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How SMEs work with IP management and IP Strategy

A case study on the impact of environmental factors on SMEs protection of intellectual property

Master's thesis in Management and Economics of Innovation

MATTIAS CARLSSON
VICTOR ALVBÅGE

DEPARTMENT OF TECHNOLOGY MANAGEMENT AND ECONOMICS

DIVISION OF ENTREPRENEURSHIP AND STRATEGY
CHALMERS UNIVERSITY OF TECHNOLOGY
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Report no. E2022:094
Department of Technology Management and Economics
Chalmers University of Technology
SE-412 96 Göteborg
Sweden
Telephone + 46 (0)31-772 1000

Gothenburg, Sweden 2022

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VICTOR ALVBÅGE

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SUMMARY
Society, and as an extension business, have in recent times become ever more digitized and technology driven. This shift from a resource-based economy to a knowledge-based economy has increased the importance of the management of intellectual property rights (IPRs) as a competitive advantage. In order to reap advantage from IPRs companies need to have a well-defined intellectual property (IP) strategy, which is connected to overall business objectives, as well as IP management practices that support that strategy. This is not an easy task for any company, but it is particularly difficult for small and medium-sized enterprises (SMEs) due to limited time, money, and resources. Against this background this case study aims to investigate how an SME in the mechanical automation industry works with IP strategy and IP management. The case study is of qualitative nature and is based on semi-structured interviews, review of literature, and documentary analysis at the host company. Specifically, the case study investigates the unique context in which the company operates and what internal and external factors shape strategy and management practices. The coding process in the interview study indicates that there are five concepts that influence IP management and strategy. These are product, relationship, industry, organization and process, and strategy, and because of the interdependent nature between the concepts it is important to investigate them in relation to one another. The findings are in line with previous SME literature on IP management that SMEs are at a disadvantage in comparison to larger companies. Moreover, the findings indicate that the IP management at the company of the study is largely influenced by its customized and project-orientation approach that naturally limits the possibility to work with a long-term IP strategy, but the business approach provides the opportunity to use other less formal protection mechanisms in regard to IP.

Keywords: intellectual property, SME, IP strategy, IP management.

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Abbreviations

IC: Intellectual Capital

IP: Intellectual Property

IPR: Intellectual Property Rights

SME: Small - and medium sized enterprises

FTO: Freedom to Operate

1. Introduction

This first chapter presents an introduction to the background of the research. The purpose and the research questions are also included, as well as the delimitations and scope of the study.

1.1 Background

As globalization increases competition within and between markets, distance is reduced, and the global economy becomes increasingly knowledge based, companies concerned about maintaining their competitive advantage must find ways to navigate in this new business landscape (Somaya, 2012). The transition from a mainly resource-based economy to a knowledge-based one has increased the importance of intellectual property rights (IPRs) as a competitive advantage (Wang, 2010). Technological resources often become the basis for competitive advantage (Holgersson & Wallin, 2017), and since knowledge itself is prone to leakage, imitation, and mobility, there is an ongoing competition for intellectual property (IP) (Somaya, 2012).

As technology and intellectual property is prone to leakage, companies must protect their intellectual property in order to protect its business from competitors and imitators. Available options for companies include patenting, which excludes others the right to use the invention. Strategic disclosure, another tool that firms can use, makes the invention a non-novelty which is a requirement for patentability, and thus no firm can exclude others from using it (Somaya, 2012; Holgersson & Wallin, 2017). Firms can also keep the technology a secret and in this way protect its IP. In various circumstances and contexts, it can be beneficial for firms to publish and share technologies with other actors, and benefit from lock-in effects. However, firms can also manage their IP through other means. Hanel (2008) argues that the management and use of IP in manufacturing industries is correlated to firm size, innovation type, originality of the innovation, and the industry environment. Regulatory environment is another factor that influences the way in which firms approach IP and manage it, especially in countries where the regulatory environment is weak (Hanel, 2008).

In a world where knowledge and information are becoming more crucial factors for the creation of innovative ideas and making of new products, the companies that are best at generating and protecting their innovation will be the winners. It is argued that an increase in innovative efforts benefit society in general (Granstrand & Holgerssson, 2015), but since different actors compete on different premises and in different contexts the ability to contribute to society through technological development and monetize on these vary accordingly. Firm size is one influencing factor. For example, small and medium sized companies (SMEs, firms with less than 250 full-time employees and a turnover below 50 MEUR) are identified as a strong contributor to society and an important driver of technological development (Kitching & Blackburn, 1998; Rassenfosse, 2012), and more

specifically in the generation of ideas that are at the forefront of product and process innovation (Kitching & Blackburn, 1998), as well as bringing innovation to established industries (European Patent Office [EPO], 2022). However, SMEs possess limited knowledge about the management of the IP on which their business relies. Consequently, the relationship between SMEs and the management of IP have become has become a widely researched topic among researchers and studies in the field (e.g., Holgersson & Aaboend, 2019; Thiel & Peters, 2012; Wang, 2020). In firms that are aware of the importance of IP there is even no or little indication of how it is being managed (Kitching & Blackburn, 1998). A reason for this is, among other things, that smaller companies do not have the resources to employ knowledgeable personnel (Pitkelthy, 2007). Meanwhile, with smaller companies having most of their competitive advantage in intellectual property (Pitkelthy, 2007), this is an issue that in combination with a lack of important complementary resources risks may lead to substantial problems when facing competition from larger actors that practice more extensive and sophisticated IP processes.

A world of thriving SMEs is considered as one of the building blocks of the competitive and sustainable economy (EPO, 2017), and it is therefore crucial to provide a sound market dynamic where smaller companies can exist for the modern economy to prosper. In an effort to help SMEs and make firms more informed about the difficulties of IP and the possibilities from good practice, research has been made both on governmental level and across the EU on behalf of the European Commission (e.g., Swiss Federal Institute of Intellectual Property, 2009 & EPO, 2017). These results indicate that SMEs in niche markets often enjoy a form of natural protection (Swiss Federal Institute of Intellectual Property, 2009), and when necessary, due to their limited resources, are encouraged to use good practices for IP management, leverage key patents to protect key technologies (EPO, 2017). This view presumes that there are capabilities internal to the company in managing IP, which may not always be the case in SMEs. Literature has emerged on how companies can protect technology in order to commercialize innovation through other means than formal protection, e.g., patent rights (Kitching & Blackburn, 1998; Cohen et al., 2000). This literature argues that SMEs emphasize informal methods that are familiar, cheaper, and less time consuming, and that making use of natural mechanisms such as secrecy and gaining advantage from lead time are better approaches than formal ones. Thiel and Peters (2012) state in their research how SMEs "act within different institutional and organizational environments, different strategic frames, and possibly under different regimes of appropriability motives, such as favoring freedom to operate over exclusivity" (p. 4).

The idea that companies should protect innovation and technologies as a means to protect their business is valid also for SMEs. However, since the outlook between companies differs due to multiple factors, as described above, tools traditionally adopted by companies that historically needed to protect their innovation and technology are not always applicable. As globalization increases and competition across continents intensifies, smaller companies must understand the risks, so that sufficient protection can be put in place to ensure the future of

the business. Against this background, it is relevant to research how aspects, including external ones, influence SMEs IP management and their ability to implement different IP strategies.

1.2 Purpose

The purpose of this thesis is to understand how SMEs work with IP management and IP strategy. Specifically, the aim of the thesis is to understand how various aspects influence and shape the rationale behind, and the practices adopted for IP by an SME in mechanical engineering within automation. This also includes what implications the environment has on the implementation and maintenance of different strategic options.

1.3 Research Questions

RQ1: How does a project-based business orientation influence the approach to IP management and strategy in an SME in mechanical engineering within automation?

RQ2: What other parameter(s) influence the strategic options for IP in an SME in mechanical engineering within automation?

1.4 Delimitations and Scope

The scope for the study is to investigate how a mechanical engineering company within the automation industry works with its IP. The research is done as a case study at the host company, and therefore the study is primarily focused here. Findings and results from the study are consequently based on observations and data collected in the context at the host company, including processes practiced by the company and its product portfolio. Although these characteristics may not be common for all companies within mechanical engineering and automation, the study will not consider any additional cases.

Moreover, a geographical delimitation is made with focus on Europe and North America. The reason for this is the corporate strategy at the host company, which has selected to limit its operations here. This delimitation has implications on the results and findings as other areas could present other data, due to variances between countries and cultures in e.g., business ethics and regulatory frameworks. However, this limitation will not affect the collection of data, which means that the process for reviewing literature will be made with any widely available information without this geographical delimitation.

2. Review of Literature

In this chapter relevant literature and previous research, within fields pertinent to the purpose of the study, is presented. First, an overview of intellectual property and patents are introduced. Second, a set of IP management strategies are introduced, as well as firms' motives to adopt them, and criticism against patents. Lastly, how IP can be managed in collaborations is presented, as well as an introduction to IP-related processes.

2.1 Overview of Intellectual Property and Patents

IP is a resource with assigned ownership that is of intellectual or intangible character (Granstrand & Holgersson, 2015). Resources can be categorized as tangible or intangible (Granstrand, 1998). The latter type is a source of immaterial capital (IC), and ecompases IC that is both embodied and disembodied. Disembodied IC can to some extent be protected by IPR. An intellectual property right is a legally supported right to assign ownership to intellectual resources (Granstrand & Holgersson, 2015). IPRs constitute several "temporary, restricted, and transferable or licensable rights" (Granstrand & Holgersson, 2015, p. 1), and include patents, copyrights, design rights, trademark rights, and trade secret rights, all with different areas of application ranging from technological inventions to design and other artistic creations (Granstrand & Holgersson, 2015). Most IPRs are temporary. The maximum lifetime for patents is 20 years and for design rights the lifetime is 14 and 25 years in the EU and US respectively (Granstrand & Holgersson, 2015). In addition, trademarks do not have to be temporary, but in these instances, they must be continuously maintained and renewed by the holder.

One domain within IPR is patents. A patent is defined as a grant which does not give the holder the right to practice an invention, but rather provides the holder of the grant the right to exclude others during a limited time (Holgersson & Wallin, 2017; Somaya, 2012). According to Holgersson and Wallin (2017) patent holders are given "the right to prevent third parties from making, using or selling the [patented] invention without their owners' consent" (p.3). The patent system constitutes an institution itself and is deeply embedded within many Western democracies legal systems (Somaya, 2012).

The reason behind a decision to file for a patent application differs between actors, and consequently the density of patents varies across and between industries. Industry, and to some extent market and type of product, dictates how common and effective patents are, as the legal and overall conditions differ between industries. For instance, legal mechanisms are more suitable to protect product innovations than process innovations (Somaya, 2012; Wang, 2020), thus industrial companies patent more than service companies do, where knowledge is more tacit (Wang, 2020). Whereas patents for complex products aim to block rival use of in-house made components, patents for discrete products aim to block substitutes (Dosi & E. Stiglitz, 2014). The institutional setting influences the reasons for patenting, because it varies

between countries, which extends the question if to patent, to also include where to patent. Patent protection is geographically limited, meaning that firms need to apply for the same patent in various markets, to enjoy protection in these (World Intellectual Property Organization [WIPO], 2015). Lastly, firm size also influences the patent decision, as it is more difficult for smaller firms to defend their patents (Heurlin, 2021). Moreover, for an invention to be patentable it needs to meet three criteria; it has to be a novel invention, has to be non-obvious to a skilled individual in the same technological area, has to be applicable or useful to at least some people (Granstrand & Holgersson, 2015).

2.2 Intellectual Property Management Strategies

There are many different strategies for IP management as the formation of a strategy depends on a firm's set of core knowledge, its valuable inventions and its unique competitive landscape. A firm's ability to appropriate technological inventions, that is to commercialize innovations, is determined by the management of core knowledge, the level of patent control and intellectual property rights (Holgersson & Wallin, 2017; Somaya, 2012). Consequently, the protection of the right to commercialize an invention becomes fundamental for the establishment and survival of businesses (Thiel & Peters, 2012).

