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Extracting Value from a Non-core Patent Portfolio

A Useful Process to Increase the Percentage of Patents That Generate Value to the Company

Master of Science Thesis in the Master Degree Programme, Entrepreneurship and Business Design

OSCAR PETERSSON
FREDRIK JERN

Department of Technology Management and Economics
Division of Management of Organizational Renewal and Entrepreneurship - MORE
CHALMERS UNIVERSITY OF TECHNOLOGY
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OSCAR PETERSSON
FREDRIK JERN
Department of Technology Management and Economics
Division of Management of Organizational Renewal and Entrepreneurship - MORE
Chalmers University of Technology

Abstract

Patents have been used for a long time to protect innovations from being copied without consent from the owner of the patent. The transformation over the recent years has increased the focus on and importance of patents. The use of patents are today much more complex than just using them for blocking. They could for example be part of sophisticated business cooperation structures. As a result, companies file for more patents than ever. However, due to many reasons, far from every patent brings value to the company. Examples of such patents that do not bring any value are non-core patents, which are patents that are not relevant for the company's core business and are not used in any way. Hence, it is very likely that the knowledge about them is poor which makes it hard to use them and extract value from them. In order for a company to change this situation and actually extract some value from these patents, a structured process is required. This is not an easy task and the aim of this report is to address a part of this problem by analyze how a company can capitalize on a non-core patent portfolio which only has a few years left until the patents expire.

From reading books, newspapers and from experience a hypothesis about how the commercialization process should look like was developed. The process consists of three parts. The first, the portfolio analysis, is very important and shows how to know what is in the patent portfolio and structure that information in a good way. The second one, market analysis, shows that external factors both can be used to understand the value of the portfolio as well as find potential targets for the commercialization process. The final part focuses on the strategic considerations when choosing how to commercialize the portfolio. What is seen is that the choice is highly dependent on the context and is therefore unique for each situation.

The process was developed and verified during a case study at Ericsson. Our conclusion is that the process works very well. All three parts of the process are important for a successful commercialization. However, since each part consists of many considerations and methods, the conclusion drawn from the case study was that some of these considerations and methods are not very useful in practice. In addition, during the case study, additional methods were found to be useful and hence added to the process. The findings in this report lay the basis for the result which is formulated as the Value Extraction framework which is recommended to be used by companies in order to extract value from their non-core portfolios.

Keywords: Value Extraction, Framework, Non-core, Intellectual Property, Patent, Portfolio

Contents

Nomenclature

(Preliminary) Injunction	An injunction is a court order requiring a person or company to do or cease doing a specific action [29]. A preliminary injunction is a temporary injunction that is issued early in a lawsuit [29]. An injunction in relation to a patent infringement case is an order from a court requiring that a company ceases to produce or sell the infringing products, which is the type of injunction that will be described in this thesis.
IP	Intellectual Property is the legal rights, such as patents, trademarks, copyright and design rights, which result from intellectual activity. In this report, IP will refer to patents.[54]
IPR	Intellectual Property Right is a legal right that is granted to a creator or producer of intellectual goods that gives the creator certain exclusive rights to control the use made of those goods for a limited time period. The different IPR:s are Patents, Trademarks, Copyright and Industrial Design rights.[54]
Non-core patent	For this report a non-core patent or non-core patent portfolio is defined as a patent or patent portfolio that does not cover any products or processes that are currently used by the company. Furthermore, the definition here includes that the non-core patent or patent portfolio is not currently licensed to a third party, not used to block competitors and does not contain standard-essential patents.
NPE	A non-practising entity is an entity who owns a patent or patent portfolio but does not sell or manufacture any products that includes the technology covered by the portfolio. A NPE could be a PAE or a university since they (usually) do not sell or manufacture any products.
PAE	Patent assertion entity. It is a kind of NPE. Their core business is to buy and assert patent. They do this by establish license agreements which gives income in terms of royalty fees from which

	most of their revenue is derived from. In addition, they sometimes file litigation against companies that does not want to take a license. In this way, they both help increase the marketplace for patent transactions as well as strengthen the patent system. [6].
Patent Families	A patent family is the set of all the patents covering a specific invention, therefore it is usually one patent for each geography that an patent application was filed in.[51]
Patent Portfolio	A patent portfolio is a bundle of patents.
Prune	Prune means to discontinue to pay the maintenance fees for the patent which means that it will not longer be valid.
USPTO	The United States Patent and Trademark Office is the Federal agency for granting U.S. patents and registering trademarks.[48]
WIPO	World Intellectual Property Office is the United Nations agency dedicated to the use of intellectual property as a means of stimulating innovation and creativity.[53]

1 Introduction

This thesis describes management in relation to intellectual property. More specifically it focuses on how companies can extract value from non-core patent portfolios. This chapter will give an introduction to this field and define the research questions that are answered in this report.

1.1 Background

R&D has for a long time been seen as one of the most important activities in a company. Companies spend a lot of money on R&D in order to keep their competitive advantage. This is among other things indicated by the fact that the global spending on R&D in 2013 was as much as 1 496 trillion USD [2]. It is also indicated by the fact that the number of patent applications have more than doubled from 1985 to 2011 when the number of patent applications was as high as 2,1 million [56].

Innovations and new technologies can only benefit a company if the company can control them and manage them in a good way. Intellectual property rights are therefore becoming more and more important for today's companies. In fact, a survey in 2002 of the Fortune 500 companies estimated that anywhere from 45 % to 75 % of the wealth of individual companies comes from their intellectual property rights [9]. Combining this with the fact that international royalty and licensing fees rose from 27 billion USD in 1990 to approximately 180 billion USD in 2009 really shows that this is an important trend that most companies cannot afford to neglect [13].

Despite that companies now start to realize the values of patents, the effective value extraction from patents are still very low. Some estimations point towards that as much as 97 % of all patents never make any money [26]. Clearly, there should be many patents that actually have the potential to generate money. Let us at least hope so. Still, in a high-tech company with some 10 000 patents, fewer than 5 % by most estimates have a distinguishable value [3]. These facts together with the spending on R&D that is made today and the number of patent applications that are filed each year, gives most companies very good reasons to ask themselves; are we really utilizing all the value in our patent portfolios?

This report addresses parts of the issue of having patents that do not generate any value by focusing on a process that companies can use in order to extract some value from their non-core patent portfolios.

1.2 Purpose with the Report

Since many companies today have patent portfolios that they are not using, the main purpose in this report is to provide an understanding of how a company can extract value from these non-core patent portfolios. The report

is mainly targeted towards industry professionals and academics within the field. The report describes both the theories of how a patent portfolio can be analysed, some of the aspects that affect the value of a patent portfolio as well as the different choices a company has for extracting value from its non-core patent portfolios.

1.3 Research Question

With the background and purpose of the report in mind, the overall research question of the report is:

How can a company extract value from a non-core patent portfolio?

This overall research question has been divided into three research questions where each cover one important step that a company should go through in order to extract value from a non-core patent portfolio. These are:

1. *How can a company analyse and categorise the patents of a non-core patent portfolio?*

   When looking at different ways to extract value from a non-core patent portfolio, the first important step is to gain an understanding of the patents in the portfolio and the technologies that they cover. An understanding of the content of a patent portfolio is crucial since it can determine both what markets that the portfolio is applicable to as well as the different options that exist for extracting value from it. There are many different ways to assess a patent portfolio and this question aims at giving the reader an understanding of the different ways that exist to analyse the content of a patent portfolio as well as how the patents in a patent portfolio can be categorised in order to facilitate future value extraction.

2. *What factors affect the value of a non-core patent portfolio?*

   When an understanding of the patent portfolio has been gained it is important to start to look at the different external aspects that affect the value of the patent portfolio. This question aims at giving the reader an understanding of theories that can be used when analysing technology trends as well as providing the reader with the different factors that affect the value of a patent portfolio so that a full understanding of the value of a patent portfolio can be gained.

3. *What different ways are there for a company to commercialise a non-core patent portfolio?*

   When understanding the content of the patent portfolio and the different factors that affect the value of it, the last research question aims

at showing the reader the many ways that exist for extracting value of a patent portfolio. This question is important because understanding all the different options a company has to extract value from a patent portfolio will make it easier to extract as much value as possible.

1.4 Scope

This research report will analyse different ways to gain an understanding of the content of a patent portfolio, the factors that affect the value of a patent portfolio as well as the different options that a company has to extract value from a non-core patent portfolio. This report will focus on patent portfolios that cover innovations within the high-technology field where each product is usually covered by several patents.

This report will not at all look at the type of patent portfolios owned by pharmaceutical companies where only one or just a few patents usually correspond to a whole product, usually a substance. It is however believed that many of the theories and methods explored here could be applicable to patent portfolios in this field as well.

As described earlier, this report will explore the different theories and factors that affect the value of a patent portfolio. However, it will not describe any way to determine a monetary value of a patent portfolio. Value can mean different things. In the context of extracting value from a patent, this report distinguishes between value and monetary value. Estimation of the former is usually referred to as evaluation and the latter as valuation. They are both related as the value of a patent is the base for its monetary value. The monetary value of a patent is easy to grasp in the sense that it is just a price. However, it is usually very difficult and complex to determine such price. One reason is because it changes over time and is highly dependent on the context as well as the motive of the transaction, between whom the transaction is made. Therefore, when this report talks about value, it will be a general estimation of the value but no estimation of the strict monetary value will be presented. Value in this report represents value in the sense that a patent can generate money when sold, open up business collaborations, strengthen negotiations, give access to technological innovations and so on. However, important to note is that it is still hard to determine such value.

1.5 Thesis Outline

This report is divided into seven chapters. After this introduction chapter, the following chapter describes the background needed for the report. The chapter after than describes the method that was used during the research.

The following three chapters each answers one of the research questions. The chapter Portfolio Analysis answers the research question *How can a*

company analyse and categorise the patents of a non-core patent portfolio? and contains information about different ways to analyse the content of a patent portfolio as well as different ways to categorise the patents in a patent portfolio. After that, the chapter Market Analysis answers the research question *What factors affect the value of a non-core patent portfolio?* and describes three different aspects that each contain different factors that affect the value of a patent portfolio and that are important to understand when looking to extract value from a patent portfolio. The last research question *What different ways are there for a company to commercialise a non-core patent portfolio?* is answered in the chapter Value Extraction Strategies and describes how the value is dependent on the context, how potential stakeholders can be found and the different ways that a company could extract value from a patent portfolio.

The last part of the report contains a chapter with the results from our research, a chapter discussing the results of the report, a chapter with proposals for future research within the field and then a short chapter with the conclusion.

2 Background and Theory

This chapter will give the background and theory necessary to understand the context of this report and why the research questions are highly relevant in this context. The chapter begins with an overview of the development of the use of patents followed by an explanation of what a non-core patent portfolio is and why companies have them. The chapter ends with a discussion of why it is hard to extract value from a non-core portfolio which is the basis for this report.

