials. The Swedish context offers a unique setting since it has some particularities compared to other systems. First, Bjuggren et al. (2015) found that the duration of Swedish patent litigations is on average much longer than in most other countries. The average duration for a patent litigation process in Sweden during 2000-2008 was 35,5 months, compared to an average of 10 months for other European countries (Bjuggren et al, 2015). Arguably, the long duration in Sweden further increases the strain for small actors since they are occupied with the conflict for a longer time. Therefore, the Swedish setting offers a good opportunity to study the potential consequences this has for small actors involved in litigation. Further, the average damages awarded in Sweden found by Bjuggren et al. (2015) is significantly lower than in for example the US. In Sweden, damages ranged from 200 000 sek to 30M sek (\$20 000-\$3M) during the period 2000-2008 (Bjuggren et al., 2015), while in the US the average damages awarded ranged from \$5M-\$7M during the same period (Statista, 2020). Thus, the monetary incentives for going into litigation when finding out about infringement are less significant in Sweden, arguably making it more likely for small actors to not go into litigation to avoid the costs associated with it. Finally, the use of contingency fee

lawyers is essentially prohibited in Sweden (Swedish bar association, 2008), meaning that the actors in the litigation do have to pay fixed fees for their lawyers, independent of the outcome of the process. Thus, small actors in Sweden do not have the opportunity to avoid upfront lawyer fees when going into litigation.

3.3. Data collection

The data collection is made up of semi-structured interviews with 16 patent litigators. In total, 15 of the respondents are active as patent attorneys while one is a patent agent. The average duration for the interviews was 43 minutes. Information about each interview is summarized in Table 1.

Table 1: Interview information

The table lists all interviews, including some basic information about the respondent and the interview. The names of the respondents have been replaced by aliases (S1, S2...) to ensure anonymity. The table presents the aliases, the role of the respondent and the type of firm they were hired at when the interview was conducted. Further it contains information about the duration of each interview and the format in which the interview was conducted.

Subject alias	Role	Type of firm	Interview Duration	Format
Subject 1 (S1)	Attorney/IP-strategist	Large patent and law firm	103min	Zoom
Subject 2 (S2)	Attorney	Large law firm	40min	MS-Teams
Subject 3 (S3)	Attorney	Law firm	30min	In-person
Subject 4 (S4)	Attorney	Large law firm	27min	Zoom
Subject 5 (S5)	Attorney/IP-strategies	Large patent and law firm	54 min	MS-Teams
Subject 6 (S6)	Attorney	Large law firm	40min	Zoom
Subject 7 (S7)	Attorney	Large law firm	37min	Zoom
Subject 8 (S8)	Attorney	Large law firm	39 min	Phone
Subject 9 (S9)	Attorney	Law firm	37min	Zoom
Subject 10 (S10)	Patent Agent	Patent agency	51min	MS-Teams
Subject 11 (S11)	Attorney	Large law firm	45min	MS-Teams
Subject 12 (S12)	Attorney	Law firm	51min	Zoom
Subject 13 (S13)	Attorney	Large law firm	30min	Zoom
Subject 14 (S14)	Attorney	Large patent and law firm	50 min	Zoom
Subject 11 (S15)	Attorney	Large law firm	26min	MS-Teams
Subject 16 (S16)	Attorney	Law firm	65min	Zoom

The choice of semi-structured interviews as the main method for data collection was based on the purpose of the study. The method is useful when there are no obvious predefined questions with simple answers, and when the purpose is of an exploratory nature (Bell et al., 2019), which is the case for this study. Further, semi-structured interviews allow the participants to speak more freely than structured interviews, and thus the method is useful to understand the participants' experiences and the meaning they attach to them (Bell et al., 2019). However, in comparison to unstructured interviews, semi-structured interviews provide more guidance for

the interview and ensure that the interview does not deviate significantly from the main topic (Bell et al., 2019). In this case, the interview was guided by the interview guide attached in Appendix A. During the interviews, all the questions or topics in bold were touched upon. However, the exact ordering of the questions varied, and different follow up questions were asked to follow up on relevant points made by the respondent in each interview.

All interviews were recorded with permission from the respondent and then transcribed verbatim. The transcription process does require a lot of time, but it significantly simplified the analysis and ensured no relevant points were lost. The interviews were conducted in Swedish, with one exception that was held in English. Therefore, most transcripts are in Swedish. None of the transcripts was completely translated to English, however all quotes from interviews held in Swedish that are included in the report have been carefully translated to English. Table 2 summarizes the amount of data that was collected.

Table 2 – Quantity of data

The table presents the quantity of data collected measured in interview duration and number of transcribed words respectively. The table contains information about the shortest and longest interview, further the mean length and total combined length of all interviews are presents.

Interview Duration (min)				Transcription (words)			
Min	Mean	Max	Total	Min	Mean	Max	Total
26.00	43.00	103.00	725.00	3 925	6 400	14 525	102 404

3.4. Sampling

To identify relevant interview subjects, the researcher partly drew from his own network and partly utilized generic internet searches. The researcher already had some attorneys with experience from patent conflicts in his network and contacted them by email to schedule interviews. To identify more subjects, internet searches was made on “patentadvokater” (“patent attorneys”). This led to websites for law firms on which several relevant respondents were identified. Finally, all interview subjects were asked if they knew other people that might be relevant to interview, a method that Bell et al. (2019) refers to as snowball sampling. The criteria for relevance in this case was that the attorneys should have experience from patent conflicts.

Combining these methods, a significant number of potential interview subjects was identified before and during the data collection phase. In total 27 attorneys were contacted and 16 of them were interviewed. This sampling strategy resembles what Bell et al. (2019) refers to as purposive sampling. This means that the sampling consists of selection of interview subjects with direct reference to the research question and purpose of the study (Bell et al., 2019). It should be mentioned however, that not all candidates in the list were contacted at once. Rather, a few randomly selected candidates from the list were contacted by cold emails in the first stage. Then, after waiting for responses and conducting some interviews, a new set of candidates were contacted. The purpose of not contacting everyone at once was twofold. Firstly, the number of respondents contacted at any particular time was limited simply for

practical reasons, to avoid overscheduling with too many interviews. Secondly, this method gave the researcher an opportunity to continuously analyze if and when *theoretical saturation* was reached. Bloor and Wood (2006) describes the concept of theoretical saturation as a valid method to determine the number of interviews conducted in a qualitative interview study. Fundamentally, it means that more interviews are conducted up until the point where no further insights are gained (Bloor & wood, 2006). This research followed this method, and the number of interviews conducted was thus determined by an evaluation of the degree of saturation after each set of interviews.

It is important to acknowledge that the sample used in this study cannot necessarily be seen as representative for the larger group that is patent attorneys in Sweden in general. However, the use of theoretical saturation to guide the number of interviews provides some safeguard against arbitrary selection. Nevertheless, the sampling method does leave room for bias in the selection of interview subjects, which does limit the generalizability of the findings.

3.5. Analysis methodology

All interviews were recorded and transcribed verbatim. This resulted in transcripts with a total of 102 404 words of raw interview data. To analyze the data, the content of all interviews was coded and categorized in order to arrive at conceptualizations of phenomena that emerge from the data. McMillan (2012) describes three steps when coding interview data, organization and coding, categorization and summary of the code words, and interpretation.

As suggested by McMillan (2012), the coding process started partly already during the data collection phase, as general themes and patterns emerged quite early on. Further, the contents of the literature section were updated iteratively in conjunction with data collection and initial coding, as making such connections between data and literature can help the researcher to deepen the discussion in later interviews (Davies & Hughes, 2014).

For the formal coding process, the qualitative analysis tool NVivo 12 was used. As recommended by Wisker (2009), McMillan (2012) and David and Huges (2014) the first step of the coding entailed reading the transcriptions thoroughly several times to identify first level code words. These first level code words should, according to Holton (2007), primarily be of descriptive nature, which means that each code word fundamentally describes and summarizes a topic or perspective that the interview subject talks about. In total over one hundred descriptive code words were identified and entered into NVivo.

The next step, according to McMillan (2012), is to categorize the code words. Holton (2007) highlights this step as particularly important, since it is at this stage that a conceptualization of the data occurs, which is essential in order to inductively transform data to theory. The code words can basically be seen as indicators for the categories (Holton, 2007) and thus the process fundamentally involves categorizing similar codewords into categories. The emerging categories are broader than the code words and include many code words, and each code word can be included in several categories. The categorization step was not initiated before all interviews had been coded.

In this study the categorization of the first level codewords was conducted in two steps. First, the codes were categorized chronologically, more specifically according to what stage in the patent process they apply to. The patent process is a long process, and some of the disadvantages small firm face in litigation have causes rooting much earlier in the patent process than at the litigation stage. Therefore, it makes sense to separate phenomena that occur at different stages chronologically. Codes that described solutions or remedies suggested by the respondents were placed in a separate category. The second step of the categorization entailed conceptualizing the codes in each chronological stage by coding them to different categories or themes. Thus, the final coding consists of three chronological stages and one category with suggested remedies to challenges small actors face, each with themes conceptualizing the challenges or suggestions. The initial coding was made in Swedish since most interviews were held in Swedish. However, for presentation purposes all codes and themes were translated to English and some first level codes that were similar were combined. Table 3 and 4 illustrates the final coding with the first order descriptive codewords contained in each phase and theme.

Table 3 – Coding table

The table presents all first level codes and relates them to the second level theme and chronological phase. The right column contains all the descriptive first level codewords, and links them to the theme (second level code) they are categorized under in the middle column. Finally, the themes are classified under the three phases in the third column, referring to chronological phases in the patent process. Phase 1 entails the period before an up until getting a patent, phase 2 refers to the phase while owning a patent and getting into a conflict, and phase 3 refers to the litigation process in court.