According to Wang (2020), an IP strategy should be used to maximize value appropriation from an organization's innovation, be in support and in alignment with its business objectives, and cover-in practical distribution of IP. Moverover, Reitzig (2007) argues the benefits from support from top management. When developing an IP strategy factors to consider include, but are not limited to, innovation type, firm size, industry (Holgersson & Wallin, 2017; Thiel & Peters, 2012; Somaya, 2012), as well as IP regime and market structure (Holgersson & Wallin, 2017). According to Lorenz and Somaya (2013) firm size and market power also influences appropriation of innovation and consequently strategy. This is because companies with more resources enjoy higher degrees of economies of scale and scope, have the opportunity to hedge risks by spreading their investments, and as a result of more funding can approach riskier innovations.

Teece (1986) argues that it is important to estimate the potential economic return of an invention. The author argues that it is the appropriability regime, access to complementary assets and the dominant design paradigm that determines potential monetary return. The appropriability regime is defined as an innovator's ability to reap profits from an innovation, and is influenced by existing governance and the efficacy of legal protection. Strong protection and effective legal systems that deny imitators' access to relevant knowledge characterizes a tight regime, while the opposite is true for a weak regime. While tight regimes can ensure value capture for some time, profitability in weak regimes is to a higher degree influenced by the business strategy, innovation phase and access to complementary assets. According to Teece (1986) innovation takes place in either a pre-paradigmatic phase or a paradigmatic phase. In the pre-paradigmatic phase, an innovator will unlikely emerge as the

winner, since floating designs and unclear customer demand benefit imitators. In the paradigmatic phase complementary assets, including distribution, service competence, and marketing, are instead crucial for commercial success, as technology imitation is assumed to be easy, and therefore the innovator must rely on complementary assets in order to succeed. Young and innovative companies often lack access to complementary assets and must reach strategic partnerships to secure such resources (Schneider & Veugelers, 2018).

2.2.1 Motives of an intellectual property strategy

The motive of IPRs is to protect creative efforts, incentivize commercialization of inventions, and encourage the disclosure of informational resources (Granstrand & Holgersson, 2015; Somaya, 2014). In capitalist economies innovation and knowledge disclosure is incentivized, which allows patent applicants to temporarily exclude others from using the technology (Granstrand & Holgersson, 2015). In addition, patents are granted as they are considered to increase innovation in society overall, as an increase of innovation efforts benefit consumers and rewards self-interested innovators (Granstrand & Holgersson, 2015).

The underlying logics of resource allocation and decision making related to patents occur along three wide patent strategy domains (Somaya 2012). These domains are interdependent and include rights, licensing, and enforcement. According to Somaya (2012) rights refer to the spectrum "of actions whereby patent rights are acquired, renewed, reissued, and maintained…" (p.5), as well as purchases of patents in the secondary market. The term licensing encompasses actions concerning the sharing of rights to use a patented innovation. Examples of contexts in which licensing can be used are alliances, standard setting, patent pooling, and open innovation (Somaya, 2012; Thiel & Peters, 2012). The propensity for firms to engage in either rights or licensing varies. The propensity to engage in rights depends on factors such as industry, firm size, and innovation type, product or process innovation, whereas licensing varies in terms of scope and exclusivity (Somaya, 2012). The third domain enforcement refers to litigation, which includes both the use of and the threat of engaging in litigation. This is done to discourage patent infringers or encourage them to pay royalties. However, patent litigation is a rare occurrence, and even after commencing litigation firms retain the option to settle with the other party before trial (Somaya, 2012; Heurlin, 2021).

In addition to the factors outlined above, there are certain motives for proceeding with a strategy to register IPRs or patents. While both larger corporations and SMEs approach patents as a means to protect product technology and their freedom to operate (FTO), SMEs to a higher extent express an importance to use patents to attract investors rather than to achieve secrecy (Holgersson & Granstrand, 2017; Rassenfosse, 2012). This is in line with what Holgersson (2013) phrases the marketing motive with patents in SMEs, which include generating both customer and capital marketing. In addition to these, SMEs motives to patent include achieving better legal certainty and increasing value and image (Bereuter et al., 2017).

Further, Somaya (2012) argues that firms that engage in activities within the three domains in a concerted manner can increase the appropriability entailed by patents, meaning that they can capture more value from its IP. One patent by itself may be weak and easy to invent around, however, a set of combined patents can buttress firms' patent strategies and make imitation more difficult. In addition, patent-related activities are often costly and resource intensive. Maintenance and prosecution costs are estimated at around 100,000 USD p.a. and patent litigation costs are estimated in terms of millions of dollars (Somaya, 2012). The high costs associated with litigation are particularly notable by SMEs (Heurlin, 2021). Besides, indirect costs, such as time spent on patent related activities, may surpass these costs. Hence, it is necessary for organizations to prioritize and engage in effective patent strategies focused on specific technologies. For SMEs this prioritization of directing scarce resources is even more important and significant and as a result they are reluctant to bring legal action to suspected infringements even in situations where formal protection is in place (Kitching & Blackburn, 1998).

2.2.2 Protection of intellectual property

Although IP protection has long been a strategic tool in business, the literature has been preoccupied with how to use patenting as a source of competitive advantage and is still biased towards patents and exclusive property rights as tools for value capture (Holgersson & Wallin, 2017, Peters et al., 2013). Today, more dynamic markets and increased difficulty to achieve exclusive market positions are factors that according to Peters et al. (2013) have fostered the need for alternatives to patents in a way to ultimately achieve FTO (Holgersson & Wallin, 2017; Thiel & Peters, 2012; Peters et al., 2013). Recent events have boosted the need for patent alternatives, such as the proliferation of the internet and increased availability of information, more available databases for publication of prior art, and a shift in regulation from invention to filing (in the US) as the important determinant for ownership of IP (Peters et al., 2013).

In the article “The patent management trichotomy: Patenting, publishing, and secrecy” authors Holgersson and Wallin (2017) argue that extant literature has been fixated with how to use patenting as the sole strategic IP tool. In addition to patenting, the authors extend patent management to include publishing and secrecy. Holgersson and Wallin (2017) dubs these three mutually exclusive options, patenting, publishing, and secrecy, as the patent management trichotomy. Moreover, Thiel and Peters (2012) and Peters et al. (2013) write about strategic disclosure, which combines patenting and publishing. The motives behind opting for one of these options depends on, among others, a firm’s ability to achieve either FTO or appropriation, given its specific context and business landscape (Holgersson & Wallin, 2017; Thiel & Peters, 2012; Peters et al., 2013).

Secrecy provides a firm with monopoly advantage during the time a trade secret remains secret, making it difficult for other firms to patent the invention. On the contrary, publishing publicly discloses information - making it non-novel - thereby eliminating the option to

patent for all firms (Holgersson & Wallin, 2017). As publishing is an instantaneous process, it can be combined in a strategic way with patenting to achieve competitive advantage. Publishing can therefore be used by firms as a tool to instantaneously disclose an invention, effectively stopping competitors from patenting the same invention. This approach grants the firm FTO, however, it also reveals in which technological fields the firm focuses its research. With that said, the firm can also proactively use this approach to confuse and mislead competitors. However, it is also important to consider the time aspect and that patenting and publishing are preceded by a certain level of secrecy, for example by upholding novelty to ensure patentability (Holgersson & Wallin, 2017). Rationally, firms should opt for secrecy if the expected time they keep the invention a secret is longer than the patent protection time (Boldrin & Levine, 2012).

SMEs show a tendency to adopt both formal and informal strategies for protection of their IP. According to Kitching and Blackburn (1998) 89% of SMEs practice any kind of non-registrable rights as formal protection, and only 62% practice registrable protection. Moreover, the most common informal strategies practiced by SMEs is to rely on trust in relationships, exploit lead time advantage, and to spread information across staff (Kitching & Blackburn, 1998). According to Kitching and Blackburn (1998) SMEs tend to introduce formal protection and registrable rights only in special conditions where business owners anticipate high commercial success. Moreover, Schneider and Veugelers (2018) have identified a relationship between innovation that is considered to be "big", and the related strategy opted by companies. Young and innovative companies that are to launch considerably new innovation show an increased tendency to secrecy as a strategy for protection, as well as an increase in use of formal protection.

2.2.3 Proprietary, defensive, and leveraging patent strategies

Somaya (2012) classifies three generic patent strategies: proprietary, defensive, and leveraging strategies. A proprietary strategy entails an offensive, preemptive approach regarding patents (Somaya, 2012). A proprietary strategy employs an aggressive approach against competitors. A practical example of this is to patent potential substitutes, complementary and follow-up technologies, and carefully renew patents with help of legal counsel (Somaya, 2012). Two terms that encapsulate this strategy are patent thickets and patent fences, which are used to make it difficult and deter competitors to imitate and create competitive advantage. Both patent fences and patent thickets are an accumulation or bulk of individual patents that protects a sole product overall (Reitzig, 2002). Whereas patent thickets mean to repeatedly apply for technologically complementary patent rights, patent fences refer to protecting a single product by repeatedly applying for substitute patent rights (Reitzig, 2002).

Contrary to a proprietary strategy, a defensive strategy does not aim to create competitive advantage, but rather to avoid being at a competitive disadvantage. If a company is being squeezed by competitors, paying high rents for access to necessary technology, the

company's FTO is limited. The purpose of a defensive strategy is therefore to avoid such a situation and ensure that the company retains static and dynamic FTO. Static FTO is concerned with the freedom to operate based on current technologies, whereas dynamic FTO refers to the freedom to operate based on future developments and improvements of current technologies (Holgersson & Wallin, 2017). This strategy is a result of the function of patents, which does not grant patent holder rights, but prohibits others from using the technology and consequently firms need to ensure that their inventions are not hold up by others' patents and that existing patents does not hinder the development in new technological fields (Granstrand & Holgersson, 2015; Somaya, 2012). If an invention is restricted by existing patents a firm's FTO decreases and the risk of being at a competitive disadvantage increase.

The aim of a leveraging strategy is to pursue direct and indirect profit opportunities by actively creating cases for patent licensing and finding new sources of rents in different contexts (Somaya, 2012). This means that a firm may even engage in patent technologies that are outside its core business without any intentions to commercialize these. Controversial actors, for example patent trolls and patent sharks, employ this strategy. This strategy does not aim to manage competition and competitors' actions for the sake of protecting competitive advantage, which the other two strategies are preoccupied with.

2.2.4 Patent criticism

Various authors imply that patent rights and the current patent system are problematic (Ewing & Feldman, 2012; Boldrin & Levine, 2012; Granstrand & Holgersson, 2015). Criticism against patent rights include arguments that patent rights in fact do not aim to enhance innovation, but rather inhibit new ideas and technological development due to too strong competitive advantage and monopolistic behavior (Granstrand & Holgersson, 2015; Boldrin & Levine, 2012). This results in a tax on production when manufacturers are forced to pay fees to mass aggregators of patents (Ewing & Feldman, 2012).

The inefficient static competitive situation creates welfare losses for consumers and society. Moreover, conflicting interests between individuals and corporations, and developing countries and industrialized ones, create a skewed balance since the latter are more prone to political capture (Granstrand & Holgersson, 2015). Another criticism is that license fees on patents are confidential (Lemley & Myhrvold, 2007). This confidentiality benefits actors with insider information and makes it difficult for patent holders and licensees to know whether the deal is good or not.

2.3 Managing Intellectual Property in Collaborations

It is of strategic importance for many firms to protect their technology in order to control the use and enable appropriation of those. This is valid also in open innovation, which is an approach where multiple actors work on innovation with collaborative efforts and is referred to as a new paradigm where firms can join both internal and external ideas and paths to

market in search to level their technology (Granstrand, 2021). Moreover, awareness about the correlation between innovation ecosystems and competitive advantage has increased the need to better understand open innovation (Holgersson et al., 2018).

In order to successfully implement open innovation, firms must exchange information with others (Bogers et al., 2012). Moreover, exchanging information with others raise concerns, such as in Arrow's information paradox where sharing information is crucial in the decision for another party to participate, but where sharing such information may present risks as knowledge is transferred without any compensation (Arrow, 1962), making allocation and ownership of knowledge and technology of importance in collaborative innovation. The need for companies to coordinate is partially influenced by the level of complementarity (Holgersson et al., 2022). That is, whether objects in the relationship are weak or strong complements and increases little or much in value as it is used in combination with other objects, respectively. In an open collaborative innovation project different types of knowledge are developed. These can be distinguished as background, foreground, sideground and postground knowledge, depending on whether development by any partner takes place before, during, outside, or after the project (Bogers et al., 2012; Granstrand & Holgersson, 2014). Depending on whether knowledge is codified or not, and if standards are required to achieve interoperability, licensing can be used as a strategy in open innovation to allocate access to, and ownership of technology (Bogers et al., 2012; Somaya, 2012). In the context of open collaborative innovation, it is not sustainable to specify every transfer of knowledge since it brings transaction costs (Bogers et al., 2012). Instead, less explicit agreements can be used that only cover collaborative efforts and do not become adopted separately by the actors (Bogers et al., 2012).