2.1 The Transformation

The world has changed a lot since the time when most people worked on a farm in order to feed themselves and their families. As an example, about 2 percent of the population today works as a farmer in the United States [45]. Still, more food than ever is produced. The industrialism has made it possible to make the food production extremely efficient. With innovations the production of food is easier than ever, requiring fewer farmers. However, what is interesting to note is that most of the value created in the value-chain is not created in the typical production, but in the knowledge surrounding the production. The value is not created on the open crop fields, it is knowing the DNA structure of the crop which gives the best harvest that creates the value for the company. [20]

This is quite different from what it used to be. At the same time, the use and importance of intellectual property and the rights associated with it have changed. Intellectual property had from the beginning more or less the sole purpose of ensuring that if you invest a lot of time and money to create or invent something, the intellectual property make sure that you have the right to control the use of it, thereby enabling you to get a good return on your investment. Trademarks, design rights and copyrights have not changed that much and are mainly used in this way. However, the value of the intellectual property, for example trademarks (brands) has increased to extreme levels. As an example, the brand of Coca-Cola was estimated to be worth 70 000 million USD in 2013 [24].

But all of these intellectual property are basically used in the same way as they were when they were created. However, the way patents are used have really changed in recent years. From being just a legal document, it has become merchandise and a building block for complex industry structures. Together with this transformation comes the fact that companies need to put more focus and resources on managing their IP portfolio in general and patent portfolio in particular. The work is associated with assumptions, complex evaluations, uncertainty and is quite often rather time consuming. The good thing is that if patent portfolios are managed in an active and effective way, they could generate a lot of value and the departments respon-

sible for them could be among the most important departments a company has, generating a lot of profit.

2.2 Recent Development

The situation today is that many companies have a lot of patents that are just adding a cost to the bill each year, which is clearly shown by the fact that in a high-tech company with some 10 000 patents, fewer than 5 % by most estimates have a distinguishable value [3]. Many patents are not used within the company's products, they are not licensed and the management does not put any focus on them. One reason for this could be that there has been a shift in the industry. Take IBM as an example of a company that has experienced such a shift. In 2004 they were a large personal computer *manufacturer*, filing a lot of patents [22]. Today, having sold their personal computer business, they are almost a completely new company with a strong focus on leverage their knowledge through providing services and software[23]. This is indicated by their hardware sales which was 35 % of their revenue in 2000, which has gone down to 14 % in 2012 while services and software, which represents the remaining revenue, have grown substantially [23]. For some companies, a shift like this could mean that patents that were previously protecting their products are no longer used meaning that the patents become redundant and hence non-core.

In the classical raw material based economy, the competitive advantage came from extracting and refining natural resources, as seen in Figure 3. After that, there was a transition to a more production based economy where the competitive advantage came from the refining material into quality products as efficient as possible, the next step in Figure 3. Now there is a transition to the newer knowledge based economies, both the knowledge based industrial economy and the knowledge based knowledge economy, were the natural resources are becoming secondary, the last step in Figure 3. The competitive advantage ranges instead from intellectual assets and the control of such. In these two economies knowledge is the main source of competitive advantage and the knowledge is brought to market either through physical products or through IP, virtual products or services. Patents are therefore especially important in both these economies. Before, the main reason for having a patent was to protect the technological advantage that a company implemented in its products. Now, the patents itself can be the "output" from the company meaning that the company can focus on producing innovations which they protect and control by patents. Then they can transfer the knowledge and the innovation to a production company by selling or licensing the patents.

The IBM example indicates a change where the value creation does not lie as much in manufacturing, but rather in value creation that is based on the management of intellectual assets, property and capital, which is

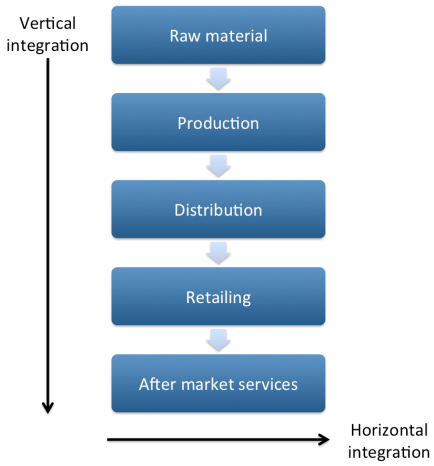

Figure 1: The figure shows the material value-chain. Source: [37]

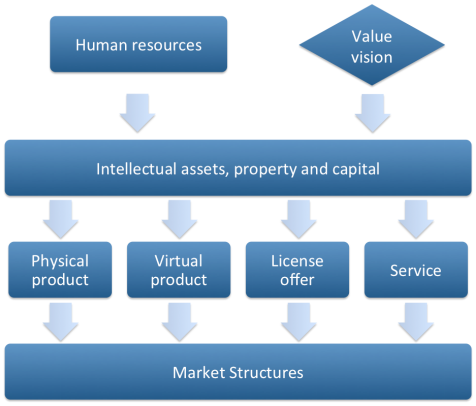

Figure 2: A framework for an intellectual value-chain. Source: [37]

brought to the market through physical products, virtual products, license offers and services. It is a transformation from the material value-chain as seen in Figure 1 to an intellectual value-chain as seen in Figure 2. For IBM, this also represents a change from being a more knowledge based industrial company to a more knowledge based knowledge company as shown in Figure 3.

This change is not only seen in IBM. There are many indications that show that a lot of companies are moving in this direction. It can for example be seen that the number of patent applications have almost doubled from 1985 to 2011, where the number of patent applications in 2011 was 2,1 million [56]. It can also be seen how companies have started to use their patents more and more against each other, which has even got people to recently start to call it the "patent wars" [50].

2.3 Intellectual Property Value Extraction Process

All the companies that today have moved to a stronger focus on IP and a more knowledge based business model have some kind of process for extracting value from their IP. It is believed that by looking at technology transfer offices, whose sole purpose is to generate money from R&D, a good understanding can be gained of how companies in general generate money from R&D through the use of intellectual property [44]. In accordance with the focus of this thesis, the process here will only show how value is extracted from R&D through the use of patents. The process for how technology transfer offices generate money from R&D is shown in Figure 4.

As seen here, it all starts with the R&D that is done in the company. After that the first step is to write so called invention disclosures [27]. An

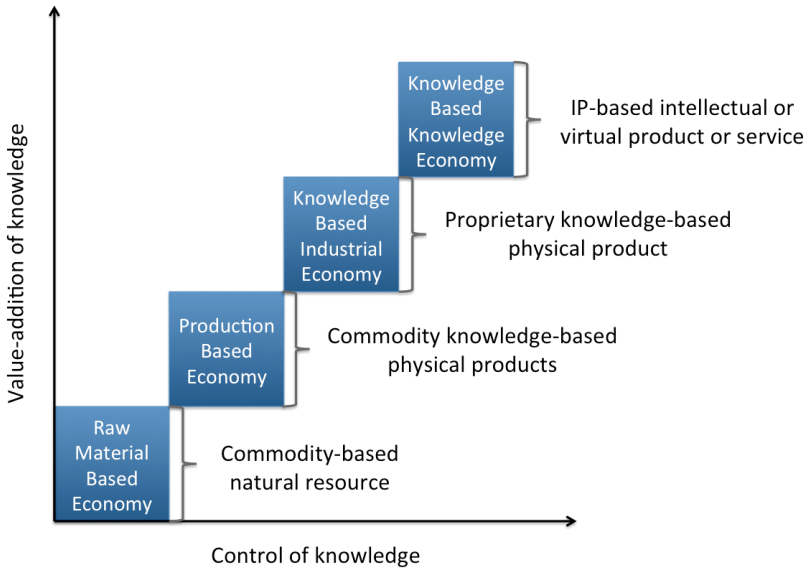

Figure 3: The different steps that the economy and companies in general are going through towards a more knowledge based economy with knowledge based companies. Source: [20]

invention disclosure is a description of an invention, which can be used when deciding if it is worth applying for a patent for the invention [27]. The second step is therefore to decide if a patent application should be filed. If the patent is granted, the company can then move on to the third step, where they can generate money either indirectly by using the patents to protect the products that they are selling or directly through licensing or selling the patents.

However, even though most people would agree that patents have some kind of value, extracting this value from the patents has been shown to be quite hard. Estimates show that only 3 % of all patents generates money, for example through licensing or selling [26]. However, when taking into account all the patents that generate value for the company for example through defending the market position or giving a better bargaining position in cross-licensing deals, it is more likely that around 50 % of all patents are valuable [3]. This means that in the 3rd step shown in Figure 4, 50 % of the patents will go to the left and generate a value for the company, while the other 50 % will not generate any money at all but will instead add a cost for the company each year. In most companies, a part of the revenue is invested in new R&D, which is then the forth step that closes the loop.[44]

In order to capture as much value as possible from the R&D that is made, it is of course important to do all the steps shown in Figure 4 as efficient as possible. But as seen here, this is quite hard and something that companies in general are not very successful in doing today. This thesis will

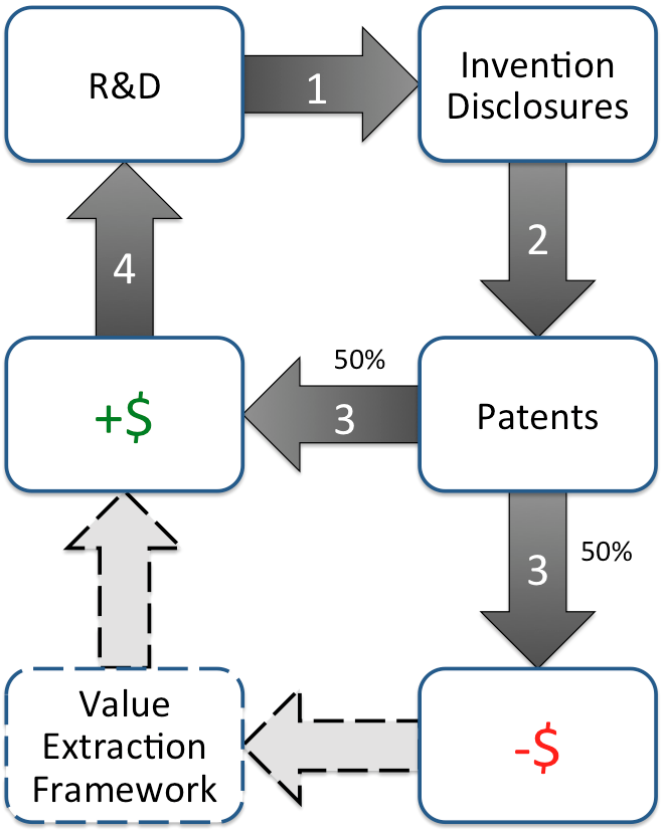

Figure 4: This figure shows a process for how companies can extract money from R&D through IP, which then gives them more money to spend on new R&D. As seen here it is estimated that only 50 % of all patents generate value for a company [3]. The Value Extraction framework shown in this thesis can, as illustrated, be used to make sure that more patents generate a value for the company. The figure is based on [44]

therefore focus on how these unused patents, namely non-core patents, can be used to create value, thereby moving them from the pile of patents that only cost money to the pile that actually generates money for the company. As illustrated in Figure 4, this can be done through the use of the Value Extraction framework that is the result of this thesis.