Chronological Phase	2nd level theme	1st level codes
Phase 1	Economic barriers stop small firms from getting a patent	High costs to get and have patents
		Large firms less concerned about high costs
		Small firms believe they will have more money to defend patent later
		Small firms very concerned about costs
		Unaware of high enforcement costs
	Lack of foresight and deliberate strategy lead to poor patents	Afraid formal contracts will hurt trust with collaborator
		Get patent for investment purpose
		Get patents not optimized for enforcement
		Get patents only based on external advice
	Overly optimistic view on patents influence the decision to get a patent	Expose technology before patent
		Overestimate scope of protection
		Small firms believe they will have more money to defend patent later
		Small firms fail to be proactive with documentation and formal contracting
		Small firms unaware that they have to actively enforce
		Unaware of high enforcement costs
Phase 2	Economic constraints prevent small firms from detecting infringement and enforcing their patents	Unawareness about the function of patents
		Large firms better at monitoring for infringement
		Small firms give up before going to an attorney
		Small firms avoid litigation due to risk for invalidation
		Small firms avoid litigation due to high costs
		Small firms rarely sue large firms for infringement
		Small firms very concerned about costs
	Small firms fail to proactively document and set up formal contracts	Uncertainty with litigation worse for small firms
		Very common to settle before litigation
		Afraid formal contracts will hurt trust with collaborator
		Entrepreneurs busy focusing on the business and market
		Large firms are better at contracting and formal contracting
		Small firms fail to be proactive with documentation and formal contracting
		Small firms know their technology but not law
	Small firms lack the competence to evaluate their case before enforcing	Large firms can assess infringement cases with in-house resources
		Large firms have better routines to prepare for conflicts
		One patent can be the foundation of small firms business
Phase 3	Economic constraints significantly limits the chances to win in litigation	Small firms need more external help before and during conflict
		Small firms sue for emotional reasons
		Small firms sue to prove patent-value to investors
		Small firms that sue on poor grounds is a problem
		Small firms are forced to (counter)sue as their only option
		Difficult for small firms to defend their patent due to lack of money
		Large economic consequences for small firms involved in litigation
	Lack of proper documentation and contracts prevent small firms from building a strong case in litigation	Large firms can put more money into litigation
		Large firms throw in a lot of evidence as a strategy to stall and shift focus
		Small firms run out of money during litigation
	Small firms need more external support in litigation	The money spent in litigation affects the chance to win
		The patent litigation takes time and is taxing
		The Swedish process allows for bringing up a lot of evidence material
		Difficult to build a strong case for small firms due to lack of documentation and contracts
	High opportunity cost and personal consequences from involvement in litigation	Good documentations and contracts increases chances to win in litigation
		Large firms have better routines to prepare for conflicts
		Choosing the right attorney affects chances to win in litigation
		Large firms better at choosing attorneys
		Small firms know their technology but not law
		Small firms less proactive in choosing attorneys
		Small firms need more external help before and during conflict
		Specialised knowledge resources required in litigation
		Emotionally taxing to be in litigation
		Important to involve people from the firm in litigation
		Key employees in small firms get tied up in the litigation process
		Large firms have dedicated departments and employees for dealing with
		Psychologically taxing to be involved in litigation
		The CEO or other key people have to deal with litigation in small firms
		The litigation process causes a negative view on patents among small
		The litigation takes focus from the business

Table 4: Coding table for suggested solutions

The table presents all first level codes and relates them to the second level theme. The right column contains all the descriptive first level codewords relating to solutions proposed by the respondents, and links them to the theme (second level code) they are categorized under in the middle column. The proposed solutions have been divided into three themes depending on what type of measures they entail.

	2nd level theme	1st level codes
Solutions	Education and external competence	Education & requirements for documentation and contracting
		Education on the function of patents
		Union for small firm/organization similar to STIM
		Prevent over belief about the function of patents
		Stop giving poor advice to patent
	Changes to the litigation process	Courts can be more strict in evaluating what evidence to bring up
		Higher damages
		Problems with a simplified process
		Trade-of between simplified and legal quality of the process
	Financial support	Give legal representation to actors that can't afford it
		Improve legal insurances
		Private litigation funding
		Public litigation funding
		Public funding to evaluate case
		Problems with public litigation funding

4. Empirical findings

In the following section the findings from the interview study with patent attorneys is presented. The breakdown of the findings is aligned with the coding of the interview data and are therefore presented for each of the different chronological phases that emerged from the coding. Challenges and causes for the disadvantage have been identified in the three chronological phases, (1) before up until applying for a patent, (2) owning a patent and getting involved in a conflict and (3) during involvement in patent litigation. In each of the three chronological phases, different themes were identified with challenges or disadvantages that has their roots in, or that small firms face, in each phase. Except for the three chronological phases, the coding resulted in one category that summarizes solutions and remedies suggested by the respondents on how to help small firms.

4.1. Phase 1: Applying for a patent

The first phase includes the period before and up until applying for patents. The findings illustrate challenges small firms face and mistakes they make when deciding whether and what to patent, and when applying for patents. The decisions made already at this early phase do have implications for the chances to win later in litigation. The main themes identified relate to challenges related to economic constraints in small firms, lack of foresight in patent formulation, and deciding to patent on poor grounds.

4.1.1. Economic barriers stop small firms from getting patents

Applying for and owning a patent does cost money. According to many of the respondents, the cost of getting a patent does affect the decision whether to get patents or not, in particular for small firms. Relatively speaking, the cost of getting a patent is usually more significant for small than large firms. Therefore, small firms are more influenced by financial constraints in their patenting decision and may not have the opportunity to get the patents needed for optimal protection against infringement. As one respondent stated:

Of course, for a small firm that might not even have a positive cashflow yet and survives only thanks to investments, for them the high cost might be a real problem.
(S10)

Many respondents also pointed out that small firms are more often than large firms unaware of the fact that the application cost is not the only cost. It does cost money to own a patent since the patent owner needs to pay annuities, which small firms often do not think about when considering the opportunity to get a patent. Therefore, small firms are oftentimes not prepared financially to handle a potential conflict and litigation.

4.1.2. Lack of foresight and deliberate strategy lead to poor patents

A common pattern for small firms, as described by the respondents, is that they get patents only based on external advice. In many cases small firms perceive that they need a patent to attract investors or collaboration partners.

It is not entirely uncommon that having a patent becomes a necessity to get an investment. So, I would say the decision [to get a patent] is very driven by the investment phase. (S12)

In many cases, it even seems as the primary reason to get a patent for small firms is to attract investors, rather than for using it as a part of their IP-strategy to protect their technology. The decision to patent in those cases is not based on an overarching IP-strategy, and many small firms do not even consider the patent as a tool to enforce if other actors infringe it.

My view is that a lot of small firms don't think about patents primarily as a tool to enforce and for going into litigations, but rather as something that manifests value and something they can show for investors and potential collaborators. (S9)

Some respondents pointed out that the lack of strategic intent with the patenting decision may result in patents that are not well suited or optimized to be used for protecting the core technology. Small firms may hire an IP-person, or use consulting services, to formulate patents with the primary purpose to simply get the patent granted, rather than to get a patent that is strategically formulated for exploitation of the technology and enforcement. One respondent commented the following on the expertise small firms consult when their main goal is to simply get a patent granted:

They understand how to push applications through the EPO. They know zero about litigation because they are not legally trained. They know how to push applications through the EPO. (S1)

In summary, the incentives that small firms have when deciding to get a patent, might lead to a lack of proactiveness in the formulation of the patents and arbitrary decisions on what exactly to patent. This lack of foresight can influence the chances to negotiate and win if the firm end up in a conflict and litigation.

4.1.3. Overly optimistic view influences the decision to get a patent

A lot of the respondents mentioned that small firms tend to overestimate the scope of protection that a patent provides, and underestimate the efforts required to enforce them. Larger firms are usually more aware of how the patent system works, for example that other firms can invent around the patent protection and that the patent holder actively must sue or contact any potential infringer. Small firms and individual inventors in many cases believe that a patent guarantees them the right to use what they perceive to be the invention, which may be much broader than what is defined in the patent. This may lead to patenting decisions based on incorrect expectations, a lack of preparedness for enforcing the patent, and lack of other measures to protect the invention.

But I still think there is a rather, what shall I say, a naive attitude to what a patent is, and what kind of protection you get, and there is a belief sometimes that it is a general blessing. (S8)

Further, it seems to be common that small firms are not aware of all costs related to applying for and owning a patent when they decide to apply for one. Therefore, the fact that they need to pay annuities may come as a surprise and not be factored into the patenting decision. Further, it leads to financial challenges and lack of financial preparedness for keeping and defending the patent.

Medium sized companies do absolutely have a larger awareness, but small firms not so much. They might be concerned about the initial costs, "oh, it is really expensive to apply for a patent!", yeah, but it will only get more expensive since the annuity is increased each year. And then you might want to add countries, and you only have one chance to do that. (S7)

Finally, some respondents mentioned that small firms are prone to make mistakes that might make it difficult for them to even get the patents they intend. For example, they might accidentally publish or say something about the invention before patenting, ruining any chance to get a patent. Another mistake that small firms that are in collaborations tend to do is to not formally keep track and document who does what, which might lead to conflicts about who is the inventor when applying for a patent.

4.2. Phase 2: Having a patent and getting into conflict

The second phase constitutes the period after getting a patent granted, up until potentially being involved in a conflict. Therefore, it includes both the stage where the firm is a patent owner but not yet in a conflict, and the stage of getting involved in a conflict but before getting into litigation. At this stage, small firms suffer from disadvantages primarily due to lack of internal knowledge and financial constraints. Small firms also tend to make mistakes in these stages by failing to be proactive in documentation and contracting, which may be detrimental if they end up in a litigation process.

4.2.1. Economic constraints prevent small firms from detecting infringement and enforcing their patents

All respondents share the view that small firms in general are more subject to financial constraints than large firms. At the stage of owning a patent and at the early stages of patent conflicts this leads to some challenges and disadvantages for small compared to large firms. At the first stage, while owning a patent but without yet being involved in any conflict, small firms generally struggle more to monitor the market to detect potential infringers. Most respondents agreed that large firms usually have more active surveillance of competitors, patent filings and the overall market to actively identify products that may infringe their patents. The respondents pointed out that such surveillance can be done either in-house or outsourced to specialized firms, but that it in either case is expensive. Therefore, small firms usually cannot afford comprehensive surveillance in the way that larger firms can. Instead, small firms rely more heavily on their employees and network to detect potential infringements to their patents. However, large firms tend to also have more well-established routines internally and in their

network for reporting and detecting potential infringement, once again putting smaller firms in disadvantage when it comes to detecting infringement.

I mean, larger firms do have more monitoring. It is quite expensive to monitor the market, so it is fundamentally a financial problem (...). So, I would say that the firms that do have the liquidity to monitor do that. So, when it fails, I would say that is because they have not had the time and money to do it. (S14)

If a firm does manage to detect a potential infringement, or are being sued for infringement, small firms still seem to suffer from disadvantages due to financial constraints. Usually, the involved parties try to agree on a settlement, but if they cannot agree the conflict can end up in court. Most respondents agreed that small firms are more prone to want to avoid litigation processes in court than large firms, due to the high financial risks of involvement. According to the respondents, it is expensive to litigate, and the economic factor is always relevant when deciding whether to sue or not. However, for small firms, the economic risks of going into litigation are usually higher than for larger firms, at least in relative terms. Therefore, small firms tend to avoid litigation to a larger extent than larger firms and in some cases have to agree to suboptimal settlements simply due to financial constraints. The following two quotes from different respondents exemplify the financial disadvantage small firms have when deciding whether to litigate or not:

Yes, of course it is always more severe for a financially weaker firm to go into a patent litigation process, if you compare to these like large giants that have a lot more resources. (S13)

As an attorney you always have to do some sort of assessment of the case, and if you have a large client, it might be acceptable that they have a 60/40 chance to win. However, if you represent a smaller client, then you have to reach like over 70/30 chance of winning for it to be worth it. (S12)

Some respondents further conclude that it is much more uncommon for small firms to sue large firms for infringement than the opposite, due to the financial risks of litigation. Finally, a few respondents also pointed out that small firms may in many cases feel more threatened by the risk of getting their patent invalidated that a litigation process invokes, since they often base their entire business around a single patent. In short, economic barriers stop small firms from enforcing their patents by litigation.