According to Granstrand et al. (1997) technology diversity is a driving force behind some major features in business. Technology diversity can be achieved through external technology sourcing and influence corporate growth and opportunities to engage in technology-related new businesses (Granstrand et al., 1997). This process results in an accumulation and enhancement of established competencies, but cost increases more than proportionally to the number of technology competencies acquired, as the addition of competencies require integration. Where value is inherited from technology in a system, it may be difficult for a firm to achieve protection while at the same time involving external actors in technological development. One way to control this is to use modularization to allow multiple actors with different capabilities work jointly on innovation to create new value propositions (Holgersson et al., 2022), and to modularize the system or IP to achieve more customized distribution of information (Henkel et al., 2013). Firstly, Henkel et al. (2013) states that this can be used to support innovation in ecosystems if the potential for value co-creation is high, if the actors of co-creation are distributed, and if the need for customization is high and varied. Secondly, IP can then be divided into open and closed modules that can be protected to different levels. In practice this could mean allocating proprietary IP status to core technology, such as to a technological platform, while allocating more open IP status to complementary components

(Henkel et al., 2013). Thirdly, a modular IP strategy could be used to avoid IP leakage by granting elective access to suppliers, employees, and collaborative partners (Henkel et al., 2013).

One way to manage innovation in a collaborative context is through governance. A good relationship between actors does not only help choosing and designing how and what should be shared, it also minimizes the likelihood of opportunistic behavior, thus mitigating the risks of hostile situations (Bogers et al., 2012). Granstrand and Holgersson (2014) identifies a risk for small or inexperienced firms in collaborative innovation agreements to, due to their inferior position, miss out on complementary or substitute technologies that are pursued by larger and more experienced firms. The authors present practical means to manage these risks of hostile sideground and postground knowledge takeover, including safeguarding innovation through contracts that include exclusive agreements or a potential minimum royalty (Granstrand & Holgersson, 2014).

2.4 Processes for Intellectual Property

Rationally, it is important to proceed from the business strategy in order to formulate a sound IP strategy. IP processes should be envisaged similarly to other business processes and incorporated in such a way that they support business needs (Barrett & Crawford, 2002). Many companies, however, lack a formal IP strategy and end up with a hazardous IP portfolio that does not reflect the business strategy (Barrett & Crawford, 2002). Reasons why companies fail to develop an IP portfolio in a concerted manner that reflects strategic objectives and goals include, but are not limited to, not basing the strategy on competitive IP intelligence, insufficient internal processes to extract and leverage IP, and lack of in-house IP knowledge and tactics (Barrett & Crawford, 2002; Wang, 2020). SMEs experience more challenges than large corporations, which includes constraints relating to lack of resources in processes for managing patents, including application, monitoring, and enforcement, even when such expertise can be obtained externally (Holgersson, 2013). It is relevant to consider IP from a portfolio perspective, because different IP assets such as patents, secrets, trademarks can be exploited together and create better protection against imitators (Wang, 2020). Additionally, effective integration can mitigate complexity in coordination and enhance execution of IP strategies, since functions in an organization are separated and respond to different parts of the organization (Wang, 2020). The alignment between different functions is therefore a powerful differentiator in terms of successful IP strategy execution.

Gollin (2008, as cited in Wang, 2020) proposes four steps required to form an IP strategy, which are: define an organization's overall goals, assess internal resources, evaluate the competitive landscape, and shape a simple consistent long-term IP management plan. In the same vein, Sullivan and Harrison (2008) propose a three-step process. First, the company should formulate what it expects to gain from the management of its IP. Second, determine in what specific roles IP can support the company's business. Third, decide and pursue a simple

IP strategy to meet the company's desired objectives. In other words, all businesses have different objectives and unique business needs, and the IP strategy should therefore be tailored specifically to suit a given company. As demonstrated, there is no single way to formulate an IP strategy and consequently, there is also no single defined way to implement an IP strategy. Some steps commonly involved in implementing and integrating an IP strategy include conceptualization, documentation, capture, initial and formal review, and patent prosecution (Barrett & Crawford, 2002).

2.4.1 Patent processes

It is difficult for innovators to gain perspective on their own innovations, as they are viewed to be too close to properly evaluate the innovations potential from an IP perspective (Barrett & Crawford, 2002). According to Barrett and Crawford (2002) inventors mentally discard innovation with significant value prematurely. As a result, it is important to educate personnel so they can identify inventions with significant latent value. Documentation is important in order to bridge the gap between conceptualization and a formal patent application that meets legal requirements (Barrett & Crawford, 2002). Using patents in this way as a tool for internal governance also helps safeguard that knowledge and intellectual capital is kept within the company (Holgersson, 2013). Moreover, it is according to Barrett and Crawford (2002) beneficial to lower the bar for initial documentation, making it easier to evaluate possible inventions early in the latter capture phase. Capture is the activity of proactively collecting key information from documentation and from communication with inventors. If inventions are to pass through the initial review phase, they should be aligned with the IP roadmap and considered valuable enough (Barrett & Crawford, 2002). Barrett and Crawford (2002) recommend that the initial review is done by individuals with expertise in technology, business, and legal matters. The formal documentation consists of a detailed description of the invention, which includes a level of detail necessary to replicate the invention. It is important to formalize this stage to ensure that all documentation contains enough information needed by patent counsel and management to make an informed decision.

Should an invention pass through the formal review a legal documentation is necessary in order to file a patent application. As the patent claim is the most important aspect in patent prosecution and many managers and inventors lack knowledge about the legalese of patents there is a risk that the patent claim is drafted in a way differently envisaged by inventors (Barrett & Crawford, 2002). As a result, the scope of a patent may not be aligned with the IP roadmap and strategic objectives. To this end, Barrett and Crawford (2002) argue that companies should educate managers and inventors to better understand the legal aspect of patents, and thereby mitigate the risk of filing for patents that lack protection and alignment with strategic needs. In addition, continuous revision through feedback is identified as an important factor that guides what is invented and how IP is handled, as the business and technology landscape is constantly evolving (Barrett & Crawford, 2002).

3. Methodology

The research is of qualitative nature and based on a documentary analysis, literature review, and a semi-structured interview study with employees at the host company. All respondents were employees at the host company's headquarter in Sweden, and in total six pre-interviews were conducted and followed up by eight interviewees guided by an interview guide (see appendix A and B). Seven interviews were conducted in person and one interview was conducted through Microsoft Teams. Moreover, interviews were recorded and transcribed verbatim. After transcription, an analysis in multiple steps was done in order to distinguish themes relevant to the research purpose and questions.

3.1 Research Design

A research design can be explained as a framework for how research is carried out and its direction for collection and analysis of data (Bell et al., 2019). The study will focus on one specific company and thereby, through analysis of collected data and available literature and theories, provide insights into the difficulties in IP management that an SME in the automation industry experiences. Collection of data is in turn either done at the host company, or elsewhere with the intention to be used in the context of the company, and with the company's particular setting as the primary source of inspiration. Therefore, the study is characterized as a single organization case study. A case study is concerned with the complexity and nature of the case in question and is widely used within business research (Bell et al., 2019). Since the study is of qualitative nature, the study will be directed by an inductive approach in combining theory and research. This relationship is common in case studies (Bell et al., 2019). Moreover, the study will focus on a bounded situation; the host company and its context. This is according to Bell et al. (2019) suitable for case study as a research design, as it emphasizes the examination of a closed system consisting of an entity with a purpose and functioning parts. The purpose of a case is to study the setting of a particular company and extrapolate results that are generalizable for other SMEs and as a result the case is of a representative nature. Further, this implies that the study is an instrumental case study with an idiographic approach because these features concern research that sheds light on unique matters of a case with the ambition to provide an understanding for broader issues (Bell et al., 2019).

3.2 Research Strategy

In this section the epistemological and ontological considerations, inductive and deductive considerations, qualitative and quantitative considerations for the case study are presented.

3.2.1 Epistemological and ontological considerations

The overarching purpose of this study is to understand how SMEs work with their management of IP. To shed light on this issue, the study examines a specific company, and

extrapolates potential insights and findings. As the context the host company operates in is unique, it is important to study how external factors shape and influence the IP management and IP strategy. Building on this, the study aims to pinpoint causes and factors that affect the strategy and the management of IP, which makes it necessary to understand the subjective experience of employees at the company. The ontological assumptions that guide this study are therefore of constructivist nature. This means that the examined reality is considered to be made up of the views and perspectives of the people in it (Bell et al., 2019). According to Bell et al. (2019) such an ontological assumption leads to an interpretivist perspective of knowledge, as the subjective experience of the examined actors constitute the foundation of the data.

According to Bell et al. (2019) epistemological considerations are what is viewed as justifiable knowledge in a discipline. It is characterized by two positions: positivism and interpretivism. Positivism entails an epistemological position that advocates for the use of scientific methods in the study of social reality and its aspects. Interpretivism, on the other hand, entails an epistemological position that acknowledges the differences between people and the objects of the natural sciences, which requires the researcher to understand the subjective meaning of social action (Bell et al., 2019). For this case study an interpretivist approach will be used, considering the research strategy.

3.2.2 Inductive and deductive considerations

The linkage between theory and research is generally described as either inductive or deductive (Bell et al., 2019). This consideration is important as it represents the nature of the research, such as if it collects data to test or develop theory. The aim of this study is to investigate matters related to IP in the context of one specific company, in order to understand how various external and internal aspects influence IP management and IP strategy in SMEs. As a result, the study aims to progress through observations and findings, and not by testing hypotheses. Because of this, the study will have an inductive approach where theory is the outcome of research (Bell et al., 2019), rather than a deductive approach where the relation is the opposite. Moreover, Bell et al. (2019) points out that inductive research often is an iterative process and entails a non-linear relationship between collection of data and creation of theories, which applies to this case study.

3.2.3 Qualitative and quantitative considerations

The general orientation of how research is conducted can be explained by what research strategy is used. This study will primarily analyze words and what is interpreted as important from the collection of data and review of documents (organizational documents). Similarly, analysis of existing literature and theory will primarily emphasize in-depth knowledge as a means to bridge gaps between present research and the study, in an aim to contribute to research with insights into the IP management difficulties that SMEs experience. Research strategies are generally differentiated as two different approaches; qualitative research and

quantitative research. Although it should be noted that the orientation of research does not necessarily have to be unilateral (Bell et al., 2019). Moreover, a qualitative approach is according to Bell et al. (2019) suitable when the steps for the research require a more iterative methodology during the collection and interpretation of data. This characteristic is favorable as the case study is characterized by induction, and its scope will be narrowed down with time as more information and knowledge is acquired. Consequently, this study will have a qualitative approach.

3.3 Research Method

Whereas a research design is the general framework for the gathering and analysis of data, the research method is the technique used to collect data. For this research, a case study is suitable because it concerns the complexity and unique nature of the case in question (Bell et al., 2019). In this case study data will be collected through semi-structured interviews, document analysis, and literature review. The data collected can be categorized as primary and secondary.

Saunders et. al (2012) and Bell et al. (2019) argues that an interviewer should be knowledgeable in the given field. Before the semi-structured interviews six pre-interviews were conducted in combination with analysis of company documents relating to projects, strategy, patents, and intellectual property, as well as a literature review, in order to gain a better understanding of the company, its organization, and the industry.

Below, see Table 1, is a summary of the research methods for data collection used in the study.

Table 1. *Summary of research methods for data collection and data used in the study.*

Type of data	Source	Description of data
Primary	Interviews	Employees at the host company
	Document analysis	Documents and files at the host company
Secondary	Literature	IP management, IP strategy, SMEs

3.3.1 Interviews

The data collection consists of eight semi-structured interviews with employees in separate roles at the host company. More information about each interview is presented in Table 2.