2.4 Non-core Patent Portfolios

As seen in the previous section, around 50 % of all patents does not generate any value for the company owning them [3]. This thesis will focus on these so called non-core patents, which include all the patents that do not cover any product or processes used by the company [18]. Even though this general definition will be used, it is important to clarify that in this

report non-core patents; do not include patents that are currently licensed to a third party, do not include patents that are core to direct competitors and do not include patents that are standard-essential. Patents that are currently licensed to a third party are left out because not all value extraction strategies are available for these patents, for example it might not be possible to prune these patents. Patents that are core to direct competitors are not included because these can be used to block a competitor even if the patents are not core to the patent owner since they for example still can be used to gain bargaining power in a potential cross-licensing deal. Furthermore, standard-essential patents are not included because most companies have commitments to license standard-essential patents under so called "Fair, Reasonable And Non-Discriminatory" (FRAND) terms, which also affects the available options for value extraction since for example litigating might not be in line with a commitment to FRAND licensing. Figure 5 shows a patent portfolio and illustrates which of the patents that this thesis will focus on.

There are several different reasons for why companies end up with non-core patents that do not generate any value. First of all, since the importance of patents have increased especially with the "patent wars" that are going on, companies are filing a lot of patent applications sometimes just for the sake of having many patents. This leads to a lot of patent applications that cover technologies that are never implemented in future products. Secondly, as shown with the IBM example described earlier, companies constantly evolve and change their business focus. When they do so, the patents that cover products that they stop to sell suddenly become non-core patents.

This thesis will explore how companies can extract value from these non-core patent portfolios. However, one of the first problems that arise when looking at non-core patent portfolios is the simple fact that since a patent is valid for 20 years it is extremely hard for companies to know if they will use the covered technologies in the future, and therefore would benefit from just keeping the patents. As a first step to extract value from non-core patents, this thesis will therefore focus on non-core patent portfolios with a short lifetime left before they expire, around 5 years. This increases the chance that a company can be sure that they will not use the patents in the future and thereby increase the likelihood of a value extraction to actually take place. It is of course believed that all non-core patents should be analysed and used to create value, but by extracting value from those with a short lifetime left the company can start to extract some value with low risk. The focus on non-core patents with a short lifetime is also chosen because this puts different requirements on the value extraction strategies as will be discussed in this thesis.

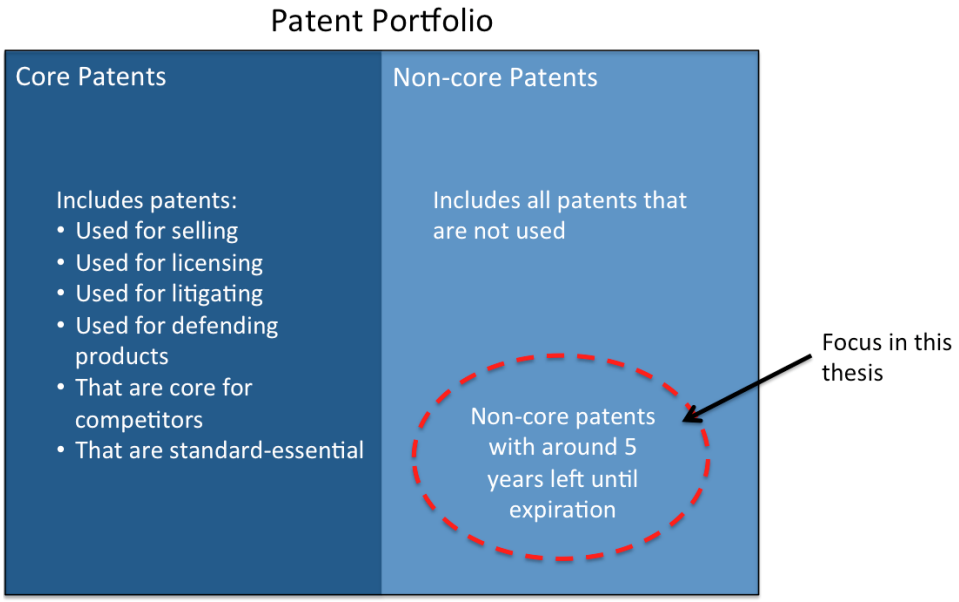

Figure 5: This figure illustrates a patent portfolio, showing which patents that are considered core versus non-core, and which of the non-core patents that this thesis focuses on.

2.5 Commercialize Patents versus the Covered Technologies

One option for creating value from a patent portfolio is to commercialize the patents and it is possible to look at the commercialization process from two perspectives. The perspective depends on the buyer's or licensee's intention.

From a strategic perspective, acquiring the intellectual property, the patent, could be a way for a company to acquire a technology to use in its operations. Instead of investing time and money into research and development, this might be as expensive but is quicker and has lower risk since the innovation is already made. In this case it is a matter of commercializing the innovation or technology. But it is very important to understand that even though the patent is meant to be a public disclosure of the invention so that someone "skilled in the art" is supposed to be able to use the patent to make use of the technology, this is often not easy. Therefore if a commercialization of a patent is intended to give the buyer or licensee the possibility to use the technology more assets often needs to be transferred. This could include databases, drawings, formulas, instructions etc. In the case of non-core patents with a short lifetime, all of these other assets might not be possible to transfer. For example the inventor might have left the company owning the patent so that he can't explain the invention to the buyer. Therefore, this option is not very interesting when it comes to non-core patent portfolios with a short lifetime.

From another perspective, the company acquiring the patent might not at all be interested in the technology but rather the intellectual property in itself. There are many reasons for this. It could be because they want to stop a competitor from acquiring it, ensure its own freedom to operate, use it to strengthen the portfolio or as in the case for a patent assertion entity (PAE), for licensing or litigation purposes. This means that no other asset apart from the patent itself needs to be transferred from the patent owner to the buyer. This makes the deal much easier, which is why this option is especially interesting when it comes to non-core patent portfolios with a short lifetime.

The motive, of the buyer or licensee, to acquire the patent portfolio is something that the company who is commercializing the patents must consider. Obviously it will affect the price of the deal but it will also affect the options available for the commercializing company. As explained here, when the patents have a short lifetime the technology is probably 10-15 years old, which further shows that the only option is to commercialize the IP rather than the technology. Since this report focus on patents that have about 5 years until they expire, talking about commercialization will, if nothing else is mentioned, mean commercialize the IP.

2.6 So why is it hard to extract value from non-core patent portfolios?

The main reason for why it is hard to extract value from a non-core patent portfolio is simply because it is complex to even understand what the content is of a patent portfolio. The complexity relates to the inherit structure of patents. On one hand each patent covers one invention, which makes it hard to group several patents together without losing the specific details for each of the covered inventions. On the other hand a technical solution is often dependent on several inventions and therefore dependent on several different patents. In that sense the patents could be grouped together in a logical way. But even this grouping can be problematic since the invention covered by a single patent often can be used in different technical solutions meaning that the patent could belong to several different groups. All this together makes it very hard for companies to even understand what is covered by the patents they have.

Looking at the patent system, this has to some extent been solved through the use of a patent classification system. These systems provide some guidelines of what the patent covers but is mainly adopted for the patent offices so that they can find similar patents when deciding if a patent application should be granted or not. For a company, this classification system is of less value in the sense of knowing what you have in general and getting a clear overview of what the patents cover. Most companies that have some sort of structured IP handling have develop their own system, groups, classifica-

tions, valuations and so on. Some of them are working rather well, some are not.

Here is an example to highlight the problem. Regarding most assets that are tradable, like houses, stocks, machinery and raw material, it is rather easy to know what you have. However, for patents, which also are tradable assets, it is very hard to know what you have. It is easy to describe them in general terms but often a more detailed description is needed. This becomes an issue since every patent is unique. Hence, knowing what every patent covers *in detail* is very hard, if not impossible.

Add the time perspective to the equation were valuation as well as application area could change drastically over the years, requiring a continuous review, revaluation and perhaps reconstruction of the portfolio. What we have is a very time consuming task which is also hard to automate. The companies can assign a department of the company that has the responsibility to monitor and manage the portfolio. Typically, the total portfolio of all the company's patents is divided among those persons. They will then have a rather good view of what the portfolio covers. However, for natural reasons, with limited resources, their main focus will be on the patents that are easiest and most obvious to create value with. Left is a bunch of patents which is not really used within the company, perhaps missing some of the reviewing and revaluations and soon it is very hard to know what you have.

Just letting a bunch of patents be part of the portfolio is most probably just a waste of money. Therefore, companies need to now and then look at those "forgotten" patents. What happens then when the company decides to look at the portfolio to see if it is possible to find and extract some value from it? In some way a clear picture of what the portfolio covers must be created in addition to an understanding of where the value for a patent is. This report has the aim of trying to analyse, discuss and provide an option of how this could be done.

The benefit of having an effective method of capturing value from the patents that are not used within the company (including those that are licensed) is that there are costs to save by pruning those patents that after revaluation have no or little value. Even better is that there is a potential to find really good patents that convert from just being a cost to something that actually could bring a lot of value to the company. Since the company, the industry and the technologies develop and changes all the time, patents that 15 years earlier did not seem to have any value might now, put in a completely new perspective, have a lot of value.

3 Method

This chapter will describe the research methodology that was used for this project as well as the research methods that were used to gather information. For this whole chapter the book [5] has been used as a source.

3.1 The Overall Methodology

This thesis is based on both primary sources as well as secondary sources. The primary sources used in this thesis include experience from working in the industry and the secondary sources includes books, academic papers, reports and news articles. In parallel with the writing of the thesis, an internship has been conducted at Strategy and Portfolio Management, IPR & Licensing unit at Ericsson where a non-core patent portfolio was analysed. The understanding gained in the field through this internship has been a crucial part of the development of the thesis. This experience has been combined with the experience from earlier studies at the master's programme Intellectual Capital Management, in order to build the foundation on which this thesis is built.

The research has been mainly qualitative and the results of the research are mainly based on a confidential case study that was done during the internship. When possible, the information gained from the case study has been combined with quantitative research based on academic papers and reports.

The main part of the research has been done through a deductive approach. In order to answer the overall research question of how a company can extract value from a non-core patent portfolio the first hypothesis was that they need to do a portfolio analysis, a market analysis and then form a strategy based on that. In combination with this deductive approach, an inductive approach has been used whenever no hypothesis could be formulated based on the known theories. The inductive approach lead to a few additions and changes to the hypothesis based on information from the confidential case.

Furthermore the research was divided into three parts based on the research question and the first hypothesis. The overall research question was answered by answering all of the three research questions. The first research question *How can a company analyse and categorise the patent of a non-core patent portfolio?* is analysed in the chapter Portfolio Analysis. The second research question *What factors affect the value of a non-core patent portfolio?* is analysed in the chapter Market Analysis. The last research question *What different ways are there for a company to commercialise a non-core patent portfolio?* is answered in the chapter Value Extraction Strategies. As seen here, each chapter corresponds to one research question and one part of the first hypothesis, the research questions are shown in Figure 6. The overall

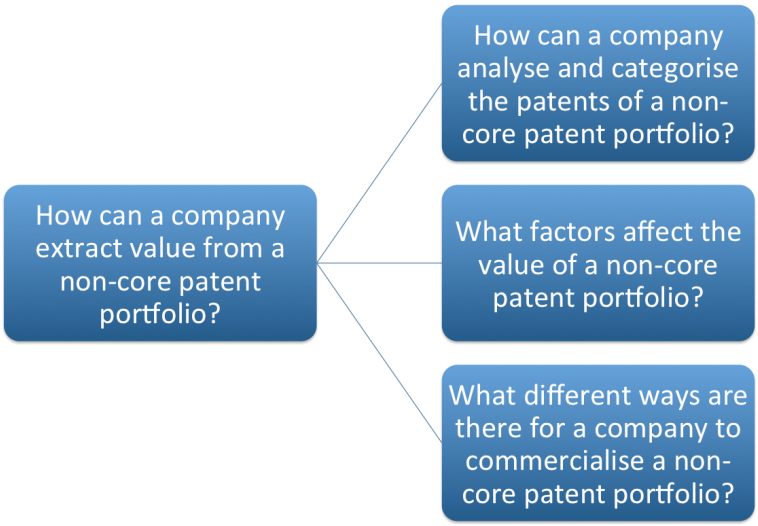

Figure 6: Illustration showing different questions that was researched in order to write the different parts of the report.

research question is of course answered partly by all the different chapters of the report but is also partly answered in the Result chapter.