4.2.2. Small firms fail to proactively document and set up formal contracts

A big mistake that small firms make, according to most respondents, is that they fail to document and set up formal contracts at the stage where they own a patent. Large firms usually have well established routines to document all actions and decisions that relate to patents, and to set up formal contracts with for example collaboration partners. Small firms however often fail to do this. The respondents agree that this can be a huge problem if the patent is subject to a conflict and litigation where they need to provide evidence material.

This is a problem with small firms. They are focused on their business and being entrepreneurs, and they don't think that "now we have to save material and document what we are doing all the time, in case we would end up in a litigation trial". So that is a problem that small firms have. (S7)

The respondents mentioned a few reasons for why small firms fail to proactively document and set up formal contracts. The most mentioned reason is illustrated in the quote above and is simply that small firms are very focused on their business and don't have the time, knowledge, and resources to prioritize documentation and contracting. Large firms on the other hand, especially those that are used to dealing with patents, tend to have well established routines for documentation and contracting. Another reason for poor documentation and contracting in small firms that some respondents mentioned was related to psychological or interpersonal factors. In some cases, small firms might be reluctant to set up formal contracts since they do not want to harm informal trust between them and for example collaboration partners. The fact that small firms often have poor documentation and contracts, may cause large issues at a later stage when they go into litigation.

4.2.3. Small firms lack the competence to evaluate their case before enforcing

When detecting an infringement or being sued for it, the first step is usually for the firm to evaluate their case and chances of winning in a potential litigation. Most respondents agreed that small firms struggle more than larger firms in this evaluation due primarily to lack of knowledge and internal resources. Large firms more commonly have internal resources to conduct evaluations, meaning that small firms must turn to external attorneys and experts. As a result, many respondents claim that small firms are more likely to abandon the opportunity to enforce already before evaluating the case and considering enforcement options. If small firms are sued or decide to get external help to evaluate their case it does constitute a financial effort.

The largest difference, I would say, is that the large firms with patents usually have the opportunity to evaluate the case, if it is an infringement or not, already in-house. The small firms and entrepreneurs have to go to a patent agency or attorneys and say, "I need help, we have this patent and I think... could you help me analyze this?" or something similar. They need that help, since they are insecure. The larger firms on the other hand have already confirmed that there is an infringement when they come to us, and... they usually have a strategy in place where they have categorized their rights. (S6)

Partly as a consequence of this, small firms tend to go into litigation with poor understanding about the potential consequences and their chances of winning. Further, a lot of respondents pointed out that small firms and entrepreneurs might in some cases be eager to sue what they perceive to be an infringement, even though they are not fully aware of the implications. One respondent stated:

I think the dialogue with external advisors is very important, to make sure they are not to trigger happy, which they often are in these situations. Many times, it is very infected, there are a lot of emotions. For startups and entrepreneurs that are usually very passionate about their business and inventions or whatever, they might feel that “we have to fight against this, let's go”. And many times, these people are risk takers, these entrepreneurs and small firms have that like, entrepreneurial spirit. So it might be that they don't think it through a thousand times, they just go. So, they do that, fast, they want action, and they might not take the time to listen to their advisors and think about what they are getting into. So then, after a while it will probably start to diverge, and they end up in a situation where “this does not correspond to what I thought I was getting into”. (S10)

On the contrary, many respondents mentioned that small firms can many times be forced into conflicts and litigation processes against their own will. For many small firms, the entire business is dependent on technology protected by just one patent, and in that case, they might have no other options than to face the conflict headfirst. Further, since small firms tend to get patents only to get investment, they may in practice be forced to sue and litigate to prove to their investors that their patent is valuable and that they are willing to enforce it. In short, small firms tend to get into litigation on poor grounds and being less prepared than large firms, which does influence the chances to win.

4.3. Phase 3: Patent litigation

The third phase simply includes the litigation court process. From the interview study, it is evident that small firms face a lot of challenges in litigation. Again, small firms seem to be at a disadvantage due to financial constraints and lack of internal knowledge resources. Further, mistakes made at earlier stages can prove detrimental in litigation, for example lack of proper documentation and contracting. Finally, it seems to be more demanding for small firms to be part of litigation on an emotional level for the individuals involved, which may lead to a bad overall view on the patent system from small firms and entrepreneurs.

4.3.1. *Economic constraints significantly limit the chance to win in litigation*

All respondents stated that it is expensive to be in patent litigation and that patent litigation is one of the most complex and expensive forms of trials in court. A large part of the costs comes from fees to attorneys and the respondents pointed out that it is important to have an attorney with experience from patent litigation, of which there are only a few from quite expensive firms in Sweden. Further, to build a strong case, the parties in the litigation can benefit from paying external experts to do evaluations on the patent and the alleged infringers technology. In short, it does cost a lot of money to be in a patent litigation process, and spending more money usually increases the chances to win.

Almost all respondents agreed that small firms have a significant disadvantage to larger firms in litigation. Larger firms are usually less constrained financially and can spend more money on building a strong case. According to the respondents, spending more money significantly

impacts the chances to win in litigation. For example, as one respondent claimed, the parties can benefit from paying for external evaluations of the product from the alleged infringer, which small firms many times cannot afford to do.

Then you have, in the next stage, you need to hire some independent third party, maybe some sort of technical analyst to do an examination of a certain product for example. But that can really cost a lot of money. Because, then you need, apart from your attorney and patent engineer, you need to hire yet another party, for example an independent consultancy firm that provides a service that you need to prove a certain claim. And a large firm can afford such a cost, but perhaps not a small startup. (S14)

The financial constraints small firms often suffer from do not only stop them from building a strong case. In fact, it is not entirely uncommon that small firms simply run out of money during the process and have to find more financing or abort the litigation entirely. As one respondent stated:

It is not entirely uncommon that they [small firms], after running the process a while, simply run out of money. Then you face the dilemma, like, what do we do now? (S12)

Finally, many respondents pointed out that it is quite common that large firms actively use their advantage in being less financially constrained as a strategy in litigation. The Swedish litigation process allows for the parties to invoke a lot of evidence of their choice, which the opposing party then has to disprove or argue against. Large firms, in some cases, actively use this to shift focus from the main case, swell the size of the case and stall the proceedings, which may be detrimental for smaller less capital strong counterparts. One respondent stated:

It is important to not underestimate that this imbalance between the parties can be used as a strategic weapon. It can be used by the larger actor, in more or less subtle ways. For example, they might make the process significantly larger than it needs to be. They can invoke a tremendous number of expert testimonials and evidence, that the small actor then has to consider and argue against in some way. And large actors use this to make the case larger and longer. (S12)

4.3.2. Lack of proper documentation and contracts prevent small firms from building a strong case in litigation

All the respondents that were interviewed had a lot of experience from patent litigation. All of them shared the view that in order to win a case in court, it ultimately comes down to being able to build a strong case with concrete evidence material. It does not matter what actually happened or who might have the “moral right” in a given situation, it all comes down to evidence. The following two quotes illustrates the importance of concrete evidence to build a strong case:

I would say that it is very important. A patent dispute is seldom a matter of only law, it is ultimately a matter of evidence. And the one who can... the one who has good documentation, is in a much better position. (S9)

The quality of the case does depend on what you have access to. You do not have a case if you cannot prove it, and I would say that is the most common reason... Or not the most common, but one of the common reasons to why you lose, that you underestimate what evidence you need to put forward. (S4)

As mentioned earlier, small firms tend to be less structured with documentation and formal contracting while owning and using their patents. Large firms often have formal routines to make sure they document properly and save anything that might be used as evidence in litigation. Small firms, however, often lack such routines. In litigation this may be detrimental for small firms. Most respondents agreed that it is a problem for small firms that they have not documented properly, and that it significantly impacts their chances to win in litigation. The following quote from one of the respondents summarizes the problem:

It is not about being right, but it's about proving that you are right. Small firms almost always... or not almost always, but a lot of the time they have a disadvantage in that they haven't documented things properly and haven't saved things. It often comes to a situation where they say "yeah but we have used this, we showed it at these points and we have been using it since 2018" and I say "ok, great", "yeah we have used this, everyone knows about it, we have used it everywhere, it is known", "ok that's great, can you show me any documents for this?", and they can't, because there are no documents. (S7)

4.3.3. Small firms need more external support in litigation

Building a strong case to be successful in patent litigations is dependent on access to several different fields of knowledge. Besides legal expertise there is also a need for technical knowledge and knowledge about the products and patents in question. Most respondents agreed that large firms, more commonly than small firms, can access such expertise in-house. Large firms typically have a legal department, or even a patent department, that can discuss legal issues on a high level with external attorneys. Further, large firms usually have technical expertise and product experts in-house. On the contrary, small firms often lack such internal knowledge resources. Consequently, small firms have a harder time building a strong case and usually have to consult more external experts.

Then I would say you have to help small firms more and guide them more in many ways. Usually, they need external help with technical expertise and things like that. Large firms, on the other hand, usually have experts in-house that we use in the litigation, depending on the specific technological area. (S6)

Another knowledge-related challenge that might constitute a disadvantage for small firms relates to choosing the right attorneys. Most respondents pointed out that patent right is a specialized field and that it is important to find an attorney with experience from that. In Sweden, there is not an abundance of specialized patent attorneys, and they tend to work for a few large law firms that are usually quite expensive to hire. Further, a few of the respondents mentioned that small firms tend to be less aware, or less prepared to secure collaboration with such specialized attorneys. One respondent, whose firm mostly worked for large actors, stated that:

I think that the larger firms are usually a bit faster and more active in choosing their attorneys, so I think that is the reason [that they mostly work with large firms]. Because it is not like we actively try to avoid smaller actors, it is just how it has turned out. (S8)

4.3.4. High opportunity cost and personal consequences from involvement in litigation

It is clear from most interviews that it does take a lot of time for firms to be involved in patent litigation processes. Firms in litigation need to set aside one or a few employees as representatives in the conflict, and these representatives usually need to put a lot of time and effort into, for example, collaborating with the attorneys and taking part in hearings. Large firms typically have a department responsible for dealing with legal conflicts that can be representatives, and they might further have to set aside some individuals with technical knowledge or knowledge about the product. Small firms, however, do not have as many employees and it is not unusual that key personnel such as the CEO or co-founder have to deal with the patent litigation process.