Table 2. *Interview information displaying the interview subjects, their respective role at the host company, and the technical information from the interviews.*

Subject alias	Role	Interview duration	# words	Interview format
Subject 1 (SI)	Software Engineer	44 min	3 400	In-person
Subject 2 (S2)	Project Manager	40 min	2 271	In-person
Subject 3 (S3)	Head of BA Customized	49 min	3 475	In-person
Subject 4 (S4)	Head of BA Healthcare	50 min	4 919	In-person
Subject 5 (S5)	Technology Manager	46 min	3 507	In-person
Subject 6 (S6)	Engineering Director	47 min	3 776	In-person
Subject 7 (S7)	CEO & Head of BA Pharma	60 min	7 030	In-person
Subject 8 (S8)	Chief Engineer Pharma	28 min	2 556	Microsoft Teams

The table below (Table 3) presents a summary of the collected data.

Table 3. *Information about the duration of the interviews and the number of words transcribed from each interview.*

Interview duration (min)				Transcription (words)			
Min	Mean	Max	Total	Min	Mean	Max	Total
28	46.5	60	364	2 271	3 491	7 030	30 934

The decision to opt for semi-structured interviews as the central data collection method is because it best reflects the purpose of the study. When no clear questions with defined answers exist, and the purpose is of exploratory nature, the method of semi-structured interviews is useful (Bell et al., 2019). In comparison to structured interviews, this method permits interviewees to speak without constraints and opportunity to further explore interesting topics. The interviewee can bring up new perspectives, topics, or issues unknown to the interviewer, which is helpful from an exploratory perspective. In comparison to an unstructured interview, a semi-structured interview ensures that interviewees do not drift too

far from the key issues (Bell et al., 2019). On the other hand, an unstructured interview could lead interviewees to drift too far from the key issues, and was therefore not used (Bell et al., 2019).

All interviews were recorded, with permission from the respondents, and subsequently transcribed verbatim. Despite that the transcription process is arduous and time consuming, it does simplify the analysis and coding process, ensuring that insights are not lost in the process. The language used in all interviews were Swedish, as all the respondents and the authors are from Sweden. Due to time constraints the interviews were not transcribed from Swedish to English. With that said, the quotes used in the report have all been thoroughly translated.

3.3.2 Sampling

The host company was selected because it is an innovative company that sells low-volume products characterized by high flexibility in operations. Most of the host company's competitors are significantly larger with more resources. As innovation is developed through a project-based orientation and different business areas present different objectives and competitive environments. This combination creates an interesting case in terms of management and the development of strategy for IP.

Prior to the interview study, pre-interviews were conducted to gain knowledge about the company, its products, operations, business strategy, and processes. A documentary analysis of company documents, such as organization matrix, business areas, product portfolio, and project processes, was done simultaneously as the pre-interviews. The purpose of first conducting pre-interviews before the interview study was because it assisted in identifying interesting and relevant interview questions and identifying relevant interview subjects. In total six pre-interviews were conducted with three employees at the host company, with each employee conducting two short interviews. In addition, during the pre-interviews the subjects were asked if there was an employee at the host company that would be relevant to interview for the study, which is a method described by Bell et al. (2019) as snowball sampling.

After the pre-interviews, additional interviews were scheduled. Due to time constraints, on behalf of the respondents, all interviews were scheduled in advance. This approach limited the opportunity to analyze interviews before conducting additional interviews. Another method is to interview respondents up until the point where no additional observations are made, which is a concept named theoretical saturation (Bloor & Wood, 2006). With that said, this research benefited from interviewing relevant interview subjects up until the point where there were no more relevant interview subjects to interview, as the number of interview subjects were limited.

3.3.3 Documentary analysis

Documents were used as another source of data in the study and is a source of data commonly used in qualitative business and management research (Bell et al., 2019). The documents in the study are from the company, with the purpose of increasing the understanding of the company and providing in-depth knowledge. Thus, data was collected to understand how IP is managed in the organization today and historically, both on a strategic and process level, and to gain insights in processes and of internal capabilities. Documents can be categorized and collected in several ways. Organizational documents such as organizational charts and process maps, as well as existing documents about IP and filed patents, were collected from internal databases, e.g., through the company intranet and Microsoft SharePoint. Other documents were collected directly from people in charge of the matters in question, such as information related to the corporate strategy from the CEO, or archived business cases from business area managers. Common for this data is that it consists of material that can be read, preserved and available, and moreover not produced specifically for the purpose of research, which is in line with Bell et al. (2019) document criteria.

3.3.4 Review of literature

For the study, a review of existing literature was made to identify concepts and frameworks prevalent within the field of research related to IP management and IP strategy focused primarily on SMEs. The purpose of the study is to understand how various aspects influence and shape the rationale behind, and the practices adopted for IP by an SME. Therefore, the motive for reviewing existing literature at an early stage is to discern the main ideas and research available, which according to Bell et al. (2019) can help guide and justify the purpose and design of the research. Another benefit from this is that it ensures that the research is well grounded, as the researchers are knowledgeable in the research field (Bell et al., 2019). The study uses a qualitative approach where theory and data are merged through induction, and the review of literature is not isolated to a particular point in time. Instead, as information was gathered and new ideas generated, additional literature was continuously reviewed to revise the scope of the study, which is an example of narrative review. This approach tends to be iterative and wide-ranging in scope and is better suited for flexible research that practices a strategy based on interpretive epistemology (Bell et al., 2019).

3.4 Data Analysis

The analysis of data from interviews was inspired by the concept of coding deriving from the process of grounded theory. Grounded theory is a framework where data is systematically gathered and analyzed, so that data is translated to theory (Bell et al., 2019). Moreover, the framework entails a close relationship between the collection of data, analysis, and theory (Bell et al., 2019). Bell et al. (2019) argues that concepts and categories are some of the key elements in grounded theory and that approaching these can be favorable for creating grounded theory as such, as well as a methodology for qualitative data analysis. The

methodology used for this study solely focuses on the ones related to the development of coding and constant comparison with the purpose of creating concepts and categories.

Coding is a process for reviewing and labeling data in transcripts and field notes that is of potential theoretical significance to the study (Bell et al., 2019). The process for the coding data was manually by using a word processing software. Pre-interviews were not included in the coding process. Topics that were relevant for the aim of the study were translated into basic first level codes. As more topics emerged within a certain area, these became merged, thus constructing second level codes that reflect a common theme for the category. The final level of coding treats more broad and wide topics and codes here were constructed by including second level concepts that all concern the same matter. The process for coding data into concepts was made in English in all steps after carefully having translated quotes in transcripts from Swedish to English. Table 4 illustrates the scheme for the final layout of concepts on all three levels.

Table 4. *A summary of the concepts on all three levels from the coding process*.

3rd level	2nd level	1st level
Product	The level of complexity in products influences relationship with companies and the sharing of IP	Limited possibility for others than the host company to modify and customize the products due to high complexity
		Natural contact with end-customers due to product's high complexity
		Product reliability is essential for customers
		Customized products allow for closer collaboration
	Low volume and customized products make it difficult to work with IP	Difficult to have IP continuity with one-off products
		Importance of IP increases with increased product modularization and standardization
		IP is not prioritized for non-recurring products/projects
		Standardization of product enables fast-tracking project process
	The possibility to protect IP is limited as products are made up of third-party components	The lifetime of components represents a technological constraint in product development
		As products are made up of various components procured, own innovation constitutes an incremental part of the total technological offer

		The technological strategy is focused on the technological platforms used in products
Relationship	How working with various actors impacts the need to protect IP	Close collaboration with large suppliers can deter potential infringers
		The need to protect IP depends on what type of company tries to imitate
		When making sales through a partner in the healthcare industry, contracts are more useful than patents for protection
		No purpose to use legal action against a partner, if sales go through that partner, as the deal is already gone
		Deepening the relationship with a partner can protect the deal and deter others from copying the product
		Mistrust can lead to an ended partnership
		Co-development with customers equal commitment and as a result an increased chance of business
	Relationships with external actors can lead to leakage of knowledge	Inter-firm relationships can lead to unintentional sharing of IP
		Engineers responsible for innovations can share info with customers because they are proud of their work
		Communication of IP with companies needs to be coherent
	Collaboration with suppliers is without exclusive rights	Suppliers are responsible for R&D and IP in collaborative efforts
		Collaboration gives insights about supplier's technology, but no exclusivity
	Customers are unlikely to use IP developed in collaboration on their own	In the business area customized, customers want to have ownership of IP
		Customer with complete ownership IP show little incentive to shift to other supplier in the business area customized
		Ownership of IP is controlled and transferred by the other party in the business area customized
	Access to IP influences sales	To restrict customers' access to IP can harm deals
Market	Industry mechanisms	Credibility and service level are important for customer satisfaction

		Credibility and reputation in the industry is more important than an extensive patent portfolio
		Contracts, stakeholders, and partners are considered important for business, in addition to technological know-how
	Difficulty to achieve high sales volumes of customized products	Price sensitivity is low in the industry
		Limited opportunity to sell one product to many customers
	Threat to IP increases with increased level of product success	Incentive for others to copy increases with increased success of a product
Organization & Process	The patenting process is subjective and random	Bad gut feeling leads to patenting
		Ad-hoc patenting process
		Patenting as a happening within the organization
		Patenting innovations because they are novel and unique
	IP-processes are not well-defined	Limited resources limit ways of working with IP
		Lack of formal process in regard to IP and patents
		Incomplete IP-processes
		Subjective IP-processes
		Currently the sole purpose of IP process is to check for potential infringements
	The risk with IP is perceived differently among employees	Engineers can be more naive and are more likely to share IP
		Employees view risk differently regarding IP
		Employees are more likely to compromise on IP than management
	Process and IP competence are limited to a few individuals	Process tied to a specific person
		One person is responsible for IP
		Competence in IP is isolated
	Project-orientation influences how the organization works with IP	Project orientation problematizes IP strategy
		Different processes for different business areas
	Transfer of knowledge in the company is unstructured	Knowledge transfer (from projects) in company is not structured

		Knowledge transfer possible between business areas is a good thing
Strategy	Patenting is seen as a complement to other more favorable strategies	Patenting in order to remain FTO and prevent partner to copy the solution
		Patent incentives are not viewed as a viable solution
		Positive attitute towards publishing among certain employees
		A cost-benefit analysis is necessary before the decision to patent is made
		Licensing perceived as not in line with strategic goals
		Secrecy bias
		Software is not worth protecting through patents
		Patents should be used as a compliment
	The IP strategy is not prioritized	Lack of time to work with IP on a strategic level
		IP-strategy is focused on the near-time
		Want to work in a group in future IP processes
		The IP-strategy is not well understood by all employees
	Negative attitude towards patent litigation	Negative attitude towards patent litigation
		Litigation as a last resort
		Perceived difficulties with following-through a litigation process
	Agility and lead times are considered better than formal protection	Being agile (lead time) more important than IP
		Lead time is more important compared to patenting
		Other mechanisms are preferred before protection IP specifically
	Management has a strict line on the sharing of IP	Strict line from top management on not sharing IP with customers
		Rationale is to make it difficult to copy core technology
		Contracts do not include sharing of IP
	The IP strategy is important to support future growth	IP strategy important to support stable organic growth

3.5 Quality Considerations

Four criteria can be used when evaluating qualitative research: confirmability, credibility, dependability, and transferability (Bell et al., 2019). Full objectivity in business research is impossible, however, researchers should not allow personal biases or theoretical inclinations to shape the outcome of the study. This is what confirmability is concerned about, ensuring that researchers remain objective and are not affected by biases. Credibility refers to how believable the findings are, and dependability is concerned about if the study can be applied in other circumstances, and if it can be replicated and understood. Transferability is concerned about if the findings are general enough to be applied in other contexts (Bell et al., 2019).

Triangulation refers to the use of one or more sources of data when studying social phenomena (Saunders et al., 2012). In this study semi-structured interviews, documentary analysis, and literature review were conducted, thus ensuring triangulation in the research. In addition, the use of triangulation improves the quality of research because the researchers avoid biases stemming from only using one source of information (Bowen, 2009).

Saunders et al. (2012) points out that the generalizability of qualitative studies can be questioned, as they often consist of smaller samples than quantitative studies. As the research is a single case study and the context of the host company is unique, both in terms of market and organizational structure, the generalizability is considered limited. While some inferences can be made, it is because of this difficult to say to what level findings are consequences of the company or its competitive environment. In turn, the generalizability is therefore limited, and the ability to apply findings to other contexts and companies is narrow.