3.1.1 Portfolio Analysis

The portfolio analysis was mainly based on a deductive approach. The hypothesis was that in order to analyse the patents, two steps were necessary. The first one was to read the patents and the second one was to structure them in a good way. However, the approach that was used to further research these two steps was not the same:

- Reading the patents. For this, no theory was known or found. Therefore this was researched through trying several different approaches before a hypothesis about the best way to do it was formulated.
- Structuring the patents. For this, several different theories for how to structure patents was known before this was done. Therefore several hypotheses were formulated and tested. Each of the hypotheses described one way of structuring the patents.

After this was done, it was seen through the case study that it is important to also check the legal status of the patents in the portfolio. This hypothesis was therefore added as a third step.

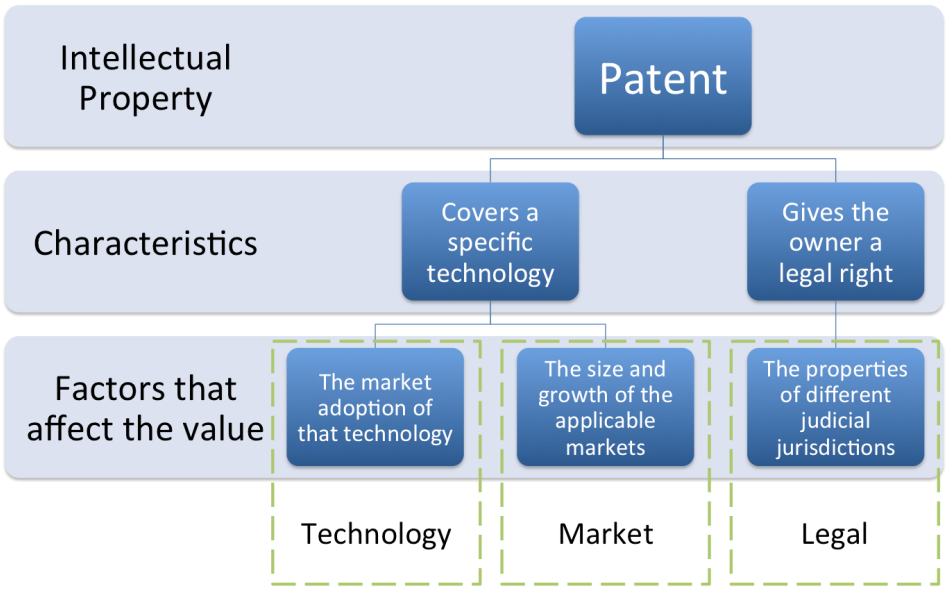

Figure 7: Illustration showing the different characteristics of a patent and the factors that affect the value for each of the characteristics.

3.1.2 Market Analysis

When researching how to analyse the market, a good hypothesis was quickly formulated. The hypothesis was that in order to analyse the market, the company needs to look at technology trends as well as market sizes and trends. Therefore these two aspects were researched using a deductive approach.

But it was soon discovered that it was important to also look at which levels of a value-chain that was covered by the patent portfolio as well as how the properties of different jurisdictions affected the value extraction. These two aspects were therefore also added to this part.

The different aspects to consider was also grouped based on how they relate to the properties of a patent. On one hand, the patent covers a specific technology, which makes it important to look at the market adoption of that technology as well as the market aspects, namely which markets the patent is applicable to and the size and growth of those markets. On the other hand, a patent gives the owner a legal right, which makes it important to look at the properties of the different judicial jurisdictions. All these aspects are shown in Figure 7.

3.1.3 Strategic Considerations

The last part focused on building a business case and the approach here was mainly deductive with the hypothesis that these three aspects were important:

- Who is the potential buyer?
- What are the commercialisation options?
- How can the portfolio be prepared for transaction?

However, through the case study it was found that the value could also be dependent on the owner of the patent portfolio. Furthermore, when looking at the different commercialisation options, the hypothesis was that they were; selling, licensing, litigating and pruning. However, the case study showed that a company might also want to consider giving away the portfolio in return for something else than money, which was therefore added.

3.2 The Created Framework

As described here, all of the different parts of this thesis contain both deductive and inductive approaches, which is why the developed framework is seen to be based on the original hypothesis but then modified based on the findings during the research project. The overall work can therefore be seen as a two step process where the first step was that the first hypothesis was tested, the second step was that the hypothesis was revised based on the research and this second hypothesis was used to create a framework, as seen in Figure 8.

An overview of all the different aspects that are described in this thesis and how they were researched can be seen in Figure 9, which shows the aspects developed with a deductive approach with blue arrows pointing towards them and the aspects developed with an inductive approach with red arrows pointing away from them.

3.3 Validity and Reliability

Since the research described here is qualitative, a lot of the usual measurements of validity and reliability are not really applicable due to the lack of measurements. As described by Bryman & Bell [5], both reliability and measurement validity are essentially concerned with the adequacy of measures, which as described earlier is not applicable in this case.

Since qualitative research is quite different from quantitative research, it has been proposed that alternative terms and ways for assessing qualitative research are required. One such criteria is trustworthiness, which has been proposed for assessing how good a qualitative study is. The trustworthiness

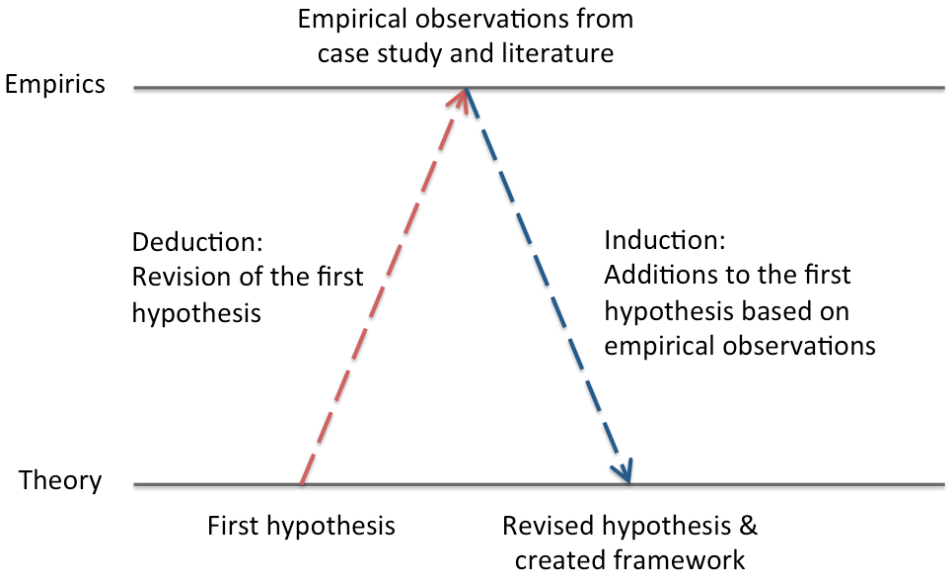

Figure 8: This picture shows the overall research process where a first hypothesis was formulated and tested. Based on that a second hypothesis was developed, which was used to create a framework.

criteria consists of four different aspects. The first one is called *Credibility*, which is similar to internal validity and answers how believable the findings are. The second one is called *Transferability*, which is similar to external validity and answers if the findings apply to other contexts. The third one is *Dependability*, which is similar to reliability and answers if the findings are likely to apply at other times. The fourth one is *Confirmability*, which is similar to objectivity and answers if the investigator has allowed his or her values to intrude to a high degree.[5]

Each of these aspects will now be assessed in relation to this thesis:

- *Credibility*: The findings are believed to be very credible since triangulation, based both on previous research in the field as well as a confidential case study done at Ericsson, has been used. This means that all of the steps described in this thesis have been tested in reality at some stage in the research.

- *Transferability*: The transferability of the findings in this thesis have not at all been tested and is therefore unclear. However, the steps described in this report as well as the resulting framework are believed to be generally applicable to any case regarding a non-core patent portfolio with short lifetime, since they are partly based on other sources than the case study. But even if the case study is complemented with other sources, it is not believed to give us sufficient evidence to say with

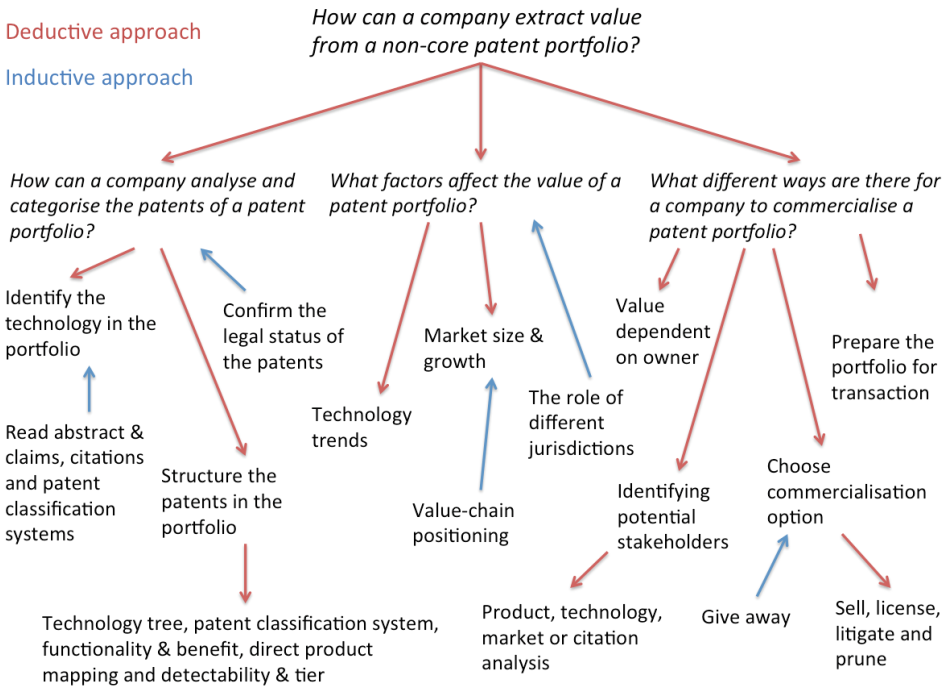

Figure 9: This picture shows an overview of the different aspects that was researched within each research question. A blue arrow pointing towards an aspect indicates that this was researched using a deductive approach, and a red arrow pointing away from an aspect indicates that this was found using an inductive approach.

certainty that the findings would actually be equally good if applied to other cases. It is also important to note that the patent portfolio in the case study was in a technology field where each product is quite complex and is covered by many different patents. It is therefore recommended that extra caution is taken before using the theories developed here to extract value from a patent portfolio in a technology field where each product is covered only by one or a few patents.