In small firms, the CEO is usually active in the litigation process. In the larger firms, they usually have a department with a budget to deal with conflicts, so there they typically send normal employees to deal with these things, and the CEO is not involved at all, as long as they stick to their budget(...) [And does it take a lot of time to be involved?]. Yes, a lot of time, a lot of time! So that is something you need to consider before considering going into a conflict. (S14)

Some respondents commented that it might be a problem for small firms that the CEO or other key personnel must be involved in litigation, due to the high opportunity cost. Instead of focusing on developing the business, key people in the firms have to spend time dealing with the legal process. Apart from the high opportunity cost, many respondents also pointed to the fact that it may be emotionally taxing to be part of a litigation process, in particular for representatives for small firms that may attach a lot of personal value to their business. Entrepreneurs in small firms oftentimes feel a lot emotionally for their business and the business is a big part of their lives, and it might affect them a lot psychologically to be in a patent conflict. As one respondent stated:

Yes, because these people are only human. They have built a business, they are passionate about it, they have created a solution that is brilliant and finally they can start making money after many years of hard work... So yeah, I mean, this affects their whole lives. My experience is that they think it is very demanding. They just want everything to work out and go away. They think it is terrible with all the money it costs, but also psychologically, that they have too... like the feeling that "I could be working with the product, with what is important, but instead I'm here with this bullshit and someone fighting with us. And then there is some attorney that wants money for every hour of work...". So yeah, it is not a simple issue this. (S2)

Some respondents pointed out that these bad experiences may cause a negative view on the entire patent system for many small firms and entrepreneurs.

I mean, when the inventors are involved themselves, they may feel that... Yeah that they have been in a disadvantage and treated unfair and that the entire patent system is useless. (S8)

4.4. Solutions suggested by the respondents

In every interview, the respondents had the opportunity to talk about their ideas on how to help small firms make use of and enforce their patents. The suggestions range from general ideas on education for small firms to targeted financial support for small firms in litigation. In the following section, the ideas for solutions and remedies have been classified depending on if they relate to support small firms with general education and external competence, make changes to the litigation process, or provide financial support to small firms.

4.4.1. Knowledge and external competence

Almost all respondents mentioned different forms of education to small firms as a remedy for some of the problems small firms face in the patent process. The respondents pointed to the importance of making entrepreneurs and small firms aware of the function of the patent system at an early stage. Small firms tend to be unaware of how patents work, what they cost and the difficulties in enforcing them. Further, they seem too often overestimate the protection that a patent gives. Therefore, most respondents agreed that it is important to inform small firms about the function of the patent system and prevent the overly optimistic view on their protective abilities.

If the government wants small firms to patent their inventions, then they also need to provide information. They need to be prepared to, I don't know, to not only give capital, but inform about the risks with patents and what it actually means to have a patent. there needs to be someone providing this information. (S2)

Some respondents also acknowledge that they themselves might be a part of the problem by being too liberal in advising small firms to get patents. Further, most respondents agreed that small firms many times are very influenced by for example investors when deciding to patent. Therefore, one suggestion was to simply stop giving bad advice to small firms and be more nuanced when advising about IP-protection:

We should not underestimate the fact that there are many other ways to protect IP that might be easier for small firms. If you for example look at different type of data development copyright might be sufficient. (S12)

The respondents also suggested education focusing on the importance of formal documenting and contracting. The suggestions ranged from general education to frameworks and even demanding a certain degree of structure in documentation for firms that receive public financial support.

Something that is worth considering is some sort of startup help with, like, documentation and contracting. Just to make sure that small firms really have access to the right knowledge and can build their businesses based on that. (S6)

Finally, a suggestion that came up from a few respondents was to establish some sort of union or organization for small firms with patents. The idea would be to collaborate and create an organization that can work as an advisor and perhaps even financier for small firms that end up in litigation. One respondent compared the idea to STIM, which is a Swedish organization with a similar function for music copyright:

In some industries they have some sort of industry organizations, like organizations for tenants for example that can act as representatives in rent disputes. And then there are other examples, like, for copyright for example you have STIM. I don't know if you are aware of STIM? But that is an organization that work for the rights of music creators, so that they get paid when their music is played and things like that. (S14)

4.4.2. Changes to the litigation process

One suggestion that was discussed in most interviews was to make the actual litigation process shorter and more efficient. Some respondents argued that this would help small firms by decreasing the financial cost and the opportunity cost for being involved in litigation. The German patent litigation process came up a few times as an example of an efficient system. However, the general consensus was that the Swedish system is quite balanced as it is. There are other systems that are much more complex and thorough than in Sweden, and most respondents agreed that there is a trade-off between efficiency and ensuring the legal security of the process. Therefore, most respondents did not believe that a slimmed down process would be a viable solution. Further, some respondents argued that it would be of no benefit for small firms specifically to shorten the process down:

I don't think that it is a good solution for the small firms to slim down the process. I think they would only lose out from that actually. Because the large actors are more used to the system. I mean, they are faster when it comes to choosing their attorneys and things like that, so I think they could actually make use of a slimmed down process. (S8)

Another related suggestion that came up was that the courts could be stricter when assessing the evidence that the parties put forward. In the current system, it is possible to put forward a lot of evidence that the court and counterpart must consider. As mentioned earlier, this is sometimes used as a strategy by large actors to stall the process and shift focus from the main points of conflict. Therefore, some respondents suggested the courts can be a bit stricter when evaluating the relevance of evidence put forward by the actors.

I would say that perhaps the courts could be a bit stricter. In my opinion, they could be a bit faster with saying "yes, thank you, it's enough. We got the case now. You are just putting this forward to stall the process and increase the costs. We got all the facts we need now, so it is enough". I think that could keep the process a bit

shorter and reduce the costs a bit, and perhaps prevent the abuse where this is used as a strategy. (S5)

A final idea that was mentioned by a few respondents was to reward higher damages to the winners in litigation cases. The damages awarded in Sweden are, according to the respondents, quite low in an international context. One respondent even argued that it seems as though the Swedish system is designed to discourage small actors from going into litigation. The point made by the respondent was that, since it does involve a high risk for small firms to go into litigation, there needs to be a reasonable potential upside to it for it to be worthwhile for small firms. Therefore, awarding higher damages might be a way to encourage small actors to enforce their patents.

One problem in Sweden is that the damages are quite low. In the US it might be different for example. There is an incentive in the fact that you can get high damages, which doesn't really exist in Sweden. And that might make it even more difficult for small firms to pursue these cases in Sweden. Because, even if you win the case, you might not... you might be compensated for your costs in the best case, but sometimes not, sometimes you might get 75% or something like that. But at that point you have already spent so much time with the CEO or some key people involved, and that can't really be compensated for fully. So it might be that even if you win a case, you kind of lose anyway. (S15)

Some respondents made similar points about injunctions, mentioning that it is difficult to get an injunction in Sweden which might discourage small firms from enforcing their patents.

4.4.3. Financial support

The last theme of suggested solutions relates to supporting individual small actors when they are involved in litigation. One suggestion that was discussed with most respondents was to provide public funding for litigation to firms that cannot afford to cover the costs themselves.

I guess one way would be to provide financial support for the litigation process. Because, as far as I know, you can get support for applying for patents, and then you might have an insurance in case you get into a process, but those are usually limited to some amount of money that isn't very high. (S7)

The idea with direct public funding to small actors was however problematized by almost all respondents. Providing public funding to a private actor in a conflict between two private actors might be considered unfair and undermine the principle of free competition. Further, some respondents pointed out that it might encourage small firms, that are eligible for the support, to litigate on poor grounds and pursue patent troll behavior since they get the costs covered anyway. Therefore, most respondents did not see direct public litigation funding as a viable solution to help small firms enforce their patents.

Some respondents suggested options to direct funding that they believed to be more viable. For example, one suggestion was to provide an attorney to firms that cannot afford their own

representation, similar to public defense in civil cases. One respondent claimed that this option has been discussed in Germany and that they have been close to implementing it.

So, it has been thought you know, I think Germany has come the farthest. There was some talk about, once upon a time, you know if you are accused of a crime, pretty much everywhere in the world, they will provide you with a defense. And there was a talk for a while about providing people with counsel in civil litigations where they can't afford it. And I think Germany went the farthest, the only place I know of. But I don't know, think, in the end that that became anything. (S1)

Another option that some respondents suggested was to at least provide public funding for evaluating the strength of the case before going into litigation. One problem for resource weak small actors is that they struggle and give up already before litigation since they cannot afford a proper evaluation of their case and chances to win. Some respondents suggested that providing public funding for such evaluations could potentially help small firms decide whether to go into litigation or not.

Further, some respondents mention private litigation funding as an option. In Sweden, as opposed to the US, it is not possible to make use of contingency fee lawyers that work for free in exchange for a cut of potential damages. Therefore, the firm must be liquid enough to pay for their representation up front. Some respondents mentioned however, that there are an increasing number of private firms entering Sweden that offer to finance litigation costs in exchange for a cut of the potential damages. Some respondents therefore argued that the market might solve some of the financing issues small firms have, by the entrance of patent litigation funding firms.

I defend a small firm right now, and there is, maybe we'll return to that, but there is one interesting new phenomenon, which is the possibility to share risks with an external financier. There are some firms that say, "we can finance this and take some risk in this process". (S1)

Finally, many respondents talked about encouraging access to more comprehensive legal insurances. There currently exist a variety of legal insurances on the market, however, most of them exclude patent cases or are very limited in terms of the size of compensation. Both relating to insurances and private funding firms, none of the respondents had any concrete idea of how to encourage their occurrence, since that is fundamentally driven by the market.

5. Analysis & Discussion

The purpose of this study has been to examine if and in what way small firms have a disadvantage compared to large firms in patent conflicts and identify causes to and consequences of this disadvantage. The empirical findings from the interview study provide data on these issues, from the perspective of patent attorneys. The findings show that some of the challenges small firms face in litigation has their origin in phases long before the actual litigation process. In the analysis and discussion section, I will provide a proposal for a classification of the causes of the disadvantage small firms are subject to. I will discuss these causes and connect them to previous literature and consequences for small firms and society. Further, I will link the solutions and remedies suggested by the respondents to the causes and discuss their viability in alleviating any potential consequences. The section starts with a presentation of the proposed classification, which is followed by a discussion connecting the identified causes to previous literature and linking the causes to consequences and suggested solutions.

5.1. Towards a classification of the causes for small firms' disadvantage

The empirical findings reveal a lot of different challenges in the patent process that are unique or particularly significant for small firms. A lot of the challenges are caused by constraints or mistakes made in phases much earlier than the actual litigation process. The causes for the disadvantages range from economic constraints to lack of foresight, time, and general knowledge.

One point that can be derived from analyzing the themes in table 3, and that was explicitly mentioned by some respondents, is that the disadvantages does not primarily seem to originate from the legal or patent system explicitly mistreating small firms in any way. All firms are treated equally in the entire process, and some respondents mentioned that courts might even support small firms by providing advice to a larger extent than they do to large firms. In short, the disadvantage does not originate from a fundamentally discriminatory legal or patent system. Rather, the disadvantage seems to be an effect of general differences between large and small firms. Certain attributes that cause a relative disadvantage are inherently more common in small than large firms. For example, small firms by definition have fewer employees than large firms, which have proven to cause problems in litigation where small firms have to send key employees to deal with the litigation. Further, in absolute terms, small firms tend to have lower revenues and cash flows than large firms, making the costs associated with patenting more significant in relation to the firms' economic situation. This observation, although intuitively quite obvious, provides a good foundation for analyzing the challenges small firms face and classifying the causes of their relative disadvantage in the patent process.