4. Empirical Findings

In the following section the findings from the interview study, documentary analysis, and observations made at the host company will be presented. First data from documents and observations will be presented, followed by the findings from the interview study. The coding contains exclusively data from the interview study, excluding pre-interviews. The presentation of the findings from the interviews follows the structure of the coding. These findings will be presented in the following order starting with findings related to the category, product, followed by relationship, market, organization and processes, and strategy. In these different categories themes were identified that influence and relate to the IP management at the host company, which in turn influences the IP strategy.

4.1 Introduction to the Host Company

The company selected for the study is positioned in the automation industry and engineers and manufactures machines used in advanced production and packaging. The company is located in Sweden and most of its operations are located here too. The company employs around 50 people. It is a small company, in an industry dominated by larger European actors, primarily family-owned companies from Germany and northern Italy. In comparison to its competitors, the company has considerably less revenue. Whereas most competitors have annual revenues exceeding 500 MEUR annually, the host company's revenue is around 10 MEUR.

The company is structured as a matrix organization where functions, including engineering, sales and marketing, project office, and supply chain, operate across the different business areas practiced by the company (see Figure 1). Business areas are responsible for strategies and accountable for profits and losses for different products, whereas functions lead execution, quality, and continuous development for personnel and processes.

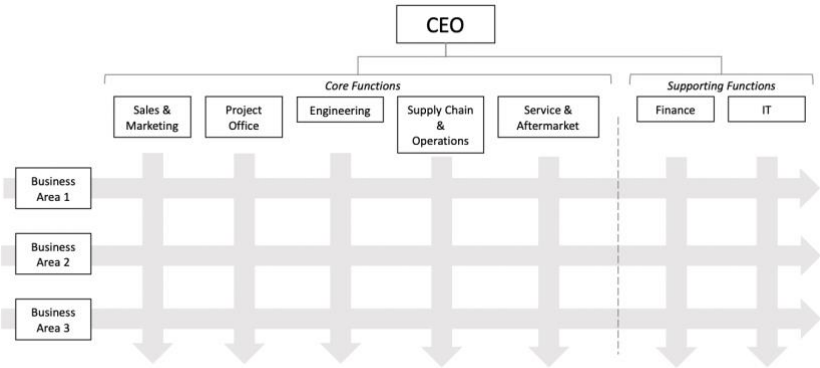

Figure 1. *A visualization of the structure of the organization.*

The company's identified business areas are healthcare, pharma, and customized. The three business areas are distinguished by multiple factors but are primarily different with regards to

product and type of customer. Whereas the two business areas healthcare and pharma are guided by a clearer set of types of customers and products, both customers and products in the business area customized vary to a larger extent. In addition to products, the company also offers service and maintenance for products across all three business areas. The company's business plan is formulated on the business area level and for each product line.

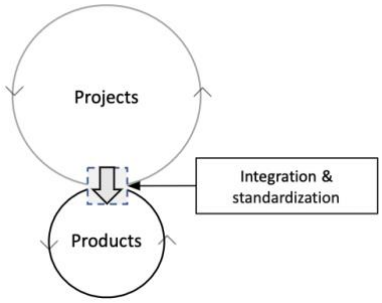

Figure 2: *An illustration of the relationship between projects and products.*

The company manufactures products through projects, and most revenues comes from projects, and not from standardized products. This relationship is illustrated in Figure 2. Projects are what drive innovation and new businesses whereas products drive margins and economies of scale. The focus in the company is emphasized by high quality and tailor-made solutions, and products are characterized by high flexibility, such as handling varied sizes in operations, meaning that the machine can handle different sized packages, without the need to reconfigure, which often is time intensive. The customers are both national and international and tolerate a low degree of error and failures in operations, a level well below that of average for production and packaging in most other industries. The reason for this is because pharma and healthcare are heavily regulated by authorities and agencies. The company currently has six active patents. All six patents have been filed over the last twenty years, but two of these are in the process of being discontinued.

4.2 Product

The host company manufactures turn-key solutions to customers within three identified business areas that are pharma, healthcare, and customized. Products within the business area customized are intuitively very customized and the market is oftentimes non-existent as it is only the company who initiated the order that wants it. With that said, products within pharma and healthcare are to an extensive degree also customized and characterized by low sales volumes. One respondent stated that:

"Each product is its own ecosystem"
- S4

This uniqueness of each product, combined with the individual characteristics of each business area, influences the strategy and management of IP. The main themes identified relate to how product complexity influences relationships, and how customized products make it difficult to work with IP.

4.2.1 Product complexity and customization influence relationships and intellectual property management

2nd level concepts: The level of complexity in products influences relationship with companies; Low volume and customized products makes it difficult to work with IP

The manufacturing of customized products naturally makes it difficult to achieve high sales volumes. According to various interview subjects it is difficult to work strategically with IP management in projects, as many products are customized. In the business area customized the customer has ownership of the IP that is created in the project and therefore it is not considered a problem that it is difficult to work strategically and with a long-term perspective regarding IP. However, in the two other business areas healthcare and pharma the host company is trying to increase standardization and modularization in products, and at the same time the sales of products, which would also make it easier to work strategically with IP. Moreover, due to the high complexity, long lifetime of products, and the fact that the host company offers product maintenance, strong relationships with customers are formed. As the complexity of products increases, so does the possibility for customers to modify and improve existing products. This creates a reliance between the customer and the host company, which deepens relationships, and decreases the need to proactively protect innovation created with the use of formal protection.

"... we still do maintenance work on our machines, and have the responsibility, and I believe this will continue because our partner doesn't have that competence, and therefore we are at the end-customer and therefore we can gather customer feedback."

- S4

4.2.2 The possibility to protect intellectual property is limited as products are made up of third-party components

2nd level concept: The possibility to protect intellectual property is limited as products are made up of third-party components.

While engineering and manufacturing take place in-house, a significant portion of the total offering is made up of third-party components, which are more or less advanced. The more advanced ones are constituted by a combination of hard- and software and include robots and programmable computers. Respondents state that the host company cannot manufacture these components in-house. These third-party components are critical for many of the more advanced operations the product performs, making them critical in the technology offering.

These components need adjustments and configurations in order to work, and there is a need to arrange multiple individual advanced components so that the machine can perform more advanced operations. One respondent stated that the company's contribution of software to the total software delivery is incremental.

"This is a PLC [programmable logic controller], so we buy the entire platform. It is from [supplier]. The application that we put into it, all of a sudden it becomes only a tiny part of the total software."

- S1

As products are made up largely of third-party components, the possibility to create and protect IP through the integration of various components is limited. Respondents state that they wish to protect the solution but find it difficult to pinpoint exactly what parts of the product need protection and are patentable. That the value that the host company delivers with its products is the unique integration of various parts into a single product, makes it difficult to protect parts of the solution with patents, according to respondents.

The strategy for the technological platform used in products is influenced by suppliers, in terms of their third-party components. One respondent said that the technological platform is a framework which the company aims to use for multiple products. The same respondent stated that:

"My role as technology manager is to identify these platforms that we develop in projects. The HMI [human machine interface] is one part of this. /…/ And then we will use the same platform in multiple products."

- S5

"From our relationships with key suppliers, we can identify in what direction they are going. And then we try and see what applications we can make on this."

- S5

In summary, the technology strategy and the level of potential IP from product development is limited by, and dependent on, the third-party components. The prevalence and dependence on third-party components make it difficult for the host company to protect, and to some extent, also create novel IP that can be protected through, e.g., patents.

4.3 Relationship

During the interview study it emerged that the relationship the host company has with various actors indirectly affects the protection mechanisms used. The main themes identified during the coding process were how working with various actors impacts the need to protect IP, how

relationships with external actors can lead to leakage of IP, and how the degree of IP ownership influences relationships.

4.3.1 How working with various actors impacts the need of protecting intellectual property

2nd level concept: How working with various actors impacts the need of protecting intellectual property

As products are made as built-to-order, and design and manufacturing are made on customers' request, there is always some level of interaction with customers in order to collect sufficient information about user requirements and tasks to be performed by the final solution. A similar relationship exists also in the other direction where some strategic suppliers are closely linked to the company. Although the company does not make up a considerable portion of most of its supplier's business, exchange of valuable information about the industry and feedback to suppliers have resulted in collaborative efforts. Respondents state that these relationships of collaborative nature with both customers and suppliers can bring additional benefits to the company. Since most customers and strategic partners are larger than the company, close collaboration with these is expected to help protect the products involved in the relationship since these actors possess more resources and sophisticated processes that could help deter potential infringers. However, such reasoning is of a speculative nature and no example is found in the documentary analysis of an incident where a large supplier deterred or mediated in a patent infringement process.

> "… if there would be a competing solution when we enter a market with a [supplier] and we have a patent, I think they would help. /…/ It is somewhat of a psychological game, no one cares about little us, but with important [partners] and [suppliers] people would probably think differently."
>
> - S4

Further, the need to protect IP in a relationship is affected by type of company and business area. In the business area healthcare, the host company sells its products through a strategic partner, and the company's product is part of a larger offering. The host company needs to sell its products through a strategic partner, which can be a direct competitor, because business is done through public procurements. The strategic partners are considerably larger and thus act as an aggregator in public procurement, which the host company is not able to. One respondent stated that this dependence on a strategic partner requires the host company to protect its product more extensively. In addition, if the host company provides a high marginal product in the total offering, the incentive to manufacture a similar product for the strategic partner increases, making it more important to protect products in healthcare. Since it is impossible to do business without a strategic partner in this business area, the outcome of a terminated relationship is described by respondents as equally bad as the consequences of a potential infringement. Respondents stated that it is difficult to protect the product through

informal mechanisms, such as secrecy, because the strategic partner is close to their product because it needs to be integrated in the total offering. The respondents indicate that in this context, there is an uneven power dynamic, which negatively affects the smaller party.

4.3.2 Relationships with external actors can lead to leakage of knowledge

2nd level concept: Relationships with external actors can lead to leakage of knowledge

Common among all respondents was that although it is clear that IP should be contained within the company, it is unclear what can be communicated with others and how such communication should be managed. Although no respondent could present a specific situation where a leakage has occurred, some respondents stated that people occasionally have shared sensitive information about the company that should not have been shared. These events are explained both as unintentional, because of the unclarities related to the management of communication and what is allowed and not allowed to share with customers, as well as intentional, mainly in relation to activities related to marketing and sales, to increase interest among potential customers. Another explanation found in the answers of the respondents is the emotional involvement among engineers that leads them to want to have their innovations appraised by others.

> "It is very hard in the company to contain it [know-how] because some people have friendly relationships with customers. For example, it is easier to sell something when you offer something extra, the more you can add in the deal the easier the sale becomes."
>
> - S6

Whereas the sharing of sensitive information might lead to a successful deal in the short-term, it can also mean that future deals go to waste, because customers might not need the host company to develop new products but instead reach out to another supplier.

4.3.3 Degree of ownership of intellectual property is dependent on type of partnership

2nd level concepts: Collaboration with suppliers is without exclusive rights; Customers are unlikely to use IP developed in collaboration on their own; Access to IP influences sales

Situations where collaboration with other companies leads to common innovation are few according to the respondents. As customers that turn to the company to have their problems solved generally are specialized in other industries, their knowledge and ability to co-develop machines to be used in production or packaging is very limited. For this reason, collaborative development is limited and mostly done in-house by the company and related IP can thus be managed accordingly by not being shared. Some respondents expressed a worry that not sharing IP with customers that specifically ask for it, potentially can harm deals.

The exceptions are companies in the business area customized which sometimes have resources and capabilities in place to design and engineer their own machines, but for other reasons, such as due to the rigid and lengthy internal processes for such projects, turn to the host company to achieve shorter lead times. These companies want access and control of the products and as a result require ownership of IP related to these. Where one respondent elaborated on potential negative effects this may have on the professional relationship it is clear that although these companies could turn elsewhere with their know-how about the product and related IP, they do not. Therefore, sharing IP in these relationships can be said to be necessary for the continuation of business, but not seen as a risk by the company as it is not a question of whether to protect or not protect it.