- *Dependability*: The dependability of the findings in this thesis is believed to be quite high, since nothing in the research has indicated that any of the results are time dependent. However, it is believed that if the research is done at a later point in time where the market place for patents has changed radically some of the findings might not be applicable anymore. The dependebility of the research could unfortunately not be strengthened through auditing of the research process since the main part of the research is based on a case study that was confidential.

- *Confirmability*: The confirmability is believed to be quite high since the research has been conducted by the two authors together. This is believed to minimise the impact of personal values on the research findings. Furthermore, the goal of the case study that was conducted was to find a way to extract value from a non-core patent portfolio, which is in line with the research presented in this report. This is believed to further enhance the will to be objective about the findings.

4 Portfolio Analysis

This chapter will begin with a focus on how to get an understanding of the content of the patent portfolio. After that, the focus will be on how to classify the patents in the portfolio and structure the information about the portfolio in a good way. The objective is to get a patent classification built upon the type of the technology, the quality of the patent claims and so on rather than potential market value at this point. Information such as market data will be included in the next chapter. The reason for breaking up the analysis in two parts, portfolio and market, is to limit the risk of valuing the patents from a subjective perceived potential market value. It is very easy otherwise to put all the attention to the patents thought to have the most value.

4.1 Identifying the Technology in the Portfolio

The first step to a successful value extraction is to have a clear understanding of what the non-core patent portfolio includes. Most companies have some sort of patent database where the data about each patent is kept. However, for a non-core patent portfolio which has not had any focus for a long time, the data about the patents could be out-of-date. Furthermore, the data is usually not detailed enough to describe what the patents actually covers. Therefore, it cannot be used solely in the commercialization process. So, in one way or another, the first step is to get an understanding of the content of the portfolio.

There are many ways of doing this, from just reading the titles of the patent to reading through all the parts of every patent, one at a time. The former is quick but perhaps not enough. The latter is extremely time consuming but gives a very good picture of what is covered. There are other alternatives as well, for example by looking at:

- the abstract and claims
- the citations (backward and forward)
- the patent classification systems (e.g. IPC, ECLA, CPC)

These will be discussed in the following sections. Before that, it is worth mentioning a real time saver. The portfolio is likely to be composed of many patent families. For a certain innovation, a patent family is the collection of all the country specific patents covering that innovation. They will have some differences adapted to each country but should in general be very similar to each other. To start with, focusing on and reading only one country patent in the family will save a lot of time. Preferably, a US or an EP patent is chosen as they are written in English and covers major markets.

4.1.1 The Abstract and Claims

Looking at a patent, it can be everything from just a couple of easy to read pages which you can read through quickly to many pages of complex text which takes a lot of time to read through. Already when the number of patent families in the portfolio is over 20, it becomes questionable if reading through every page is the best way to spend the time. When the number of patents is close to 100 or more, reading through every patent is obviously taking a lot of time, which the company most probably cannot afford spending. Therefore, another tactic must be applied.

Beginning by reading the title gives a great first glance of what the patent covers, but is not detailed enough. Continue having a quick look at the illustrations gives a little bit more context. Then reading the independent claims gives the detailed information that is sought for. At this point, only a little fraction of the patent has been read. Still, it should have generated a rather clear understanding of what technology the patent covers, how useful the technology seems to be, how easy an infringement should be to discover and so on. Sometimes, when the patent is too complex, it is necessary to read the background to understand the context and benefit of the claimed technological innovation or to read the detailed description to really understand in depth what technology the patent is covering. The latter is especially true for American patents having so called "means plus function" claims. In those claims, "means for" is used to describe that the innovation has a certain feature but does not explain it in more detail. The mean and the function are legally construed by the embodiments description. Anyhow, even though some of the patents require a more in depth reading, most of them will probably not which means that this approach still saves some valuable time.

4.1.2 Citations

Apart from the text describing the technological background, benefit and claims in the patent, there is other patent data that can be used to analyse the context of the patent. Citations are one of these patent data. There is both forward and backward citations. Both of them can be used to draw some interesting conclusions.

Citations are the link between related patents, i.e. related technologies. When filing for a patent, prior or relevant art must be referred to via citations, i.e. backward citations, and is done either by the applicant for the patent or by the patent examiner [8]. At the same time, the cited patents get a forward citation to the filed patent. So, for a specific patent, the forward citations define which patents that have used the patent in question as relevant or prior art. The forward citations that a patent owned by the company Ford Motor has got is illustrated in Figure 10.

By looking at the backward citations of a patent, you put the patent in a context. Similar or prior technologies are directly found which makes it a bit easier to understand the patent that you are investigating.

From a perspective where the objective is to extract value from a non-core patent that has not too much time left until it expires, looking at the forward citations could perhaps be even more interesting. The forward citing patents might give a feeling of the development closely related to the non-core patent. For example, if a non-core patent has many forward citations, it might indicate that the technology covered by that patent has been proven very important and good, since many new technologies build upon it. Both internal and external development related to the technology in the non-core patent might have used the patent's technology as a basis and thereby possibly being dependent on the patent. By looking at who the applicants of those patents are, it is possible to get a hint of who potentially are using a similar technology to the one covered by the non-core patent. It might even be so that they are infringing the non-core patent in order to produce their product. If so, the value of the patent increases since then they might want to buy or license the patent. The identified infringement case could also be subject to litigation which, if it is successful, generates value.

Important though when using citations is to not use it as a pure measure of the value of your patent. Better is to use it as verification or complement to another analysis. The reason is that patent citations are often done by the patent examiner [8]. Perhaps that person has "favorite" patents that are always cited within a certain technology area. At the same time, there might be much more relevant patents that are not cited due to the fact that the patent examiner has not found them. Using it as a verification is a different story. Take the telecom industry and the mobile technology CDMA as an example. Qualcomm's patent US 4,901,307 is very important for this technology and the importance, thus the value, is reflected in its forward citations [4]. With 850 citations, it is one of the top ten most cited patents in the US patent office history [4].

4.1.3 Patent Classification Systems

A third alternative to get a sense of what the portfolio covers is to analyse the patents' given patent classifications. Due to the vast amount of existing patents, the need for a structure to classify them is obvious. The most widely used classification system, IPC, is used by the patent offices to give the granted patents a classification [19]. This classification can then be used both by them but also used by anyone who wants to narrow down a search for a patent. Especially useful in the early days when there were no electronic patent databases where you could search for patents using keywords [52]. Today they are still used and there are a few big patent classification systems in use, some better and some more detailed. They

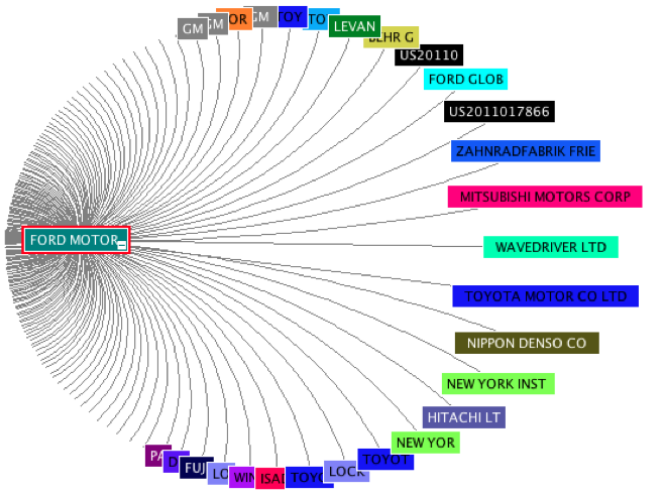

Figure 10: This figure shows the forward citations that the patent to the left, that is owned by Ford Motor, has got. Each line indicates a forward citation, which means that all of the companies in the picture owns a patent that has cited the patent to the left.

all have the common goal to structure patents in a logical way from a pure technological perspective. Each patent could fit in multiple classes within a classification system [21]. The systems are built in a hierarchical manner where each new level represents an even more detailed and narrower class. The narrowest level is extremely detailed.

So, the classification is essentially the outcome from an expert, like a patent examiner, who has already read the patent, analysed it and tried to define, by giving it a class, what the patent covers. While in an electronic format and by the use of computer software, a list or graph of all classes covered in a portfolio can quickly be created. Using only the first few levels of the classification system will provide a very good overview of what technological area the inventions in the portfolio cover. This could be done as a first step, even before beginning to read the patents. However, when using more detailed levels, the graph becomes almost too cluttered and it becomes hard to draw any conclusions. The more detailed levels are more useful when looking at individual patents rather than a group or portfolio of patents. Then, it is easier to use the information that the classification provides. The patent might have many classes, which still make it hard to draw any conclusions but each class will provide a really detailed technological description of the invention. This is crucial. To understand the portfolio from a technological perspective, the classification systems could be used as described. However, this is obviously not enough since it does not say how the claims of the patent are formulated.

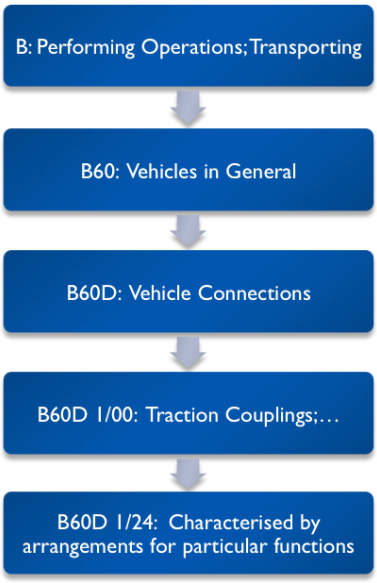

Figure 11: This figure shows an example of different levels in the patent classification system. The top level is the broadest and each level under that narrows down the scope of the classification.

4.2 Structuring the Patents in the Portfolio

The previous section discussed how to know what you have in a portfolio, both by looking at individual patents and also by analysing it from a group perspective. This section focuses on how to put these patents in a context, essentially by creating a grouping or a structure that gives an overview, which will help to identify the potential value of the portfolio. As discussed in *6.4 Preparing a Patent Portfolio for a Transaction*, another reason for grouping the patents is because it could generate more value to sell or license a group of patents rather than individual ones. There are a few different ways of doing this grouping and they will all highlight different value perspectives of the portfolio. A few examples will be given in the following sections. The different ways can either be used individually or more preferably, in combination. The classification is done by reading the patents, essentially the claims, and then marking each patent to show which class or classes it belongs to.