One attribute that causes challenges, that is obvious when analyzing the themes in table 3, is the fact that small firms seem to be generally more economically constrained than large firms. These economic constraints cause significant challenges for small firms in each of the three chronological phases defined in the empirical findings section. Therefore, economic constraints

will constitute one part of the classification of causes to small firms' disadvantage. The causes for the challenges and disadvantage that cannot be attributed to economic constraints are arguably a bit more diffuse and difficult to classify. Overall, lack of knowledge, internal resources and employees seem to be attributes that are more common for small firms that contribute to the identified challenges. Further, lower margins to handle risk and more dependents on one single patent are also factors that can be assigned as causes for the disadvantage. To generalize these causes, all challenges not directly attributable to economic constraints were listed and clustered based their general similarity. After some analysis, two categories of causes became reasonably clear and therefore will constitute a part of the classification. One of the categories related to a general lack of knowledge and internal resources in small firms. The other theme relates to a lack of foresight and ability to be proactive.

In table 5 all the identified challenges from the empirical findings are listed and classified based on their causes and in which chronological phase they occur or emerge. Further, the suggested solutions and remedies have been linked to the class of causes that they might help to cure. In the following section, each class of causes will be discussed in more detail and analyzed in relation to previous literature on the topic. Further, potential, and existing consequences for each class of challenges are discussed. Finally, the viability of the suggested solutions linked to each class is discussed shortly.

Table 5: Categorization of causes to small firms' disadvantages

The table presents a proposed classifications of the causes behind the challenges and disadvantage small firms face in the patent process. In the right column, the three classes of causes are presented. The causes are then linked to the challenges they cause and proposed solutions to help small firms in the remaining columns.

	Phase 1	Phase 2	Phase 3	Solutions
Economic constraints	-Economic constraints stop small firms from getting a patent	-Small firms are reluctant to enforce patents due to large economic risk -Small firms cannot afford to monitor the market for potential infringements	-Economic constraints significantly affect small firms' chances of winning in litigation -Large firms strategically make the litigation process longer and more expensive than it needs to be	-Public litigation funding -Funding to evaluate case before litigation -Publicly funded attorneys -Legal insurance -Private litigation funding -Reduce complexity/time of litigation processes -Being stricter in assessing evidence material provided during litigation -Award higher damages
Lack of knowledge and internal resources	-Small firms have poor understanding about the function of patents and the efforts required to enforce them	-Small firms lack internal resources to assess the quality of their case before enforcing -Small firms are reluctant to enforce patents to avoid invalidation since their entire business model might depend on one patent	-Small firms need more external advice/services from attorneys and experts -CEO or other key individuals have to handle the litigation process, stalling them from focusing on business and innovation	-Establishment of support organization similar to STIM -Funding to evaluate case before litigation Education on the function of patents and IP-protection
Lack of foresight	-Small firms patent only based on external advice -Small firms patent without a deliberate strategy and therefore get patents that are not optimized for enforcement	-Small firms fail to document and set up formal contracts	-Small firms struggle to build a strong case since they have not documented well and established formal contracts -Large firms are better at choosing attorneys	-Education on documentation and contracting -Education on the function of patents and IP-protection

5.2. Economic constraints

The empirical findings clearly indicate that economic constraints are a significant cause for the challenges small firms face throughout the patent process. From the perspective of attorneys, financial considerations do affect small firms' decisions on whether to get patents and on whether to enforce their patents or not. Further lack of money does significantly seem to impact the chances of winning in litigation negatively. These findings are mostly supported by existing literature. The respondents contributed with some suggestions to help small firms, most of which relate to different forms of funding. Some ideas seem more promising than others, but all the suggestions need to be examined and specified more before potentially implementing

any of them. Figure 1 summarizes the challenges caused by economic constraints and the suggested solutions that will be discussed in the section.

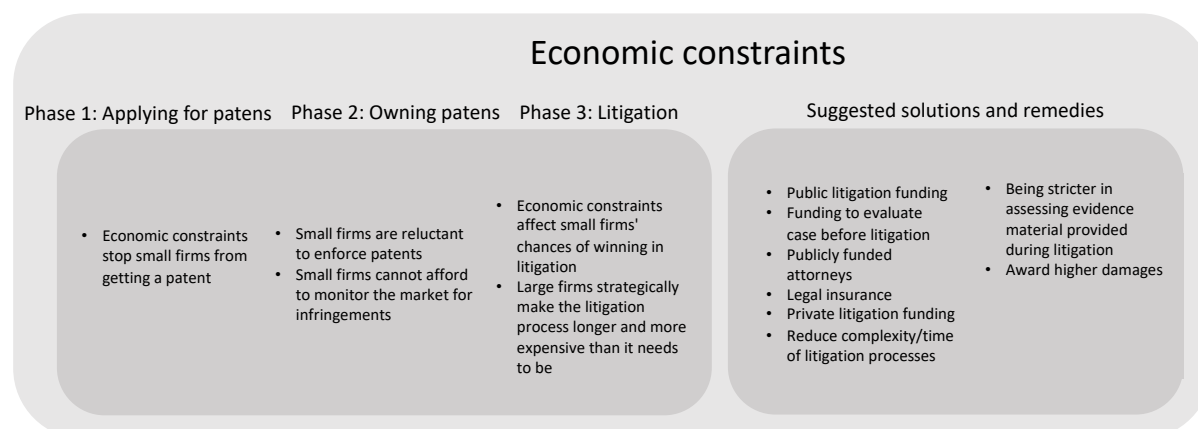


Figure 1 – Challenges caused by economic constraints

The figure summarizes the challenges and solutions from table 5 that are linked to economic constraints in small firms.

5.2.1. Relation to previous literature

The empirical findings reveal that the high costs for getting and enforcing patents might be a real barrier for small firms that are financially constrained. According to the respondents, small firms do in some cases decide not to patent since they are not capable of handling the high costs. This observation does make sense on an intuitive level and is in line with previous findings from Athreye et al. (2021) who found that the high cost for getting a patent does in many cases deter small firms from patenting. If it is true that small firms choose not to patent due to cost constraints more often than large firms, small firms should patent less than large firms in general, *ceteris paribus*. It does seem to be the case that small firms patent less, both according to findings from Holgersson (2013) showing that small firms have a lower propensity for patenting, and from statistics provided by Eurostat (2014). According to Eurostat (2014), 99,8% of all small firms in the EU can be classified as SMEs, yet only 17% of all patent applications can be attributed to SMEs. From this, it is clear that small firms in general patent less than large firms. There is probably more than one reason why small firms patent less, but it is likely that cost constraints are one contributing factor.

Moving on to the phase of owning a patent and detecting infringement, the empirical findings indicate that small firms struggle both with detecting infringements due to poor monitoring of the market, and in enforcing their patents. There is not a lot of previous literature examining to what extent small firms monitor the market for infringement compared to large firms, but it does make intuitive sense that they do it to a lesser extent due to cost constraints. A lack of monitoring should in theory mean that small firms detect a lower fraction of infringements than large firms, and that small firms' patents are more commonly infringed without the patent holder even noticing. If, however, a firm does detect an infringement, Yang (2019) states that the first enforcement step is usually to send a cease-and-desist letter to the alleged infringer. The next step is to negotiate, but if the parties still do not manage to settle, the final step is to sue the alleged infringer (Yang, 2019). The empirical findings highlight that small firms are more reluctant to take any of these actions. The first step, which is sending a cease-and-desist

letter, usually requires involvement of an attorney, and many respondents claimed that sometimes small firms abandon the opportunity to enforce already at this stage. However, the most significant indication from the empirical findings is that small firms are more reluctant to go into litigation than large firms.

It does make sense that small firms are reluctant to go into litigation, since according to WIPO (2018) patent litigation is considered one of the most complex forms of civil litigation. The finding that small firms avoid litigation due to financial constraints is further confirmed by UnifiedPatents (2019) who states that going to court might not even be an option for small firms because the costs are too high, and by Lanjouw & Schankerman (2004) claiming that the risks associated with going into litigation are much higher for small firms than large firms. Zooming out, Crampes and Langinier (2002) found that 56% of all patent cases are settled before litigation in Germany, while the number might be as high as 95% in the US (Lanjouw & Schankerman, 2003). It is unclear why such a large fraction of all cases are settled, but one contributing factor for cases involving small firms might simply be that financial constraints prevent them from starting a court process.

When small firms do go into litigation, financial constraints once again seem to constitute a fundamental problem. As mentioned in the empirical findings, almost all respondents agreed that small firms are, in general, more subject to financial constraints in litigation than large firms. This is in line with existing literature, with for example Athreye et al. (2021) and Burkhardt and Dilexit (2021) claiming that small firms are more commonly affected by cost constraints in litigation and for example struggle to pay for attorneys and expert testimonials. From the empirical findings, it further seems like these constraints significantly impact the chances to win in the litigation process. Most respondents agreed that the amount of money put into litigation does impact the chances to win, and that this is oftentimes used strategically by large actors who throw in a lot of evidence to stall the case. Large firms, generally being less economically constrained than small firms, can use this strategy to shift focus from parts where their case is weaker, and to stall the process to force small firms to settle or give up. Although there is no explicit confirmation of this in previous literature, the fact that Swedish litigation processes are comparatively long in duration in an international context (Bjuggren et al., 2015) imply that the processes indeed tend to be rigorous and cover a lot of evidence material. Further, Swedish courts apply a rule referred to as *fee shifting*, meaning that the losing party pays the litigation costs for both parties in litigation. This means that large firms are not disincentivized by costs to throw in excessive amounts of evidence, if they are confident that they will win the case if they do. Helmers et al. (2021) in fact found that when the British patent court, Intellectual Property Enterprise Court, limited the size of fee awards to successful litigants, large firms in particular spent less on litigation. This further confirms the fact that the Swedish litigation system does provide favorable conditions for large firms to strategically stall processes and shift focus by providing excessive amounts of evidence material.

5.2.2. Consequences

Economic constraints in small firms influence their decisions and behavior at many points throughout the patent process. First, they might not be able to get the patents needed to establish a strong protection for their innovation, and in later stages they struggle to defend the patents

they have. Overall, the financial constraints can prevent small firms from implementing their intended strategy for IP-protection. The problem of not being able to implement an intended strategy due to resource constraints is a problem for small firms in general and is referred to as *liability of smallness* by for example Gimenez-Fernandez et al. (2020). The authors highlight that small firms face problems in many areas that are related simply to their smallness, and thus this general problem is broader than preventing small firms from protecting their IP. This section, however, will cover the specific problems related to the patent process in practical terms, without explicit reference to the liability of smallness. However, it might be of interest for the reader to keep the idea of liability of smallness in mind when reading the section, since it indeed underpins many of the issues discussed in both this and the following sections of the report.