When contact with suppliers is close, the host company can gain insights into the suppliers' technological development, and to some extent act as a link between the market, industry, and the supplier. The potential outcome from this in suppliers' products is shared with the company, but not with any exclusivity. Thus, these relationships are primarily seen by respondents in the company as an opportunity to influence suppliers and moreover improve the fit of components used in the products, and the quality of the end-product.

4.4 Market

The market and industry characteristics affect what IP strategies the host company opt for and its management of IP. In the interview study themes were identified such as the market mechanisms in the industry, customers are prepared to pay extra for products, and that the threat to a company's IP is positively correlated with the success of its products.

4.4.1 Industry mechanisms

2nd level concept: Industry mechanisms

Respondents stated that in the two business areas pharma and healthcare there are lots of industry regulations that need to be adhered to. These regulations and necessary know-how are related to requirements in safety and level of quality on the product level. According to the respondents these regulations create relatively strong barriers to entry, since this know-how is developed over time. As a result, the reputation and credibility of a firm is important in order to receive orders from customers in these business areas. One respondent stated that reputation and credibility is more important than an extensive patent portfolio and know-how. In addition, respondents said that the service level is another factor that is important for customers, considering the complexity of products.

4.4.2 Difficulty to achieve high sales volumes of customized products

2nd level concept: Difficulty to achieve high sales volumes of customized products

As a result, from the three business areas that the company operates in and the different types of products it sells, the respondents express that the price sensitivity among its customers is generally low in comparison to other companies in the automation industry. One factor is the degree of automation and level of errors and failures its products can achieve in comparison to the alternative methods, such as using human labor. According to respondents, customers value reliability over costs.

As previously mentioned, the products that the company manufactures are customized. This limits the number of potential customers to the company's set of products at any given time. The limited number of potential customers is further enhanced by the fact that business at times is dependent on sales through other actors' networks and consequently partnerships with these. In these situations, the willingness to pay and opportunity to sell a product is limited and concentrated to a single actor. This is the case for the business area healthcare and strategic partners here.

4.4.3 Threat to intellectual property increases with increased level of product success

2nd level concept: Threat to intellectual property increases with increased level of products success

Naturally, the more successful a product is, the higher the incentive for competitors to copy the solution. One respondent described that there exists a critical mass, i.e., the monetary value of a market for a given product, and when this critical mass is sufficient competitors, with the opportunity to vertically integrate, become interested in taking over the business and compete for market shares. One respondent stated that it is not the largest competitors that are the biggest threats, they are oftentimes reliable partners, but small-sized competitors that are still bigger than the host company that constitute the highest threat, hinting that there are external factors that influence the IP strategy and management.

4.5 Organization and Process

The processes in the host company and the structure of the organization were expressed by respondents as themes that influence how the company works with and manages IP.

4.5.1 IP-processes are not well-defined

2nd level concept: IP-processes are not well-defined

All respondents stated that the company lacks processes to manage existing and new IP. This is explained by respondents that refers to processes in the company where the only existing process related to IP, which is supposed to initiate a clearance of potential infringements in a new product, is incomplete and no one is responsible for it. Respondents express that when questions about IP are raised the process to manage this is unstructured and subjective, and

that the outcome therefore is dependent on who decides to take part of it. In contrast to most other areas in the company that are managed through dedicated responsibilities and processes, the absence of processes for IP management negatively impacts the opportunity to work with these matters. This is explained by respondents by a lack of time and the need to distribute limited resources between other important matters elsewhere in the company.

"... it is because we have limited resources, for it to happen we need to employ more people or something."

- S5

4.5.2 The patenting process is subjective and random

2nd level concept: The patenting process is subjective and random

Respondents with insight into events leading up to the filing of the company's patents describe the process as very ad-hoc and based on a gut-feeling rather than a formal and structured process.

The engineering department within the company is heavily involved in the development of the technical solutions in products and projects, and its contribution to innovation in the company is described as high but with limited connection outside it. Some respondents related to R&D described how it becomes a happening for engineers, and the company as a whole, when something novel and unique has been invented. When talking about this, respondents express a concern that this random and subjective procedure lacks ties to strategic goals and business motives and that such patents therefore do not necessarily help the company in a wider sense than protection of technology.

"I believe that many times it is a happening in the organization whether there is a patent or not, and that it becomes very personal since there is someone that thinks *we should protect this*. But then it is not from a management perspective, but from the perspective of an individual."

- S6

4.5.3 Competence in intellectual property is isolated in the company

2nd level concepts: The risk with IP is perceived differently among employees; Process and IP competence are limited to a few individuals

Although processes for management of IP in the company are not well-defined, it is stated by the respondents that matters of IP usually end up among a few employees that are responsible for the technological strategy in the company. This leads to the adoption of an informal approach where specific individuals are necessary due to non-existent processes. One person in the company was mentioned multiple times by respondents as the one they usually ask or go to for questions about IP-related matters.

"I don't know about them [processes]. Every time there is a question about patents you simply say [name of person]."

- S1

A consequence of the management of IP being isolated to a few employees is that people have various knowledge and perception of IP. Respondents conveyed how the perception of risks with IP varies between employees, due to their different level of engagement in processes related to IP and competence in the area. Whereas coding from the interviews indicates that top level management do not display this behavior, employees in most other levels do. In addition to viewing IP differently, employees are also more likely to compromise on IP than management. This was stated by one respondent who described an event of an employee sharing information with others.

"We as engineers can tend to be more naive when it comes to doing business. /…/ I have heard that sometimes too much has been promised by some individuals. /…/ The perception of the danger of this is very different between people."

- S6

4.5.4 Project-orientation influences how the organization works with intellectual property

2nd level concept: Project-orientation influences how the organization works with intellectual property

Respondents state that the goal at the company is for all projects to be undertaken with the ambition to become persistent, or else of other strategic importance. However, it is difficult to take a customized product and turn it into a product that can be sold in larger quantities to more customers. According to some respondents this project-oriented approach makes it difficult to work strategically with IP and follow a fixed technological trajectory. One respondent stated that:

"... there are no volumes from making custom products, and there is no point in developing IP at once. It is more like an invention workshop where cool things are invented, but then there are no more orders and then it [IP] becomes secondary"

- S4

As the company pursues projects with long-term ambitions, one respondent stated that a project must fulfill several criteria in order to be a part of the long-term strategy. A result from this reactive process is that advancements in projects are made only after successfully completing prior stages. The same respondent stated that first only when a project is assumed to be both strategically important and presents a viable business case is it determined to be

important enough to receive additional attention in aspects that are also non-routine, such as investigating the potential of protecting intellectual property.

"... each machine is a project, and it makes no sense to work with IP on one project..."
- S4

4.5.5 Transfer of knowledge in the company is not structured

2nd level concept: Transfer of knowledge in the company is not structured

Since the three business areas customized, healthcare, and pharma consist of different customers operating in different industries and with different products, the variety in knowledge between projects in the different business areas is high. Experiences from one project can therefore be useful and applied in a different context with a customer in another business area.

"It is one of the strengths, and it is one of the reasons we still want to work with customized, because we learn incredibly much from these customers. /…/ There is a huge win from working with different branches of industry and customers because they use completely different technologies. By working like this, we can see if there are things we haven't thought about and perhaps realize that there are things we could do differently and bring in."
- S3

Respondents express that while transfer of knowledge from customers is appreciated there is no formal process to integrate it in the company. Similarly, there is no formal process for knowledge in one business area to be transferred and applied in another business area. This transfer of knowledge partly happens because employees have been part of projects in different business areas and therefore can apply knowledge from one project to another. Also, this is managed on an individual level through digital forums, according to respondents.

4.6 Strategy

The following themes were identified in relation to strategy: patenting is viewed as a complement to other strategies, there is a lack of time to work with the IP strategy and a negative attitude towards patent litigation. Also, lead time and being agile are considered better protection mechanisms than patents, and the idea of having an IP strategy is a key to unlock future growth.

4.6.1 Patenting is seen as a complement to other more favorable strategies

2nd level concept: Patenting is seen as a complement to other more favorable strategies

From respondents, it emerged that patenting, despite being referenced often regarding IP, was not viewed as effective protection and that there existed other more favorable mechanisms.

The skepticism about patents in the host company was explained by some respondents with an incident in which the company protected one of its products with a patent. The product was sold through a partner who then created a similar product, and most likely infringed on the host company's patent. However, as the host company needed to go through this partner in order to sell the product the sentiment was that there was no point to engage in patent litigation. Most respondents described that the purpose of this patent was of a defensive nature, meaning that the patent should prevent others from copying the solution. In addition, creating patent incentives in order to increase the number of patent applications by the company was not seen as an effective approach by some respondents. The respondents feared that while patents might increase, the products would not be better protected, because employees would patent innovations that did not necessarily protect the product. A cost benefit analysis was suggested by some respondents in order to ensure that the host company patented innovations that protected the company's current or future business. One respondent summed this up by stating:

"A patent should foremost protect the business deal, because there is no point in protecting something if it does not need protecting in the first place."

- S7

4.6.2 The intellectual property strategy is not prioritized

2nd level concept: The intellectual property strategy is not prioritized

One respondent, who was described by other respondents as the one responsible for IP related matters, said that most of the time spent is focused on the near-term. This respondent said that in the future it would prefer to spend more time working with a more long-term IP strategy. Data from the interview indicates that employees interpret the IP-strategy, and this difference is partly explained by the strategy not being a priority.

"The role [technology manager] includes scanning the future. But then, how much of this time do I really work with this? It is maybe not 50 %, but closer to 15 %. So much focus is on near-time."

- S5

4.6.3 Negative attitude towards patent litigation

2nd level concept: Negative attitude towards patent litigation

Most respondents had a negative attitude towards patent litigation. Patent litigation was perceived as costly, time consuming, and resource intensive. The host company is a small firm and lacks the resources of larger firms, making it less likely to engage in patent litigation. One respondent answered the question if the host company should engage in litigation with firms that use their patents, with:

"In principle yes, but it is a last resort. It will cost a lot of time and money that we can spend on other things."

- S5

In addition, if a patent litigation process started, respondents concluded that it would be better to reach an agreement prior to the court's decision.

4.6.4 Agility and lead time are considered better than formal protection

2nd level concept: Agility and lead time are considered better than formal protection

Being agile and manufacturing products with short lead time is in itself a protection. As the patent process can be quite long, respondents in the interview study stated that it was more effective to protect products through other ways beyond formal protections, such as patent. Due to the commonly long lifetime of products, the fact that they are customized, and produced in low volumes, the benefit of protection through patents was questioned by respondents. Interestingly, even though patents were not considered the best protection mechanism, respondents used the term IP somewhat interchangeably with the term patent.

4.6.5 Management practice a strict line on the sharing of intellectual property

2nd level concepts: Management has a strict line on the sharing of IP; The IP strategy is important to support future growth

The management at the host company has implemented a strict line regarding the sharing of IP with customers and regulates this through contracts. The IP strategy is considered important by the host company in its journey ahead as it tries to move from a project-based organization to a global product company. One respondent express, when talking about this, that the reason for this is that the company must ensure that current and future products are well protected so that growth is not interfered with.

"To protect and ensure that our process of productifying, that is to sell more standardized machines. This is our highest priority, our main strategy to grow. So, you can say that the IP strategy is incredibly important for us…"

- S4

5. Analysis and Discussion

This chapter presents an analysis of the findings from the interview study and documentary analysis. The findings are analyzed and contrasted to relevant literature, in order to compare and highlight interesting perspectives. The outline of this chapter follows the structure from the interview coding. As the identified concepts are interdependent and influence each other (see Figure 3) the categories can overlap to some extent. To give an example, products can be viewed as a realization of the company strategy, but not the other way around.

Figure 3: *The figure illustrates the interdependent relationships between the identified concepts in the empirical findings that influence the IP management and IP strategy at the host company. The arrows reflect the direction of dependency between concepts. Solid arrows reflect a stronger dependency, whereas dashed arrows reflect a weaker dependency*.