Before going into the details of each grouping method, another fundamental is whether the approach for creating value from the portfolio should be in terms of trying to identify individual highly valuable patents or to create value by grouping patents together. The first approach could be very good in the case where the portfolio is diversified among non-related technology fields. Hence, there will be no point in grouping the patents. Another scenario is when there is limited time or human resources available to capture

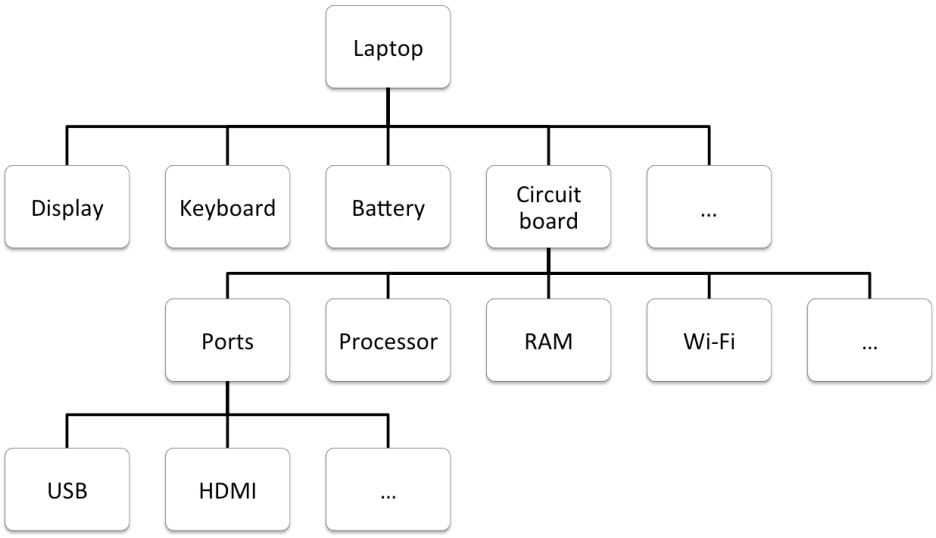

Figure 12: An example of a draft for tech tree breakdown of a laptop. The tech tree is not completed but shows the principle. So far, there are three levels having the "Laptop" as the top level.

the value from the whole portfolio. Instead of doing too much analysis, a quick look at the portfolio might highlight a few, more or less obvious patents to continue to work with. The opposite approach is, at least at this stage, to work with the whole portfolio. The methods in the following sections are most suitable for this approach.

4.2.1 Technology Tree

A rather natural approach to group the patents is to look at them from a technology perspective. This will also help the process of understanding what the portfolio is covering as discussed in the earlier. One way of doing this is to create a technology tree. A technology tree is a breakdown of the technology, usually from a product perspective. Each level of the tree represents the component necessary to build the component on the level above. For example, lets say that the initial analysis of the portfolio gave indication of that the portfolio might be relevant to a laptop. Figure 12 shows a brief technology tree for a laptop.

The next thing is to put the patents in the portfolio under the correct category in the tree. The grouping or classification of the portfolio in this manner is most suitable when the portfolio includes patents which are rather relevant to each other or in the same technology field. In some sense, a technology tree has similarities with patent classification systems but there are two major differences. First, the classification is adapted to the situation and the specific portfolio. Secondly, even though the perspective is techno-

logical, the breakdown is derived from a product perspective, as the top level of the tech tree is a product. Breaking down the technology and patents in a technology tree could be very hard (just creating a tech tree by itself is often difficult) but provides, when done properly, interesting data about the potential value of the portfolio.

Technology versus freedom to operate
First of all, the technology tree gives a good overview of the technology covered in the portfolio. It groups the patent from a technological perspective. Perhaps there is a certain component or part of the technology tree which most of the patents relate to. In the laptop example above, the conclusion might be that two thirds of the portfolio covers the display and keyboard. These are then two areas where the focus should be.

Another, very interesting aspect that can be indicated from a technology tree is whether it is believed that the portfolio will allow anyone freedom to operate or not, either for the top level component of the technology tree or for any of the sub level components. Freedom to operate for a component is when a company that sells or produces the component does not infringe any patents. It is important to note that even though a patent portfolio seems to cover all the different parts of a technology tree, it is not possible to say for sure that it will give someone freedom to operate since it is almost impossible to know if there are any unknown patents that cover any of the parts of the technology tree. Therefore, in order to be sure about if the portfolio would give someone freedom to operate an analysis of all relevant patents owned by other companies would be needed. Still, finding that the portfolio or part of it is likely to provide the owner of the portfolio freedom to operate will clearly affect the value positively and also slightly increase the possibilities for commercialising the portfolio. In this case, a potential buyer might need to be in the market place already and the portfolio will limit the barrier to entry, which means that more buyers might be interested in the portfolio. Another important aspect is that even if the portfolio doesn't give complete freedom to operate it could lower the barriers for entry, since it would give the buyer a patent portfolio that could be used when bargaining with existing players.

4.2.2 Patent Classification Systems

Another way of grouping the portfolio, again from a technology perspective, is to use the patent classification systems. This is more or less the same procedure as described in *4.1.3 Patent Classification Systems*, where the goal was to get to know the content of the portfolio. It is a fast and easy method since the classification is already done. However, it is not adapted to the specific portfolio and could therefore be hard to use in order to analyse the potential value of the portfolio.

4.2.3 Functionality and Benefit

A division or breakdown according to pure technology might not always be sufficient. Two other options that are very useful are classifications according to functionality or benefit.

Functionality means that the patents are grouped from a perspective of what is needed to provide a certain function or to enable a certain way of using the technology. For example, take the laptop example again. If the division would be based on function instead, the top level would be "Laptop". The levels below would be, for example, "watch a movie" or "surf the web". A patent covering the processor of the computer would then be put in both categories whereas a patent covering a wifi-chip would only be put under the "surf the web" category.

The other option, benefit is a bit different from the classifications discussed so far. What is different is that there does not need to be any technological connection between patents within the same category. For example, in the laptop case, one benefit category could be to increase the battery lifespan. In this case, a patent that optimizes the background light of the screen would be grouped together with a patent covering more energy efficient computing in the processor, since both of them will increase the battery life.

4.2.4 Direct Product Mapping

Having the commercialization perspective in mind, an interesting approach to the classification is to directly base the grouping on products. As an example, a patent covering a screen would be of value for laptops, desktop computers, tablets, phones among other products. In addition, many patents have claims that are formulated so that they are only applicable to a certain type of product. Therefore, it is very important and to highlight this aspect as it will affect the following analysis about how to commercialize the patents in the portfolio. Knowing which products that the patents are applicable to will steer the external analysis in the right direction. This classification method should therefore preferably be done every time as it creates value for the analysis, independent of the choice to use or not to use other classifications methods.

4.2.5 Detectability and Tier

While reading or skimming through the patent text, like the claims, not only should a product classification be made, but it is also valuable to try to estimate two parameters that will somewhat prioritize the patents in the portfolio. The first is a measure of how, intuitively, good and interesting the patent seems to be. Let us call it tier value. The other parameter is, again an intuitive estimation of how easy it is to detect a possible infringement. This

latter parameter is very important since the goal is to try to commercialize on a portfolio that has limited time left until it expires. If detecting an infringement is very hard, it might require more time, effort and money than the company are willing to pay in order to prove the case. Knowing if there is an infringement case or not is important not only in a litigation scenario but even in a scenario where the patents are going to be sold. Having identified an infringement will be a great selling point to a potential buyer. The reason for selling even though the case is already proved could be because the company does not want to litigate due to costs, risk or that the company simply does not want to do that kind of business action.

At one point or another during the analysis, there is a need to actually read through and analyse the patents and their claims in more depth. Especially when trying to understand if someone infringes on the patent. With a large portfolio, doing this for every patent is an unrealistic task. Both tier and detectability are great to use in combination in order to prioritize which patents that will be the primary focus for further investigation in the continuation of the commercialization process.

4.3 Confirming the Legal Status of the Patents

A rather simple, quick and very useful thing to do early in the analysis is to verify the legal status of the patents. It is common, especially for large companies, to have their own patent management software where all the data about the patent are stored. However, with a large database, used by different departments and many people within the company, errors are likely to occur. Then, just making sure that any of the patents are not already sold, are still valid and does not constitute part of a present license deal are good things to check early in the process. Otherwise, there is a risk that a patent uses resources unnecessarily while being included in the analysis.

5 Market Analysis

As described in the previous chapter the first thing that a company should do when they identify a non-core patent portfolio is to try to gain an understanding of what the portfolio contains and try to group the patents in a good way. When this is done the next step, which is described in this chapter, is to do an external analysis that focuses on the factors that affect the value of the patent portfolio. In the same way as for any product the main factors that affect the value of a patent portfolio are external factors that relates to the potential market and customers for the patent portfolio. However, some differences exist when looking at a patent portfolio instead of an ordinary product. Therefore this chapter has been divided into three sections describing different aspects that are important to consider when trying to determine the value of a patent portfolio.

First and foremost, it is important to remember that the underlying "product" of a patent portfolio is one or more technologies, or in some cases more specifically the access to a technology. By offering another company to buy or take a license to a patent portfolio, the seller effectively offers that company, to some extent, the technologies covered by the portfolio and also access to those technologies. Because it is the technologies covered by the patent portfolio that a potential buyer or licensee gets, the value of a patent portfolio is highly dependent on the demand for that type of technology. Therefore section 5.1 will focus on how to analyse the demand for a technology, and how the demand for different technologies have been seen to change over time.

When the demand for a technology has been assessed, it is important to look at the market, or potential market, for the technologies that are covered by the patent portfolio. As for any other product, the value of a patent portfolio is highly dependent on the size and the trends of the market for that portfolio. But even here differences between selling an ordinary product and a patent portfolio are important. As described in section 5.2 a patent portfolio covering one or more technologies can be applicable to several different markets. Therefore the value of the portfolio can be affected both by which markets the portfolio is applicable to as well as the size of those different markets. Section 5.2 will therefore focus on describing how one can analyse which markets a patent portfolio is applicable to and also on a high level describe how the applicable markets affect the value of a patent portfolio.

The third aspect that is important is the one that really distinguishes the factors determining the value of a patent portfolio from the factors determining the value of an ordinary product. This has to do with the fact that when doing a transaction with a patent portfolio it can not only be seen as a transaction of a technology but also as a transaction of access to the right to use that technology. As described by both the World Intellectual

Property Organization and the United States Patent and Trademark Office, a patent is an intellectual property that grants an inventor with an exclusive right to his/her invention [57, 47]. A patent gives the patent owner the right to exclude others from making, using, distributing or selling the patented invention [57, 47]. This means that no one can do any of these things without the consent of the patent owner [57, 47]. Even though this theoretically means that no one is allowed to do any of these things without the prior permission of the patent owner, patent infringements are committed to a very large extent today, as seen in section 5.3. The one way for a patent owner to stop someone from infringing that refuses to take a license is to take the infringer to a court, which in most jurisdictions holds the authority to stop the infringement [57]. Therefore, when a company has identified a patent portfolio that is currently not used, irrespective of whether they want to license it or sell it to another company it is crucial that they know if they can enforce the patents in a court if necessary. If the patent owner cannot enforce the patent right in court it is possible for a potential licensee or buyer to "steal" the underlying technology without paying for the patent. This can sometimes be very easy since the patent itself is a public disclosure of the technology that it covers [57]. Therefore, section 5.3 will focus on how different jurisdictions affect the possibility for the patent owner to enforce their patents, which is one important factor that affects the value of a patent portfolio.

5.1 Technology Trends and Diffusion

When looking at factors that affect the value of a patent portfolio it is important to understand the demand for the technologies that are covered by the portfolio. The demand for the technology covered by a patent portfolio could both be a potential demand or an existing demand. A potential demand is here defined as a demand that does currently not exist but that is expected to exist in the future. This can be the case when the demand for a technology is currently non-existing or very low, but the performance of that technology is superior to the technologies on the market, since this indicates that it is likely that it will be a high demand for that technology in the future. An existing demand is here defined as a demand for a technology that is currently used and where the technology is already sold on the market.

All of these aspects can be assessed through so called techno-economic analysis, and some ways to do this will here be explained.