The first direct consequence that can be partly attributed to economic constraints is that small firms have a lower propensity to patent than large firms. There are a lot of other potential reasons that could explain why small firms patent less, such as lower overall innovativeness in small firms, lack of knowledge about patents and strategies not involving patents. However, from the empirical findings and previous literature it is reasonable to assume that financial constraints is one significant factor. Therefore, it is likely that in some cases, small firms that would potentially benefit from patenting do not patent due to financial constraints. In those cases, small firms have to use other strategies to protect their innovation, or simply sit back and hope that no one decides to imitate. If someone does imitate, the lack of patents can constitute a challenge in enforcement and litigation and a relative disadvantage compared to large firms who can afford to patent what they want.

When it comes to enforcement, the empirical findings show that small firms are reluctant to go into litigation and might accept sub-optimal settlement agreements only to avoid litigation. According to Crapmers and Langinier (2002) patents do tend to lose their value if the patent holder fails to find infringers or enforce, which might constitute a problem for small firms that intend to sell their patent or are dependent on it as a quality signal to investors. Further, it goes without saying that it can negatively influence small firms' ability to appropriate value from the innovation if they cannot use their patent to exclude others from commercializing it.

In relation to appropriating value from an innovation, Teece (1986) argues that the ability to do so is dependent first on the innovator's access to complementary resources to commercialize the innovation, and secondly on what he refers to as appropriability regimes. Appropriability regimes are dependent partly on the technological nature of the innovation and partly on the legal mechanisms of protection, which includes patents (Teece, 1986). Small firms tend to lack complementary resources necessary for commercialization compared to larger firms and thus the ability to get and defend patents is arguably more important for small than large firms for appropriating value from an innovation. The fact that small firms struggle both to get and enforce their patents might therefore be very problematic. One potential consequence from the lack of complementary resources and difficulty to enforce patents might be that small firms are incentivized to sell their innovation or the entire firm as soon as possible. By selling the firm or innovation to larger firms that do have complementary resources for commercialization, small firms can ensure that they profit from their innovation even though they lack the ability

to defend their IP. Therefore, financial constraints and the high costs related to patenting might drive small firms and entrepreneurs to short-termedness, developing innovations with only the intention to sell it to a larger firm rather than to commercialize themselves. One respondent in the interview study that worked a lot with startups testified about such a pattern and referred to it as a growing “exit-culture”.

The final finding from the empirical study that relates to financial constraints, is that it limits the chances to win in litigation. It is unclear whether small firms in general are less successful in litigation than large firms, but there are indications that the financial consequences of involvement in litigation are more significant for small than large firms. Burkhardt and Dilexit (2021) found that small firms are highly affected by involvement in litigation and often have to compensate for their losses by, for example, decreasing R&D-spending. Further Bjurgren et al. (2017) have shown that involvement in litigation has a negative influence on small firms’ products on the market. From these findings it can be argued that involvement in patent litigation negatively influences innovativeness and general success for small firms involved. Bjurgren et al. (2017) further showed that entrepreneurs and small firms that have gone through a litigation generally have negative experiences from it, potentially leading to a bad reputation for the patent system among small firms.

5.2.3. Proposed solutions and remedies

In table 5, solutions and remedies proposed by the respondents in the interview study have been listed and linked to the different causes for small firms’ disadvantage. Most remedies relating to economic constraints consist of different forms of funding to small firms involved in litigation. The most straightforward approach suggested by the respondents is to provide public funding to small and financially constrained firms involved in litigation. Public funding of litigation costs would undoubtedly alleviate the financial challenges and consequences small firms suffer from in litigation, however, the suggestion does not target any of the problems small firms face before getting into litigation. To fully alleviate the disadvantage caused by economic constraints in small firms, there would be a need for financing also for getting a patent, monitoring the market, and evaluating their case before going into litigation. Some respondents did in fact suggest public funding for small firms to assess their infringement-case before going into litigation. Although such public funding could indeed help small firms, there are some principal issues related to public funding in this context. First, it is questionable whether it is acceptable from a competition standpoint to provide governmental support to one of two private firms in a conflict and thus benefiting one firm. Secondly, providing support might induce opportunistic behavior from firms eligible for the support who might for example pursue patent trolling, suing a lot of firms on questionable grounds hoping to win at least some cases, knowing their costs are covered. One suggestion that might remedy this is to provide financially weak actors with an attorney rather than covering all costs, similar to public defense in civil litigations.

The next category of suggestions to cure the problems caused by financial constraints relate to different forms of private litigation funding. A lot of respondents mentioned the opportunity for insurances covering patent litigation. Their currently exist legal insurances in Sweden, however they usually do not cover enough to be viable for patent litigation processes that are

very expensive (Forser & Ullman, 2015). There have been attempts by the Swedish Inventor Association (SUF) to establish insurances covering patent litigation, both in 1985 (Forser & Ullman, 2015) and in 2007 (Svenska uppfinnareföreningen, 2007). However, both attempts failed since they were not economically viable. The 1985 attempt failed after 10 years when the funds were drained by two large processes (Forser & Ullman, 2015), and the 2007 attempt failed largely because it only covered legal costs up to 2 million SEK, which is many times not enough to cover patent litigation costs (Palmgren, 2011). These failed attempts, and the fact that it does not exist private insurances covering the costs for private litigation, implies that it is difficult to find arrangements that are economically viable for both the insurance firms and small firms. It is difficult for any actor to do much about this, and therefor establishment of viable patent litigation insurances would be dependent either on finding creative arrangements such as group insurances, or on public funding.

Similar reasoning can be applied for the other suggested solution relating to private financing, with private firms funding litigation in exchange for a cut of potential damages. Just as for private insurances, the idea depends on there being arrangements that are economically viable for the private firms providing the service. According to some respondents, there are currently a few private litigation funding firms that are establishing business in Sweden, but the phenomenon is not well established yet. The reason for it not being well established does probably relate to the fact that it involves a high risk for the funding firm, and the upside is relatively low due to the low damage levels in Sweden. Therefore, one way to encourage the phenomena could potentially be to increase the damage levels. Increasing damage levels do however have other implications, such as further increasing the risk of litigation processes for the defendant and encouraging firms to sue for infringement more often. It might however be worth considering since the idea of private litigation funders do have one significant benefit compared to general insurances. Private firms with the business model to profit from damages in litigation processes they support will likely be very selective with regards to what cases they support. Therefore, they would not contribute to small firms suing others on poor grounds and with a weak case. Rather, strong cases with a good chance to win would be supported, which would arguably contribute positively to the intended function of the patent system.

In some jurisdictions, for example the US, law firms can act as private litigation funders by working on contingency fee rather than upfront payment. Just as a private litigation funder, the lawyers then work to receive a cut of potential damages (Legal information institute, 2020). In Sweden, The Swedish Bar Association prohibits attorneys from working on contingency fee basis (Swedish Bar Association, 2008), meaning that legal professionals cannot get membership and the right to a formal attorney title, "*advokat*", if they work on contingency fee basis. Therefore, the option to use contingency fee lawyers is very limited or non-existing in Sweden. Therefore, one suggestion to encourage the occurrence of private litigation funding options would be for the Swedish Bar Association to permit their members to work on contingency fee basis. However, the Swedish Bar Association probably have good reasons for prohibiting contingency work, meaning that the decision to permit it would have other implications.

The last category of suggested solutions relating to problems caused by financial constraints involves changes in the patent and litigation system. One suggestion, mentioned by a few respondents, is to make litigation processes shorter and less expensive. Some respondents mentioned the German system as an example of a more efficient system with shorter duration and lower costs. Further, some respondents suggested that courts can be stricter in assessing what evidence they consider relevant, to prevent large firms from stalling processes by throwing in unnecessary evidence material. The purpose of these two suggestions is essentially to make the litigation process less economically taxing, which would in theory benefit small firms that are at a disadvantage due to financial constraints. However, simplifying the litigation process comes with the inherent risk to compromise the quality and security of the process, and thus much more evaluation is probably needed before such actions are taken. The final suggestion that a few respondents mentioned is to award higher damages for the infringer and increase the propensity of injunction decisions. Sung (2015) concludes that the fundamental purpose of enforcing patents is to collect damages and get an injunction. Based on that assumption, some respondents argued that it would make more sense for small firms to accept the risks involved with litigation if the rewards were higher. The average damages awarded in Sweden is relatively low in an international context (Bjuggren et al., 2015), and if they were higher, small firms with a strong case might be more inclined to accept the risk of going into litigation. Further, as previously mentioned, higher damages would potentially encourage establishment of private litigation funding firms. However, higher damages would of course also lead to even higher economic risks for small firms in the cases where the small firm is accused of infringement.

5.3. Lack of knowledge and internal resources

The findings strongly indicate that small firms in general lack certain internal resources that are important throughout the patent process. Consequently, small firms tend to need more help from external actors and have to sacrifice more value adding time to partake in litigation. The respondents had some ideas for alleviating the problems caused by the lack of knowledge and internal resources, the most promising being establishment of an organization to help small firms with patents. Figure 3 summarizes the challenges and suggested solutions discussed in this section.



Figure 2 – Challenges caused by lack of knowledge and internal resources

The figure summarizes the challenges and solutions from table 5 that are linked lack of knowledge and internal recourses in small firms.

5.3.1. Relation to previous literature and consequences

The empirical findings show that small firms in general seem to lack competence about patents and internal resources to enforce them. Large firms tend to have an internal legal department and, in some cases, even a dedicated patent department. Small firms do not have the same internal recourses and competency, which lead to a few misconceptions about patents. On the one hand, the empirical findings indicate that small firms tend to overestimate the scope of protection from patents and underestimate the efforts needed to enforce them. A consequence of this might be that small firms are not prepared for dealing with the full scope of a litigation process. For example, Burkhardt and Dilexit (2021) found that small firms involved in patent litigation did in many cases state that the enforcement process was more demanding than they anticipated. Further, the firms interviewed by Burkhardt and Dilexit (2021) generally had a negative view of the patent system and expressed disappointment on the scope and strength of protection provided by the patent. In short, the findings from Burkhardt and Dilexit (2021) indicate that in many cases entrepreneurs and small firms get patents with an over optimistic view on the effectiveness of patents. A probable consequence of this lack of understanding is that small firms get patents on poor grounds and fail to take other actions to protect their innovations. Further, as indicated by the findings from Burkhardt and Dilexit (2021), it might lead to a negative view on the patent system among small firms that are unpleasantly surprised when they get into a conflict.

On the other side of the spectrum, the empirical findings imply that small firms in some cases are unaware of the possibility to use patents at all, or that they lack the internal resources required to formulate, apply for, and enforce patents. Connecting this to theory, Holgersson (2013) found that indeed small firms patent less than large firms due to a lack of competence about patents and lack of internal patenting resources. Similar findings are presented by Olsson & McQueen (2000). The low patenting propensity in small firms might lead to their innovations being more exposed for imitation and giving small firms less leverage in negotiation and litigation processes.