5.1 Product

As mentioned in the empirical findings, the manufacturing of customized products naturally makes it difficult to work with IP and achieve high volume of sales. Being a manufacturer of products, protecting these should be a viable approach, as literature argues that the patent propensity for product companies is higher than for service companies, because the novelty of innovations is more distinct in products and because knowledge is more tacit in service companies (Dozi & E. Stiglitz, 2014; Somaya, 2012; Wang, 2020). Dozi and E. Stiglitz (2014) argue that in complex industries the number of patents is higher than in product industries where products are simpler. The empirical findings reveal that products are complex and therefore the host company is considered to operate in a complex industry. With that said, the number of patents at the host company is low, which is not in line with (Dozi & E. Stiglitz, 2014) arguments that actors in complex industries aim to block rival use of their components. However, the empirical findings reveal that the possibility to patent components is low, because of the high prevalence of third-party components. These findings may suggest that the host company should opt for protection on processes, despite the fact that the company is a more of a product company than a service company. The host company displays characteristics associated with service companies, such as low patent propensity and prevalence of tacit knowledge, and empirical findings reveal that that there is a relative high degree of undocumented and non-formalized knowledge at the host company, and that it is challenging to document this type of knowledge.

The empirical findings that the host company has a low patent propensity is in line with literature that argues that SMEs have a higher tendency to opt for formal protection through non-registrable rights (Kitching & Blackburn, 1998). However, the context in which the host company operates is unique and there is not enough literature about this particular setting to draw any definite conclusions. A plausible explanatory factor of the low use of patents as formal protection is the nature of the products that constitute an integration of third-party and in-house made components. Because products are made up of various components, the host company's innovation constitutes an incremental part of the total technological offer. An extensive integration of external components, and consequently others IP, therefore, limits opportunities to create own IP. This could imply that products do not meet the criteria for patentability, as outlined by e.g., WIPO (2015) and Granstrand and Holgersson (2015), or that the level of originality is questionable. Findings in Hanel's (2008) study, supports the argument that the propensity for firms to patent is positively correlated with the originality of the innovation, and could explain such a relationship. However, it is worth commenting that just because an innovation is original and novel it does not mean that it should be patented.

Teece's (1986) discussion about innovation taking place in either a pre-paradigmatic phase or a paradigmatic phase is difficult to transfer to the context of the host company. The main argument against innovation taking place in the paradigmatic phase is the absence of a dominant design, which is supported by empirical findings. Teece (1986) argues that this

(floating designs) is a characteristic of a pre-paradigmatic phase. With that said, the empirical findings support that innovation takes place in the paradigmatic phase, because access to complementary assets, such as distribution, marketing, and service is very important for commercial success. These factors are in line with Teece (1986) reasoning. From the interview study, the dependence on complementary assets was highest in the business area healthcare. As the host company must sell its product through a strategic partner, oftentimes a larger direct competitor, due to the nature of the purchasing process in healthcare, it was to a certain extent already dependent on this partner, its goodwill and resources. Interestingly, the determinant if this given strategic partner had an incentive to imitate was according to the respondents twofold. Intuitively, the product had to be attractive from a monetary perspective, either being a high margin product or with potential to sell in larger volumes. Second, findings suggested that it was not the company's biggest competitors that was interested in copying the solution, but primarily larger companies. This observation is interesting because it indicates that the more uneven the power balance between the host company and its strategic partner is, the lower the need for the host company to protect its IP. Thus, threat and firm size show a non-linear relationship in partnerships. Further, this finding suggests that the host company should strive to partner with larger companies, since they seem to be more reliable partners and with a higher threshold to imitate. This adds to what Lorenz and Somaya (2013) mention about firm size influencing market power and relationships between SMEs and large companies.

5.2 Relationship

From the interview study and documentary analysis relationships emerged as a factor that affects the IP management and the IP strategy at the host company. Empirical findings indicate that there are three main variables that shape relationships, and these are products, firm size, and business area. The case study indicates that regarding products, the more customized a product is, the higher the transfer of knowledge between the two parties is, which deepens the relationship. The empirical findings show a relationship between the degree of product customization and business area, with the business area customized naturally being the business area with the highest degree of customization. In this business area the host company does not have ownership of IP, however, there is still transfer of knowledge from this business area to the rest of the organization. Respondents in the interview study expressed that there are benefits with the combination of external and internal innovation, which is supported by existing literature (Granstrand, 2021). This suggests that one type of knowledge that the host company values is what literature (Bogers et al., 2012; Granstrand & Holgersson, 2014) phrases as sideground knowledge. This in turn raises interesting ideas regarding management of IP as the host company does not have a strategy for managing such knowledge, as indicated by the empirical findings.

Regarding firm size, similar-sized and slightly larger firms have more incentives to imitate as their threshold to do so is lower compared to considerably large companies. Considerably

larger companies instead, to a higher extent, drive revenue through sales volume which makes their incentive to imitate lower. As the host company oftentimes engages in relationships with larger actors there is a power-imbalance at play. The findings from the study indicate that the determinants to this power-imbalance are if the other company can vertically integrate the operations of the host company, as well as the reliance between the two parties. This is in line with what Lorenz and Somaya (2013) states about market power and that larger companies with more resources oftentimes can hedge risks by spreading investments across a range of innovative projects, including riskier ones, in contrast to SMEs that repeatedly search investors through capital marketing (Holgersson & Granstrand, 2017; Holgersson, 2013; Rassenfosse, 2012). In the healthcare business area, the host company is reliant on a strategic partner, since it cannot sell directly to end-customers due to the nature of the procurement process and the fact that the product fits in a larger system of products. This indicates that the level of complementarity is high (Holgersson et al., 2022) which increases the need for coordination. A power-imbalance can imply that the smaller party should approach protection mechanisms, in order to mitigate the negative aspects of this imbalance. Empirical findings show that this behavior was most present in the business area healthcare.

The relationship between the host company and the strategic in the business area healthcare fits well the description above about power-imbalance in relationships. In fact, the company patented an innovation in a product sold through a strategic partner in healthcare. In the end, the strategic partner built their own similar product and, according to the interview study, the strategic partner very likely infringed on the patent. However, as the host company was dependent on the strategic partner to sell the product, it served no purpose to engage in patent litigation. As SMEs are generally more prone to use informal strategies for protection (Kitching & Blackburn, 1998; Schneider & Veugelers, 2018) and since governance can be exploited for a good partnership (Bogers et al., 2012), there is a risk that tight relationships create hostile situations (Granstrand & Holgersson, 2014). However, these findings indicate that problems can exist also when formal protection exists. This adds to what Kitching and Blackburn (1998) state as a behavior among SMEs which commonly choose to devote their scarce resources to other things than enforcing their rights even when formal protection is in place and indicates that dependency also influences such a decision. Besides formal protection a company can also adopt informal protection, one of which is secrecy. Literature argues that secrecy is advantageous if an invention can be kept secret longer than the patent protection time (Boldrin & Levine, 2012). Publishing would have entailed no benefit, since it would have allowed the partner to use the patent, which instead would have fast-tracked the manufacturing of the product (Holgersson and Wallin, 2017). From the empirical findings it is very likely that the outcome would have been the same, whether formal or informal protection was used. This is interesting because it suggests that patent and secrecy is not sufficient on its own. And there is a need to explore how firms can protect their products through other means, such as managing relations.

5.3 Market

From the case study various market aspects and mechanisms appeared that influenced the host company's approach to its IP management and IP strategy. Operating in the pharma and healthcare industry entails a high degree of regulation and in turn demand for high-quality products. The empirical findings revealed that credibility and service level are crucial for customer satisfaction. One respondent concluded that credibility and reputation is much more important than an extensive patent portfolio, according to customers. In addition, the findings show that internal technological know-how is not sufficient and needs to be combined with relationships with key partners and stakeholders. As these market mechanisms are unique in the context of the host company there is not much literature on how it affects the IP management and IP strategy. It can be argued that IP naturally is very important for the host company to achieve technical success, but in order to achieve commercial success the host company needs to use other mechanisms.

Another characteristic of the host company's market is that its customers are not very price sensitive, in other words, their willingness to pay is high. The main contributing factor to this is the nature of the host company's business, which is to sell customized products. Moreover, as products are customized the opportunity to sell one product to many customers is limited. With that said, the company can to a certain extent use a given part in more than one product, as it creates modularized products. However, the ability to exploit modularization for increased ability of distributing IP and protecting technology is not viable. Using modular IP as suggested by Henkel et al. (2013) is not possible here, because of insufficient competence and knowledge in IP. The empirical findings also revealed that the perceived IP threat is positively correlated with product success, which is intuitive to understand.

5.4 Organization and Process

The empirical findings show that the host company does not have an IP portfolio reflective of goals and strategic objectives. Reasons, according to literature, why companies fail is because of insufficient internal processes to extract and leverage IP and lack of internal IP knowledge (Barrett & Crawford, 2002; Wang, 2020). The interview study and documentary analysis further indicated that the IP processes are few, subjective and lack a clear connection to wider business objectives. In addition, competence about processes is isolated, and associated with a certain employee at the host company. This finding is in line with arguments put forward by Kitching and Blackburn (1998), and Pitklekthy (2007) that SMEs are less aware of IP management issues and that competence is limited. Whether the reason for the limited and insufficient IP processes is more related to the limited internal IP competence or a consequence of the ambiguous external environment and focus on customized products, is not clear from the data. Both Gollin (2008, as cited in Wang, 2020) and Sullivan and Harrison (2008) argue that it is important to include steps that cover the entire stream of activities moving from corporate goals and strategies to the formulation of a defined IP

strategy. Additional literature (e.g., Holgersson & Wallin, 2017; Thiel & Peters, 2012; Somaya, 2012) argue that it is important to also consider innovation type, industry, IP regime, and market structure. Since this implies including external factors relating to competing actors and products, an undefined set of products and consequently an ambiguous external environment can be considered to have significant impact on the ability to formulate such a process.

It remains unclear how SMEs can achieve an IP portfolio that reflects company objectives if it lacks set processes and internal knowledge, and the literature is sparse in this area. Presumably, knowledge in IP is necessary in order to create effective and reflective IP processes. For these processes to reflect the company strategy, the employee responsible needs to possess the ability to interpret the strategy and translate it into IP processes. This interpretation process therefore requires both extensive IP and business strategy knowledge. This is corroborated by literature (see e.g., Barrett & Crawford, 2002; Wang, 2020; Sullivan & Harrison, 2008) that argue the need of integrating the IP strategy with the business strategy. In addition, Reitzig (2007) argues that genuine involvement from top-management in IP issues is a major success factor, and this involvement can be interpreted as the degree to which the IP strategy and business strategy are aligned. Barrett and Crawford (2002) argue that innovators should possess knowledge about the legalese of patents, to mitigate the risk that patents lack formal protection. The empirical findings indicate that the legal knowledge about patents is low. Combining the empirical findings with literature on the subject, it could be argued that the success of patents is determined by how knowledgeable employees are in the following three areas. First, an employee needs to possess the relevant technical knowledge of the patent to assess it properly. Second, an employee needs to be accustomed with the legal framework of patents, so that the potential protection from the patent is maximized. Third, the employee needs to understand the company strategy, to ensure that the patent relates to company objectives. This third step requires an employee to integrate the IP strategy with the company strategy.

Historically patenting at the host company has been a subjective and random process. One respondent (S6) states that: “I believe that many times it is a happening in the organization if there is a patent or not, and that it becomes very personal since there is someone that thinks we should protect this. But then it is not from a management perspective, but from the perspective of an individual”. As previously mentioned, there is a connection between the originality of an innovation and the propensity to patent, meaning that innovators are more likely to patent innovations that are new and unique (Hanel, 2007; Somaya, 2012; Wang, 2020). However, just because an innovation is unique it does not necessarily mean that it makes it more difficult for imitators to create a similar product, just that it becomes more difficult for them to create a similar innovation. Moreover, as technology is invariably evolving, the technological foundation the patent is built on might become less important in the future, making competitors less likely to use it. The empirical findings about innovators having difficulty assessing innovations at the host company objectively are in line with

arguments put forth by literature (Barrett & Crawford, 2002). Empirical findings support that innovators' are involved in the innovation evaluation process, and therefore also influence the assessment of the degree of significance of an innovation. Schneider and Veugelers (2018) argue that SMEs are much more likely to engage in formal protection if an innovation is considered "big". A lack of formal processes in this regard invites individual subjectivity into the corporate evaluation process, and is exacerbated since innovations are evaluated by innovators, who previously mentioned tend to overestimate the importance of their own creations. To sum up, this lack of formality and objectivity can be argued to explain the random patent process in the empirical findings.