5.1.1 Technology Performance Trends

One of the main factors that affect the demand for a technology is the performance of the technology. The performance of a product is here defined as any one of the several different aspects that can be viewed as performance

parameters. For example when the product is a cell phone the performance parameters could be computational capacity of the processor, battery life, screen size, weight etc. Even thought different performance parameters are depending on different technologies, it has been observed that any performance parameter of a technology usually follows an S-curve over time, as illustrated in Figure 13 [31]. This means that at first the performance increases quite slow but as soon as a breakthrough is made and the performance starts to increase more rapidly, then there is a higher return on investment for companies to do R&D within that field [31]. This leads to a more rapid increase in the performance of the technology. This continues until a technology is starting to reach its maximum performance, which gives a situation where the R&D in that technology is not giving the same performance increase as it has before [31]. The performance of the technology will therefore slowly cease to increase [31]. This will decrease the performance increase within the technology field until a new breakthrough occurs and a new technology is found that can reach a higher performance than the old one and thereby replacing it [31]. When this happens the performance of the new technology will start to follow its own S-curve and the technical performance within this field can then be visualised by several enveloped S-curves, as seen in Figure 14, which are repeated every time a new technology within the technology field is discovered or developed [31].

When trying to determine the value of a patent portfolio, one way to assess the value is to place the technologies covered by the patent portfolio on S-curves that show their performance compared to other technologies within the same technology field. This can indicate whether the technologies covered by the patent portfolio are at the end of their S-curves so that they have reached their maximum performance and are close to being replaced by new technologies. But it can also indicate if they are at the beginning of their S-curves so that their performance has just started to increase and that it is likely that the technologies will replace existing technologies within the near future. The value of a patent portfolio that covers technologies that are at the end of their S-curves is highly dependent on the current market for these technologies. This is because the technologies have already reached the top of their performance, which makes it highly likely that they will be replaced in the future. In the same way, the value of a patent portfolio that covers technologies that are at the beginning of their S-curves is not that dependent on the current market for these technologies. This is because the performance of the technologies have not yet reached the top of their performance which makes it likely that the potential market for these technologies are much larger than the current market for them.

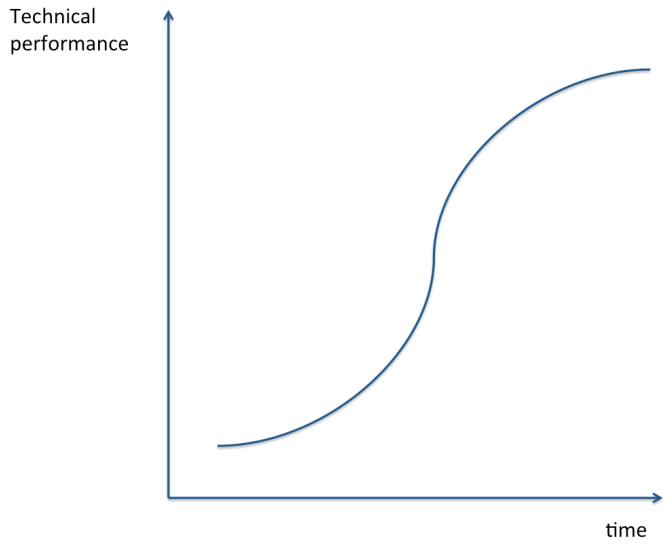

Figure 13: An S-curve showing how the performance of a technology generally changes over time. Source: [31]

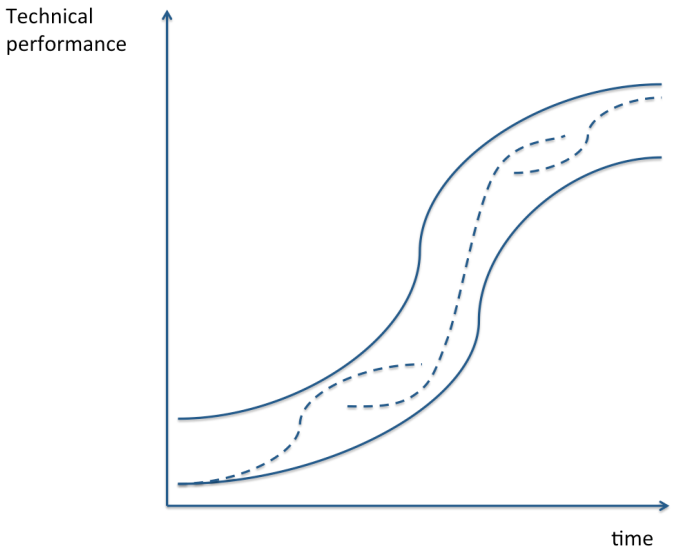

Figure 14: A so called Enveloped S-curve which shows how the performance of the technologies within a technology field generally changes over time. Each dotted S-curve shows how the performance of one specific technology within the technology field changes over time. Source: [31]

5.1.2 Technology Diffusion

As described in the previous section the performance of a technology can be described by S-curves and indicate how valuable a patent portfolio covering that technology is. However, when a company looks at a patent portfolio that is currently not used and that has a short lifetime, for example around 5 years, it is important to remember that the value of the portfolio is highly dependent on how large the current market for the technology is. The reason for this is that if the current market is small, it doesn't matter how big the potential market is if the market doesn't grow fast enough to be big before 5 years have elapsed and all the patents in the portfolio have expired.

With a patent portfolio with a short lifetime the current market for the technology is therefore the most important aspect to consider. One way to understand how big the current market for a technology is and how the current market is developing is to look at the how well adopted the technology is by the end-users. Different types of end-users adopt new technologies at different times and the diffusion of a new technology can therefore be described as a Bell curve, as seen in Figure 15, where the end-users have been categorized into 5 different categorise based on how likely they are to adopt a new innovation compared to other end-users [7]. These user-types are very important to understand in order to get an understanding how a new technology is adopted over time by the end-users. The different end-user types can be defined as: [7]

- **Innovators** are typically the most innovative 2,5 % of the population. They do not mind the risk of adopting a technology that might not be the one that in the end will be used by the majority of the society. Furthermore they do not mind using complex and underdeveloped technologies. The innovators are typically not convincing others to use the new technology because their skills and risk-taking differentiates them quite a lot from the other end-user types.

- **Early Adopters** are also innovative but not as much as the innovators. They are not as different from the other end-user groups and therefore often have the greatest degree of influence over the adoption in the other groups, since they are early with adopting a new technology but not as risk taking as the innovators.

- **Early Majority** adopts new technologies just ahead of the average of the population. They usually don't have that much influence over the adoption in the other groups but they have a lot of interaction with the other end-user types and they typically link the early adopters with the bulk of the population.

- **Late Majority** is the next big category of end-users that adopt a new technology, but they do it more because of economic necessity

and pressure from others. They are usually more sceptical and tend to have fewer resources, and therefore require more evidence of the value of the new technology before adopting it.

- **Laggards** are the last end-users that adopt a new technology. They tend to be focused on past experiences and traditions. They are also most cautious when it comes to risking their limited resources on a new technology.

As described here, the first group to adopt a new technology is the innovators. Since the innovators are not influencing the adoption in the other groups to a large extent, it is crucial whether the early adopters decide to adopt the new technology or not after the innovators have adopted it. Since the early adopters are usually have a big influence over the adoption in the other groups, once they have adopted the technology it is very likely that the early majority will follow them and later also the late majority.

It has been seen that many new technologies have followed this diffusion pattern. The diffusion pattern can therefore also be seen as an S-curve where the cumulative percent of adoption is plotted against the time since the launch of the new technology or innovation, as shown in Figure 16 [7]. This S-shaped diffusion can be seen for many new technologies even though the time it takes for different technologies to be adopted can be different. The specific example in Figure 16 shows the cumulative adoption each year of a hybrid corn seed in two Iowa communities [7].

Even though the cumulative percent of adoption of many technologies doesn't look as close to an S-curve as the example in Figure 16, it can be seen in Figure 17 that many technologies that relates to communication have a cumulative percent of adoption that is exhibiting the same behaviour as an S-curve [30]. As seen in this figure, many technologies have a slower adoption in the beginning but after a while the adoption rate starts to take of and rises quite quick until it is coming close to 80-100 % where the adoption rate slows down. It can also be seen in this figure that different technologies have very different adoption rates, for example for the telephone it takes around 60 years to reach 90 % adoption while it took around 15 years for the cellphone to reach 90 % adoption.

As described earlier, when looking at a patent portfolio with a short lifetime, for example about 5 years, it is crucial to look at the current market since the patents in the portfolio will expire in 5 years. One way to estimate if the current market for a patent portfolio is big is to look at the cumulative share of adoption of the technologies covered by the patent portfolio. A high adoption indicates that there is a big market for the patent portfolio, which increases the value of the patent portfolio. In the same way, a low adoption indicates that there only is a small market for the patent portfolio, which decreases the value of the patent portfolio. A low adoption also makes it

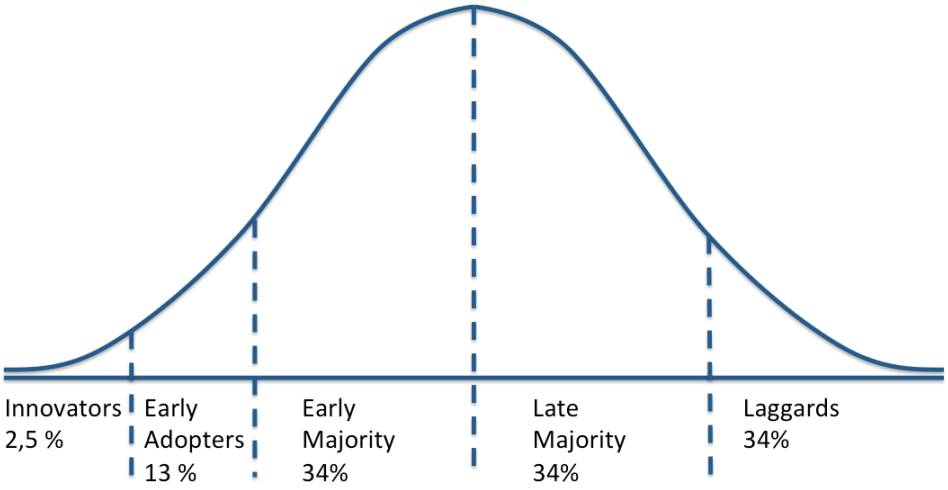

Figure 15: Different types of end-user categories and their share of the population. The categories are based on how likely it is that the different types of end-users adopt a new innovation or technology. Source: [7]