At the stage of owning a patent and being involved in a conflict, the interview study reveals that small firms tend to lack internal resources for evaluating their case before litigation and for building a strong case in court. Large firms tend to have internal departments with relevant competence, while small firms need a lot of help from attorneys and patent agencies. It is not obvious exactly what consequences this lack of internal knowledge and resources have for small firms; however, it is reasonable to assume that it is economically demanding to hire a lot of external experts. Combining this with the findings from the last section, concluding that small firms are already more economically constrained than large firms, it is not a stretch to assume that lack of relevant internal resources indeed constitute a disadvantage for small firms in the patent process. In fact, Crampiere and Langinier (2002) found that the value of a patent is strongly dependent on the competence of the patentees' legal department or external advisors, both when formulating the patent and enforcing it. Given that small firms many times

do not even have an internal legal department and may lack economic resources to hire high quality external help, it is reasonable to assume that small firms don't always get the most out of their patents.

Aside from lacking resources to enforce, some respondents pointed out that small firms are sometimes reluctant to enforce because they are concerned for the risk of getting their patent invalidated. The respondents explained that for some small firms, one single patent might be the basis for the entire business, and getting that patent invalidated would be detrimental. The dependence on patents makes sense in relation to Teece's (1986) framework on profiting from innovation. Teece (1986) points out that innovative firms that lack complementary resources to commercialize their innovation are dependent on establishing tight appropriability regimes to appropriate value from their innovations. Arguably, small firms more often than large firms tend to lack complementary resources which makes them more dependent on protecting their innovation from imitation by for example having strong patents. Therefore, it does make sense that small firms would be reluctant to enforce patents if it is associated with a risk of invalidation of the patent, which it generally is. Ironically, one can make the case that small firms do not only lack complementary resources to commercialize their innovation, but also the resources required to establish strong appropriability regimes. As established in the last paragraph, small firms often lack internal resources to formulate strong patents and enforce them. Therefore, the actors that are arguably most dependent on establishing tight appropriability regimes have the hardest time to do it, at least by the use of patents.

A final problem relating to lack of internal resources, is that the opportunity cost for being in litigation seems to be higher for small firms than large firms. Again, small firms generally lack specialized legal departments, and according to the respondents, it is not uncommon that the CEO, a co-founder, or other key employees have to sacrifice time to deal with the litigation process in small firms. The findings from Burkhardt and Dilexit (2021) confirm this, and further states that and that involvement in litigation does affect the time and effort these key employees can put into the business. Therefore, it might very well be the case that involvement in litigation halts the development of small firms involved and gives them less time to focus on their business and market. Burkhardt and Dilexit (2021) further found that not only the business is affected, but also the individuals involved. Burkhardt and Dilexit (2021) highlight that involvement in litigation many times had negative emotional and psychological effects on the individuals involved, who claimed that their overall enthusiasm and creativity was negatively affected. The responding attorneys in this study testified about similar implications, highlighting that entrepreneurs in small firms are oftentimes very involved with their company and may be affected personally from what happens to the firm. If it is the case that key individuals are affected emotionally, it is not unreasonable to assume that this might negatively influence the firms even after the litigation process is over.

5.3.2. Proposed solutions and remedies

The respondents in the interview study had some suggestions that might remedy the problems related to small firms' lack of knowledge and internal resources. The most straightforward suggestion was to simply educate small firms and entrepreneurs more on the function of patents. The idea is that this would prevent the over belief that some small firms tend to have

for the patent system, and perhaps help small firms evaluate other ways than patents to defend their innovations. It is difficult to question the purpose of this suggestion or find unwanted consequences, however it is important not to be over optimistic with regards to the efficiency of such education. In today's digitized world it is indeed possible to find information about patents and their function, and the reason why small firms do not do that is probably related to lack of time rather than intellectual limitations. A lot of respondents pointed to the fact that entrepreneurs are oftentimes preoccupied with simply keeping their business alive, and that they do not have time to engage in patenting and IP-strategy. The point is that, even if small firms are provided with information about patents and their functions, they might still not put significant effort into patenting issues. However, with that being said, there is little harm to be done with providing education on the function of patents, and it can probably steer some firms in the right direction.

The second suggestion to help firms that lack relevant internal resources in the patent process was to provide funding to help small firms evaluate their case before going into litigation. Small firms have the disadvantage that they usually lack an internal legal department to evaluate the strength of their case when they are in a patent conflict, and thus public funding to evaluate the case could arguably even the odds between large and small firms. However, just as discussed in relation to public litigation funding, there might be some principal issues with providing public support to a private actor in conflict with another private actor.

The final suggestion that was mentioned by some respondents would support small firms with a lot of the internal resources and knowledge they lack. The suggestion came up in various forms, but the fundamental idea is to establish an organization that would help small firms with patent related issues. One respondent made a comparison with STIM, which is an organization that helps music creators protect and profit from their copyrights. Other respondents framed the idea as a union for small firms with patents, consisting of a central organization and membership firms. Overall, the suggestions are reasonably similar to a concept suggested by Nordic Innovation Centre (2008). Nordic Innovation Centre (2008) made a proposal for what they referred to as a Nordic Patent Defense Union. They suggested a structure consisting of a central virtual organization, NORDIP (Nordic IP), and membership of small and medium sized firms. The idea was that the member organizations would submit proposals to NORDIP when they for example are considering a lawsuit for infringement. NORDIP would then screen proposals based on for example the applying firms own IP-enforcement resources and documentation about the case (Nordic Innovation Centre, 2008). Proposals that would go through the screening would then be evaluated based on legal feasibility and business situation for both actors in the conflict. In the evaluation, a negotiation and business strategy would be developed, and in the next step NORDIP would provide mediation between the small firms and the counterpart (usually a large firm). If the mediated negotiations fail, the idea was that NORDIP could assist with knowledge and even financing in the litigation process (Nordic Innovation Centre, 2008).

Establishing an organization that helps small firms by providing expert input, help with evaluation of cases and potentially even funding of litigation processes for small firms would bridge many of the problems experienced by small firms. The idea makes sense in theory, and

it is probably worth evaluating the viability of it in more detail. However, at this point it is somewhat unclear who would be responsible to establish such an organization. It could either be done by a group of small firms going together, interest organizations such as the Swedish Inventor Association or be a governmental initiative. It might be of interest for a governmental agency to evaluate the feasibility of taking an initiative to establish such an organization.

5.4. Lack of foresight

The last category of causes to small firms' disadvantage in the patent process relate to a lack of foresight and proactiveness from small firms. For different reasons, small firms sometimes have a short-term focus and forget to prepare for potential future patent conflicts. First, small firms tend to apply for patents based on external advice and without a clear strategy for how to use it. Secondly, when having a patent, it is common that small firms fail to document important information and set up formal contracts, which can prove detrimental if they end up in litigation. This section will discuss the problems caused by lack of foresight in more detail, discuss the consequences of the problems and comment on the remedies suggested by the respondents. Figure 3 summarizes the challenges and suggested solutions relating to lack of foresight in small firms.



Figure 3 – Challenges caused by lack of foresight

The figure summarizes the challenges and solutions from table 5 that are linked to lack of foresight in small firms.

5.4.1. Relation to previous literature, consequences, and proposed solutions

One theme that most respondents mentioned was that small firms tend to patent based on external advice or pressure rather than as a part of a deliberate IP-strategy. A common theme seems to be that small firms patent to attract investors. This observation is in line with previous literature. For example, Holgersson (2013) found that a common reason for small firms to get patents is to attract venture capital. Further, Hottentot et al. (2016) concluded that small firms generally are financially constrained in relation to R&D, and that a patent can act as a quality signal towards investors making them more likely to invest.

On the surface, there is not necessarily anything that is inherently problematic in getting a patent only for investment purposes. However, some respondents in the empirical study mentioned that small firms oftentimes lack a well thought through strategy for protecting the IP-rights. Crampes & Langinier (2002) states that indeed, there is a need to be strategic when formulating patents, since the patent claims can be formulated in different ways depending on the purpose of the patent. However, as mentioned in the empirical findings, small firms tend to consult patent agencies that formulate patents that are easy to push through the system and get granted, but that are not optimal for protecting the underlying invention. Further, according to some respondents, it is reasonably common that small firms get without having the resources necessary to enforce the patent. According to Crampes and Langinier (2002), a patent tends to lose its value, both in absolute terms and as a quality signal if the patent holder fails to find infringers or cannot enforce the patent. Therefore, if the small firm cannot afford to enforce, the patent might lose its value as a quality signal to investors. Overall, the pressure to patent for investment purposes might be problematic since small firms end up with patents they cannot enforce and that in the worst-case scenario even loses its value as a quality signal. Further, on a higher level one can argue that it is unnecessary to burden patent offices with applications for patents that are only intended to be used for secondary purposes such as attracting investors.

Moving on, one of the main topics that came up in the interviews was that small firms tend to be poor at documenting and setting up formal contracts, which can be a huge problem in litigation. The respondents mentioned a few different reasons for small firms' poor documentation. The main reason that came up was that small firms simply lack understanding about the importance of proper documentation. Another significant reason seems to be that entrepreneurs are usually very focused on their business and don't have time to set up routines for documentation. Finally, there might be psychological reasons at play, where for example a formal contract may be perceived to hurt trust between partners in collaboration. The issue of documentation and contracting seems to be significant and do affect the chances of winning in litigation, and there is literature confirming that small firms tend to struggle with formal documentation. Nunes (2006) for example found that SMEs, and specifically knowledge intense SMEs, oftentimes lack any proper knowledge management system, which does entail documentation that can be of relevance in relation to patents. However, there is not a lot of literature examining to what extent this lack of documentation influences small firms' chances to successfully enforce their patents. It would be of interest to examine the topic further since it indeed does seem to be significant and cause real problems for small firms in litigation.

To help small firms, the respondents suggested that there should be efforts to educate small firms on the functions of patents and the importance of documentation. Again, it is probably reasonable to provide education to small firms, but it will not necessarily solve the problem. As mentioned, there are plenty of reasons why small firms fail to document properly, and only one of them is related to lack of knowledge. Even if entrepreneurs are fully aware of the importance of documentation, they might still not have time to do it properly and it can still be difficult to insist on formal contracts with collaboration partners. Arguably, there might be a need for more help than education, for example providing small firms with frameworks or easy-to-use digital systems for documentation. Further, one idea would be to demand a certain degree of documentation from firms that receive public support. It should be mentioned

however, that such measures need to well be adapted to the reality of small firms. Fuller-Love (2006), for example, examined management practices and management development in small firms, and found that indeed there is a lack of structured management in small firms. The author, however, pointed out that it might be counterproductive to push management practices that work for large firms to small firms (Fuller-Love, 2006). For example, the authors mentioned that small firms generally do not need a rigorous management system in the same way that large firms do, and that it might even be counterproductive by halting the fast and informal decisions that might be necessary in small firms (Fuller-Love, 2006). Therefore, there is a need for a lot of care and consideration before forcing or encouraging small firms to adapt practices that work for large firms, such as rigorous processes for documentation and contracting. However, providing some fundamental education can be a reasonable first step that might help some small firms take more well-grounded decisions.