Moreover, as the innovator is naturally very close to the innovation, and views it subjectively, it might still be difficult for the innovator to assess the innovation objectively, despite possessing extensive knowledge about the IP competitive landscape and the company's IP strategy. This is another trouble with having limited IP knowledge and isolated IP competence in a company, because it means that the likelihood of subjective and inaccurate assessment of innovations increases. This is again supported by literature that argues that innovators have difficulty gaining a perspective on their own innovations, since they are perceived to be too close to properly evaluate innovations from an IP perspective (Barrett & Crawford, 2002). During the interview study it emerged that the host company does not incentivize patenting. An interesting observation from this is that if the host company would incentivize patenting, which is something several respondents did not view as a viable way to increase the degree of formal protection, is that the patent process could become even more subjective and random. This is because innovators, besides professional motives, also would have monetary motives to file for patents. Per se, this does not have to be negative if the innovators are not part of the patent decision. However, in an SME which the host company is, with limited resources in the form of knowledge and personnel, it becomes difficult to completely separate innovators from the patent decision. The empirical findings further reveal that many employees, including the CEO, have more than one role at the host company. Literature argues that SMEs, compared to large companies, have limited time, money, and competence, which complicates the management and strategy of IP (see e.g., Kitching & Blackburn, 1998; EPO, 2017; Pitkethly, 2007). The multiple roles at the host company reflect this lack of resources.

5.5 Strategy

The empirical findings indicate that employees do not view patenting as their preferred tool in shaping the company's IP strategy. This skepticism against patents is in line with findings in literature where this behavior is especially prevalent in SMEs (Kitching & Blackburn, 1998; Holgersson, 2013). Literature argues that SMEs do not view patents as their preferred IP tool, because monitoring and enforcing patents are resource-intensive activities. One respondent (S5) states when speaking about patents that: "...it is a last resort. It will cost a lot of time and money that we can spend on other things." This quote encapsulates the attitude at

the host company about patents and especially patent litigation as a last resort. This is an interesting observation because patents are only useful to the extent to which they are enforced by the grant-holder. The fact that the host company does not aim to use patents in the way they are intended to be used indicates that patents are used less as a legal mechanism, and more as a deterring mechanism. Another dimension with patents is that it safeguards and formalizes knowledge within the company, as argued by Holgersson (2013). Moreover, these empirical findings can be interpreted that the host company has a naive attitude towards the patent system and how it works. Whether this approach of using patents is effective is not clear. However, the approach influences the formulation of the host company's IP strategy.

Despite no respondent specifically mentioned the term defensive IP strategy, findings from the interview study indicated that the firm wished to pursue a defensive strategy. All respondents wanted the host company to be less dependent on other actors and be able to pursue opportunities without being held up by others, e.g., through patents. A term that encapsulates this sentiment expressed by respondents is FTO. In line with Holgersson and Wallin (2017) respondents wanted to retain FTO both in the static and dynamic dimension. The respondents expressed that it was more important not to be at a competitive disadvantage, than achieving a competitive advantage through patents. This is in line with findings that SMEs generally prefer a defensive strategy as opposed to an aggressive one (Lorenz & Somaya, 2013; Somaya, 2012). As the host company is more of an integrator than creator of technology, it is a challenge to retain static, and especially dynamic FTO. This is because customer demand and preference might vary over time, which is supported by the interview study, and this uncertainty makes it difficult to ensure dynamic FTO.

Another strategy that firms can opt for is licensing the right to use patents, which is called a leveraging strategy (Somaya, 2012). Respondents did not mention licensing during the interviews, which indicates that it is not relevant because it is not part of the company's business strategy. Somaya (2012) and Thiel and Peters (2012) argue that licensing is commonly used in standard setting, open innovation, and alliances. The industry in which the host company operates does not display the need for standard setting, but empirical findings show, to some extent, the occurrence of open innovation and alliances. Also, as innovation is oftentimes associated with a specific customer, rationally it is difficult to find clear areas to engage in licensing. The leveraging strategy requires competence to monitor and enforce patents, which the empirical findings reveal that the host company does not possess.

The empirical findings reveal that the host company operates in, what is characterized by Teece (1986), as a weak regime. The findings reveal that similarly to other SMEs (Schneider & Veugelers, 2018) the host company is dependent on the access of complementary assets, such as strategic partnerships, access to suppliers' products, and distribution channels, in order to reap profits from its innovations. While there is a strong legal system, there are no strong defined protection mechanisms, which is outlined by Teece (1986) as a characteristic in a tight regime. The empirical findings indicate that one reason for this is the absence of a

dominant design, which is a result of the project and customized orientation of the host company. Consequently, imitators can innovate around products or use a different combination of third-party components, which makes protection weaker. However, this goes both ways, as the host company also can innovate around competitors' products. For this reason, business is to a low degree affected by such occurrences, and accordingly the attitude towards protection of technology and IP resembles this. The empirical findings indicate that the company is a niche actor, due to its focus on manufacturing products with high flexibility, compared to competitors that compete on speed. Being a niche actor entails, according to literature (Swiss Federal Institute of Intellectual Property, 2009), a form of natural protection since it is to an extent shielded indirectly from competition. Moreover, this natural protection entails a lesser need for formal protection and can explain why the use of formal protection is not extensively adopted.

6. Conclusion and Implications

The purpose of this study has been to investigate how SMEs work with their IP management and IP strategy. Moreover, it has been to gain a deeper understanding of how various aspects influence and shape the rationale behind, and the practices adopted for IP by an SME in mechanical engineering within automation. The findings in this case study reveal that the host company practices few elaborate IP strategies. This is in line with previous literature on IP management in SMEs and contrasting to larger companies. The findings highlight that there are five concepts that influence the host company's IP management practices and IP strategy. These concepts were developed from the coding process and are product, relationship, market, organization and process, and strategy. Moreover, these concepts were identified as overlapping, thus making it necessary to view these concepts in relation with each other, rather than independently.

The products that the host company manufactures influence IP related issues because of the high percentage of third-party components combined with the high degree of customized products. The nature of the products, as the empirical findings show, influence and limit IP management and IP strategy. More specifically, the findings reveal that the use of formal protection, such as patenting, is not considered as effective as other less formal ways of protection. In addition, the high prevalence of third-party components naturally limits the host company's possibility to patent. The findings also indicate that customization is a protection. However, the customization process entails a project-based approach where customers participate. Findings indicate that customers' involvement and specific requirements makes it difficult to work with an IP strategy in the long-term. The argument can therefore be made that customized project naturally limit the time horizon when working with IP.

The host company's customized business approach makes it necessary to collaborate closer with customers. The findings of the case study suggest that relationships affect the IP management and IP strategy, and further the effect the relationship has on the strategy and management differ between the host company's business areas. In the business area customized the relationships are very close and the ownership of IP is regulated through contracts. In the business area healthcare the host company is dependent on a strategic partner in order to sell to end-customers. The dependency on this partner creates an uneven power balance in the relationships and makes it significant for the host company to protect its products. The findings indicate that if the strategic partner wants to build a similar product, formal protection is not sufficient. Further, the findings indicate that it is also difficult to protect products through other mechanisms, such as deepening relationships and regulation through contracts. As relationships are close the findings reveal that IP knowledge is at risk of leaking from the company to other actors, especially customers. The reason for this, according to the findings and in line with literature, is that engineers like to talk about their innovations and that employees tend to share information when there are incentives for doing

so, e.g., for increasing sales. In the context of the host company, this highlights the importance of keeping IP in-house, especially in circumstances where relationships between seller and buyer are close.

The findings also reveal that the market in which the host company operates is an external factor that shapes the IP management and IP strategy. The literature argues that an IP strategy needs to be tailored to a given company, which is supported by the findings. The host company operates in three different business areas, which creates an interesting area of future research as the host company, according to present literature, envisages three different IP strategies, and thereby also IP management processes. The findings revealed that the host company can be considered a niche player, as it competes on different metrics than most of its competitors. Being a niche actor, as the findings indicate, insulates the host company from competition.

Turning to the fourth codified concept in the case study, organization and processes, the findings reveal that the IP processes in place are not well defined, subjective, and random. This is in line with previous findings on the subject IP management and SMEs that SMEs, as a result of limited time, money, and competence, have insufficient processes. The findings reveal further that competence is not only limited, but also isolated within the company. Moreover, findings indicate that employees with IP competence lack understanding of the business strategy and therefore the ability to integrate the IP strategy with the business strategy, and this integration literature argues is part of a successful IP strategy. The knowledge transfer between business areas is made possible by the project-orientation based approach the host company practices. Findings indicate that the knowledge transfer between different business areas is unstructured and not formalized. This illustrates that it is difficult for SMEs to formalize IP management processes, when working with a project-based approach.

Lastly, the coding of the interview study led to the fifth identified concept which is strategy. The empirical findings revealed that the host company did not view patenting as a favorable strategy, and rather emphasized the importance of alternative ones, such as short lead-time and agility. The relative negative attitude against patenting derives from the idea that perceiving patent litigation is seen as a last resort, and that that the host company is a niche-actor in a weak regime. Further, the IP strategy was not prioritized, which is in line with the previous findings that processes are random and subjective. The relative negative attitude against patenting derives from the idea that perceiving patent litigation is seen as a last resort.

The ability to generalize findings to other contexts and companies is only limited, as the unique setting for this research provide only such generalizable results. However, findings about the motives for IP strategies can be considered generalizable, as findings to a high degree are in line with literature on the subject. In terms of future research, it would be interesting to further explore how firms, in particular SMEs, can protect their products

through managing relations, because the case study findings indicate that relationships are a factor that influence IP management and strategy. In addition, it is of interest to investigate further how SMEs can develop IP strategies in order to achieve static and dynamic FTO. Lastly, it is unclear how SMEs can achieve an IP portfolio that reflects company strategic objectives if it lacks set processes and internal knowledge and competence. It is therefore necessary to research how SMEs can achieve an IP portfolio reflective of strategic goals, and how SMEs can gain competency and knowledge about IP and then apply to formulate set processes.

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Appendix

Appendix A Interview Guide

Interview guide in Swedish (original)

- Kan du berätta om din roll på företaget?

- Vilka är de olika patent/ip-processerna ni har på företaget och har du någon erfarenhet av någon av dem?

- Vad är enligt dig skillnaden mellan patent och IP, samt patent- och IP-strategi?

- Varför anser du att företaget borde ha en IP-strategi?
    - Vilka fördelar tror du företaget kan uppnå?

- Hur skulle du vilja att företaget jobbar med IP och patent?
    - Vad är det som stoppar er idag från att jobba på ovan beskrivna sätt?
    - Hinder? Brist på kompetens/resurser? För komplext?

- Hur tror du företaget kan skapa värde genom att arbeta med patent och IP?
    - Är det viktigt enligt er att ha patent för att
        - 1. Kunna operera obehindrat
        - 2. Kunna dra nytta ekonomiskt (öka attraktionsnivå/anseende eller licensiera och få intäkter)
        - 3. Attrahera externt kapital
        - Annat

- Anser du att företaget borde försöka stämma företag som gör intrång på era patent?
    - Varför, varför inte?
    - Vilka risker anser du en juridisk tvist medför?

- Tycker du att företaget borde stärka sitt samarbete inom utveckling med leverantörer/kunder?

- Tror du att det finns bättre alternativ till att patentera?
    - Med tanke på svaret ovan på föregående fråga, utveckla.

Appendix B Interview Guide Translated to English

Interview guide translated to English

- Can you tell us about your role at the company?

- What are the different patent- and IP-processes at the company, and do you have any experience with them?

- What is according to you the difference between patents, IP, and a patent- and IP-strategy?

- Why, do you believe, the company should have an IP strategy?
    - What benefits do you think the Company can achieve by this?

- How would you like the company to work with IP and patents?
    - What prevents you today from working in the way described?
    - Are there any hinders? Lacking competence/resources? Too complex? Anything else?

- How do you believe the company can create value by working with patents and IP?
    - Is it important, according to you, to have patents to:
        1. Operate more easily
        2. Economic advantages (increase attraction/reputation or license and generate additional revenues, other)
        3. Attract external capital
        4. Other

- Do you think the company should engage in litigation against others who infringe upon your patent(s)?
    - Why, why not?
    - What risk does a patent litigation entail?

- Do you think the company should strengthen its cooperation in development with suppliers and customers?

- Do you think there are other better ways compared to patenting?
    - Depending on the answer above, ask the respondent to explain further