5.6. Summary and implications

The purpose of this study has been to examine if and in what way small firms have a disadvantage compared to larger firms in patent conflicts and identify causes to and consequences of this disadvantage. The findings show that small firms are at a disadvantage compared to large firms in patent conflicts. The findings further highlights that the causes to the disadvantage relate back to early stages in the patent process and are not only limited to the litigation process. Overall, the disadvantage is caused by attributes that are unique to small firms, rather than a fundamentally unjust patent or litigation system. Specifically, the disadvantage is caused by economic constraints, knowledge and resource constraints and lack of foresight in small firm.

Economic constraints is one driving factor for the disadvantage small firms face in the patent processes. At early stages it prevents small firms from getting the patents they need and implement their intended IP-strategy. Later, it prevents small firms from detecting infringement and enforce their patents. Finally, it does prevent small firms from building a strong case and puts them at risk of running out of money during litigation. The next factor, which is lack of knowledge and internal resources, also contribute to the disadvantage by affecting small firms through the patent process. First, it contributes to small firms getting patents with an overly optimistic view on their function, thus preventing small firms from taking other action to protect IP and preparing for enforcement. Secondly, the lack of internal resources prevents small firms from being able to evaluate infringement cases before enforcing, while arguably making small firms very dependent on their patent(s) since they lack complementary resources for commercialization. Finally, it makes small firms more dependent on external advice during litigation and forces key personnel in the firm to put significant time and effort into the litigation process. The final factor, lack of foresight, also affects small firms in all stages of the patent process. It leads to small firms getting patents that are not optimally formulated for enforcement, only to get investment. Further, the lack of foresight makes small firms less rigorous with documentation and contracting, leading to difficulties in building a strong case in litigation.

Table 6 offers an attempt to further extrapolate the driving factors and dynamics behind the disadvantage small firms face. Table 6 lists practical implications on the outcome and behavior for small firms, caused by their lack of finances, internal resources and proactiveness. Further, table 6 highlights consequences for each implication. Some of the listed consequences are somewhat speculative, such as the effect on small firms' willingness to innovate, while others have been confirmed by this and previous studies.

Table 6: Causes, symptoms, and consequences

This table summarizes the findings from the study by linking the three defined causes for small firms disadvantages to how they are expressed (symptoms) and what consequences they have. The consequences in the right column have been discussed in section 5. Analysis & discussion, however some are more speculative in nature while others have been confirmed by this and previous studies.

Cause	Symptoms	Consequences
Economic Constraints	Small firms cannot get patents	Small firms less incentivized to innovate
Lack of knowledge and internal resources		Small firms cannot execute their intended IP-strategy and therefore have suboptimal preconditions in conflicts
		Small firms cannot appropriate value from their innovations
Lack of knowledge and internal resources	Small firms get patents with unreasonable expectations	The patent system gets bad reputation among small firms
		Small firms fail to take other action to protect their patents
		Unnecessary burden on patent offices
Lack of foresight	Small firms get suboptimal patents for secondary purposes	Small firms cannot appropriate value from their innovations
		Small firms have suboptimal preconditions in conflicts
		Encourages "exit-culture"
		Unnecessary burden on patent offices
Economic Constraints	Small firms do not monitor the market for infringements	Small firms cannot appropriate value from their innovations
		Encourages "exit-culture"
Economic Constraints	Small firms do not enforce, or accept poor settlements	Small firms cannot appropriate value from their innovations
Lack of knowledge and internal resources		Encourages "exit-culture"
Lack of knowledge and internal resources	Small firms need more external help when enforcing	Higher costs for small firms when enforcing
		Small firms cannot appropriate value from their innovations
		Encourages "exit-culture"
Economic Constraints	Small firms cannot build strong case in litigation	The patent system gets bad reputation among small firms
		Small firms lose in litigation
Lack of foresight		Small firms cannot appropriate value from their innovations
		Encourages "exit-culture"
Lack of knowledge and internal resources	CEO and other key personnel locked up in litigation	Negative effects on the business and product on the market
		Negative personal consequences
		Lower innovativeness in small firms
Economic Constraints	Small firms have to compensate losses by for example cut R&D-spending	Negative effects on the business and product on the market
		Lower innovativeness in small firms

Overall, the findings from this study have contributed to research by highlighting the complexity of the disadvantage small firms face in patent litigation. The research highlights that the disadvantage is not limited to the actual litigation process but can be traced back too much earlier stages in the patent process. Further, the research has provided third party data, from patent attorneys, rather than only relying on interview or survey data from small firms themselves which may arguably be more biased. The study does provide some implications relevant for small firms, policy makers and, given the complexity of the issue, for future research.

For small firms, the findings can help them guide their behavior to avoid some of the pitfalls the patent system entails. Although many of the causes for the disadvantage are difficult for small firms to prevent, some relates to behavior or expectations that small firms can manage better. For example, small firms need to be aware of the difficulty in enforcing patents and not over-rely on patents as a means of protection. Further, the findings highlight the importance of being proactive with documentation and contracting, which small firms arguably have some power to improve themselves.

For policy makers, the study highlights the complexity and multifaceted nature of the problems small firms face in relation to patents. Most importantly, the findings clearly show that the disadvantage relates back to stages much earlier than litigation. Therefore, solutions need to address all stages of the patent process rather than being limited to changes in the litigation process. Arguably, the lowest hanging fruits when it comes to helping small firms can be found outside the actual litigation process by for example providing education at early stages. The study has also provided some suggestions for solutions or remedies proposed by the respondents. All suggested solutions do need more evaluation before potential implementation, but they can guide policy makers by providing some options to investigate further.

This study also provides some implications for relevant future research. The findings indicate that small firms have a disadvantage in defending their patents, however they do not contribute much to understanding the consequences this has on a societal level. It is clear that small firms and entrepreneurs suffer on an individual level, but future research can investigate the cumulative effects this might have on for example innovativeness and general success of small firms. Further, the findings from this study also open up for quantitative research to examine the significance of the identified causes and problems small firms face. For example, it might be of relevance to study to what extent economic constraints affect the patenting propensity in small firms, to what degree the lack of monitoring for infringement affects the detection rate of infringement, and if small firms are less likely to win in litigation due to difficulties in building a strong case. Finally, all the solutions suggested by the respondents do need more evaluation before they are implemented. Some interesting topics to investigate would be the reasonably new occurrence of private litigation funders on the Swedish market, the appropriateness of offering public funding for litigation, and the implications of changing the litigation process to make it shorter and cheaper. Further, analyzing the efficiency of providing education to small firms would help determine if the education-based suggestions would be efficient in helping small firms. Finally, it would be of interest to further examine the

opportunity to establish a STIM-like organization, whether it would be efficient and how to optimally design it.

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Appendix

Appendix A and *Appendix B*, show the interview guide that was used for the semi structured interviews. Appendix A shows the original version in Swedish, while Appendix B provides a version translated to English.

A. Original interview guide in Swedish

Kan du berätta lite om din egen bakgrund och din/er roll i klientens patentprocess och vid patenttvister?

Kan du berätta om exempel på hur patenttvister startar? Hur upptäcker (små) företag att någon gjort intrång eller vill stämma dem?

- Handlar det ofta om en tidigare relation som leder till en tvist?
- Vilka orsaker är vanligast?

Vilka frågor brukar (små) företag ställa när potentiella konflikter uppstår och vad ger du för råd?

- Skiljer sig råden åt beroende på typ av aktör (liten/stor)?

Hur bra kunskap bedömer du att (små) företag har överlag om patent och dess funktion samt riskerna med en rättsprocess?

Hur ofta går potentiella fall faktiskt vidare till rättegång/stämning?

- Vilka faktorer avgör? Bara faktorer kopplade till caset eller också externa faktorer som kapital, kunskap, tid?
- Hur vanliga är andra utfall från ett tvist, exempelvis att små företag väljer att inte göra något alls eller tvisten leder till förlikning?
- Skillnad små/stora bolag? Olika orsaker till att inte starta rättsprocess?

Väl i rättegång, finns det faktorer utöver grunderna för målet som påtagligt påverkar processen och utfallet?

- Vilka faktorer är mest avgörande? (Bra advokat, väl förberedda, tid/resurser, slarv med dokumentering/kontrakt före och under processen osv)

Från ditt perspektiv, är det så att små företag och enskilda entreprenörer har en nackdel i den juridiska processen kopplad till patentintrång jämfört med stora företag? Varför?

- Om ja, vad får det för konsekvenser för småföretagen och för din rådgivning?
- Vad är din uppfattning att det får för konsekvenser för samhällssystemet mer allmänt (exempelvis – väljer små företag i allmänhet att inte lägga lika mycket resurser på innovation och patentskydd)?

Hur påverkas aktörerna av att vara med i en konflikt, samt att vinna/förlora en konflikt? Skillnader mellan olika typer av aktörer (små/stora)?

- Finansiellt?
- Emotionellt?
- Kreativitet och innovation (inklusive tid för det)

Hur kan rättssystemet förändras för att öka möjligheten för små aktörer att göra sig hörda, och minska konsekvenserna av en rättsprocess?

- Ökad "rättvisa" givet de nackdelar små aktörer har.
- Legalt, förändra regler/lagar?
- Erbjuder hjälp till små aktörer?

Vilka två personer tycker du är mest relevanta att intervjua härnäst?

B. Interview guide translated to English

Can you tell me little bit about you own background and your role in the clients patent process and conflicts?

Can you give me some examples of how patent conflicts start? How do small firms realize that someone is infringing their patent or wants to sue them?

- Is it common that conflicts start from previous or current collaborations?
- What causes are most common?

What questions do small firms ask when potential conflicts emerge, and what advice do you give them?

- Does the advice you give differ depending on the type of actor (large/small actor)?

How knowledgeable do you perceive that small firms are when it comes to patents, their function and the risks related to litigation?

How often do patent conflicts actually go to litigation?

- What factors influence if they do? Only factors related to the case or also external factors such as capital, knowledge, and time?
- How common are other outcomes than a conflict, for example that small firms decide to do nothing or that it is resolved by settlement?
- Differences between large and small firms? Different reasons to not go into litigation?

In the litigation process, are there other factors than the case itself that influence the process and determine the outcome?

- What factors matter most? (Good attorneys, preparedness, time/resources, documentation before and during the process?)

From your perspective, do you see that small firms have a disadvantage in the process related to infringement compared to large firms? Why?

- If yes, what consequences does that have for small firms and the advice you give them?
- Do you think it has any consequences on a societal level (for example - that small firms don't want to put as much resources towards innovation and patent protection?)?

How are the actors affected by being part of a conflict, and by losing or winning?

Differences between type of actors (small/large)?

- Financially
- Emotionally
- Creativity and innovation (including time for that)

How could the legal system be changed to increase the chances for small firms, and reduce the consequences of involvement in litigation?

- Increase "justice" given the disadvantage small firms have
- Legally, change rules/laws?
- Provide help to small firms?

What two other people that you know do you think would be the most relevant to interview next?



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