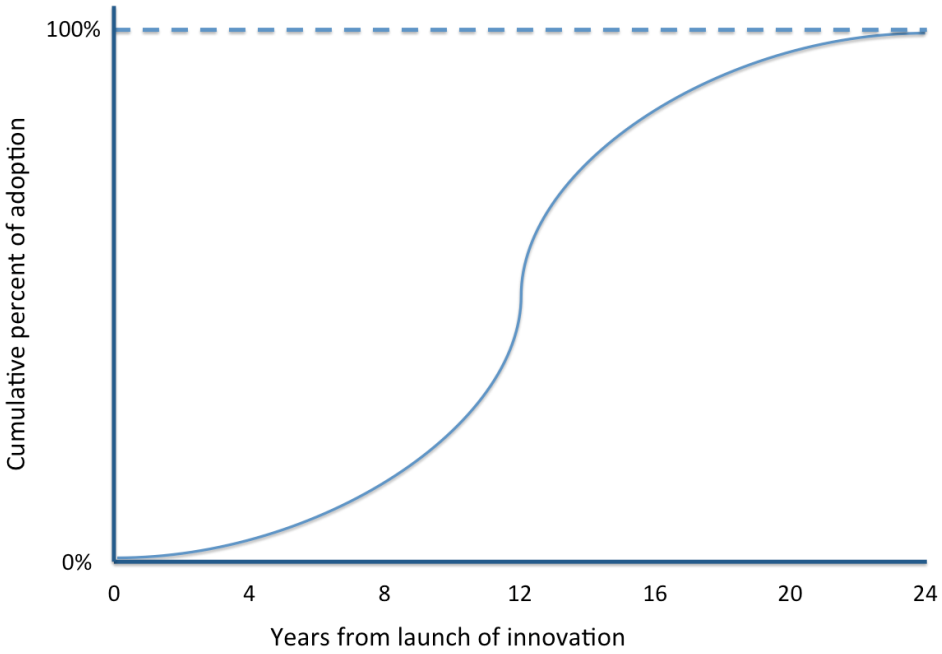

Figure 16: Cumulative percent of adoption of a hybrid corn seed for each year after the launch in two Iowa communities, which represents an adoption rate that is similar to the one of many other technologies. Source: [7]

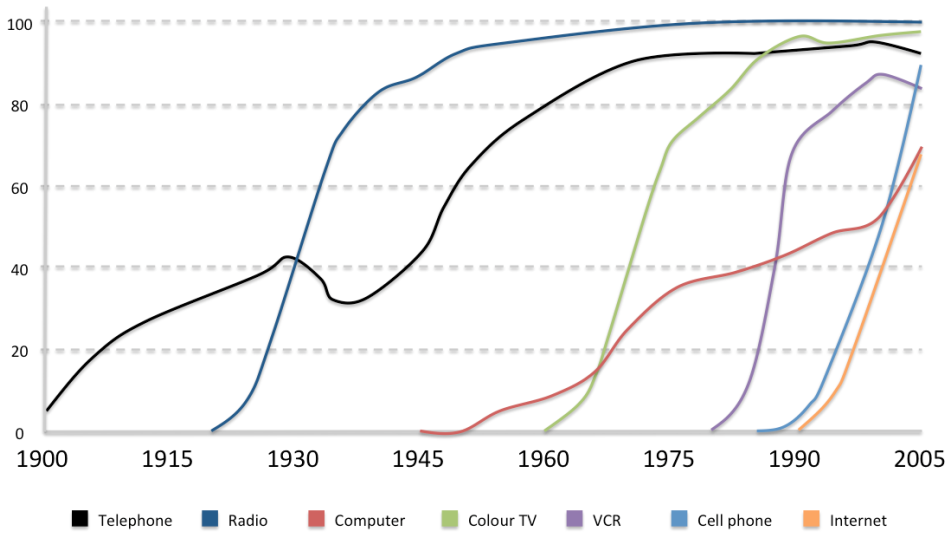

Figure 17: Cumulative percent of adoption for some important technologies relating to communication. Source: [30]

hard to predict whether the technology will be widely adopted in the future or if it will simply be replaced in the near future by a superior technology.

5.2 Size and Trends of the Applicable Markets

The previous sections described how the size and trends of the market can be analysed from a technology perspective and this section will describe how to do it from a market perspective. Section 5.2.2 will therefore describe on a high level how the size and the trends for the applicable markets can be analysed. But as will be described in section 5.2.1 it is very important to remember that a patent portfolio can cover several technologies and can therefore can be applicable to several different markets. Furthermore even if the portfolio only covers one technology, that technology can be used in several different markets, which also adds complexity to the analysis. The following two sections therefore describe both these aspects and how they relate to the value of a patent portfolio.

5.2.1 Market and Value-Chain Positioning

When determining the value of a patent portfolio it is as important as it is for any business decision to analyse both the size and the growth of the applicable markets. This is however a little bit more complex for a patent portfolio since it can cover many different technologies and thereby also many different markets. If for example a patent portfolio covers technologies that are used in cars, it could for example cover different types of engines,

wheels and transmissions. This portfolio is then of course applicable to the markets for engines, wheels and transmissions. This portfolio could then for example be licensed to a manufacturer of each of these technologies, as is illustrated in Figure 18. This is important for the portfolio owner to consider when deciding between different commercialisation options since some of the markets might be more attractive than others. This might lead to a situation where the portfolio is best leveraged if broken down into smaller portfolios, for example one portfolio that cover engines, one that covers wheels and one that covers transmissions. These portfolios could then be sold to different actors.

But most patent portfolios can also be leveraged at different levels in the value-chain. So if for example a patent portfolio only covers engine technologies, this example portfolio could be applicable to the market for engines but also to markets at other levels in the value-chain. This example portfolio might therefore be applicable to the market further down in the value-chain, in this case the market for cars, or to a market further up in the value-chain, in this case the market for parts used when manufacturing engines. This is illustrated with a licensing example in Figure 19. The options that are available for the patent owner are of course affected by the specific technologies covered by the patent portfolio, but as seen here even a patent portfolio that only covers a single technology can potentially be applicable to many different markets.

It is however very important to note that if a patent portfolio is licensed to a manufacturer of engine parts it might not be possible to license it to a manufacturer of engines. This is because if the manufacturer of engine parts has a license that gives him/her the right to manufacture engine parts, the buyer of those parts is allowed to use them and to sell them. This is because once a product has been produced or sold with consent from the patent owner, then the patent right is exhausted for that product [25]. Furthermore, it is important to remember that it can be hard to license the portfolio to any engine manufacturer if the portfolio is already licensed to one manufacturer of engine parts. This is because even though an engine manufacturer is found that does not buy his/her parts from the licensed engine part manufacturer, he/she could just change supplier if accused for infringement. This means that even though a patent portfolio can be applicable to different levels of the value-chain, it is best to choose one level and then try to license the portfolio to all the companies in that level.

5.2.2 Market Size and Trends

As with any business decision, it is important to consider the size and the growth of the applicable market when determining the value of a patent portfolio. As discussed in the previous section it is very important to remember that a patent portfolio could be applicable to several different markets. When

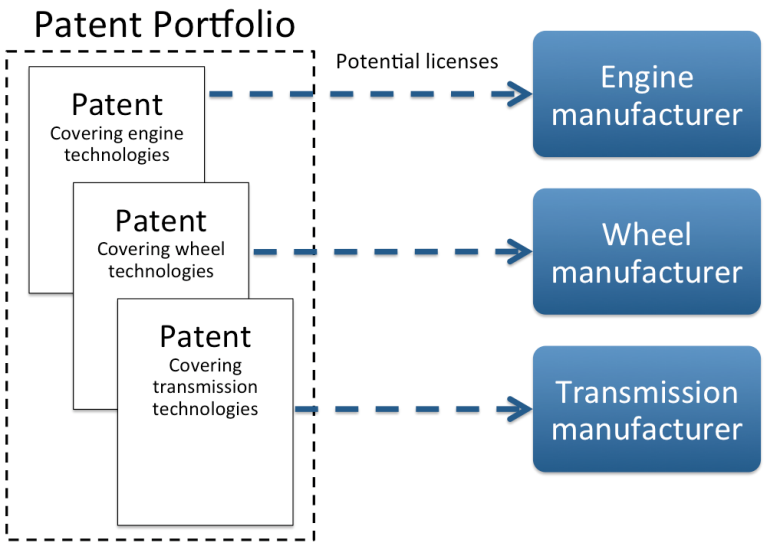

Figure 18: An example patent portfolio that contains patents covering different technologies, which means that the patents could be licensed to different actors. This illustrates how one patent portfolio can be applicable to several markets.

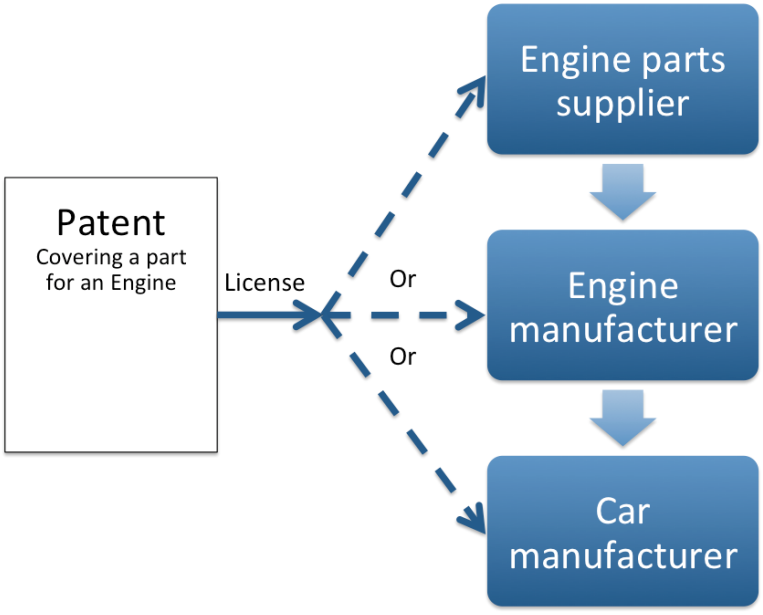

Figure 19: Example of a value-chain that shows how a single patent that covers an engine part can be licensed to actors at different levels in the value-chain. This illustrates how one patent or patent portfolio can be applicable to several levels of a value-chain and therefore applicable to several different markets.

looking at the market for a technology it is important to look at the revenue that it generates as well as the units that are sold with that specific type of technology. Both these aspects are very important since the three basic ways of calculating the royalty that a company needs to pay in order to get access to a patent portfolio is based on payment as a lump-sum, as a percentage of revenue or as a fixed price per sold unit [36]. This shows that the more revenue that is gained and the more units that are sold with a specific technology, the more valuable a patent portfolio covering that technology becomes.

When determining the market value for a technology it is also very important to consider the margins for the products that the technology is used in. Theoretically, higher margins give a higher profit for the company selling the product and therefore increases the amount that they could pay in licensing royalties. In the same way if they get access to a technology that enables them to have higher margins then that increases the value for them of having access to that technology. In the same way, at least theoretically, lower margins decreases the amount that a company can pay in royalties.

As with any product it is also important to look at the growth of the applicable market. For example, a company is much more likely to be interested in a technology used in products where the sales are growing and where the product is important for the future of the company, rather than a technology used in products where the sales are decreasing and that the company potentially will stop producing in the future.

Furthermore it is very important when looking at the market for a patent portfolio to remember what geographical coverage the patent portfolio has. Take as example a multinational company manufactures and sells a product all over the world and the global market for the product is huge. Even if this product uses a technology covered by a patent portfolio, the owner of the patent portfolio can only demand royalties for the product in the specific countries where the portfolio contains granted patents. Therefore, if a patent portfolio only contains granted patents in for example the United States, then only that market is relevant when trying to determine the value of the portfolio, which of course lowers the value of the patent portfolio compared to if it contained granted patents in several countries [10].

5.3 Geographies and the Role of Different Jurisdictions

When determining the value of a patent portfolio it is very important to analyse in which geographies the patent portfolio contains granted patents and to analyse the corresponding jurisdictions. The geographical coverage of a portfolio can easily be plotted, which is done by plotting the number of granted patents in each country for the portfolio. This has been done in Figure 20, which shows the number of patents in each country for an example portfolio containing 100 patent families. This figure can also be used to see

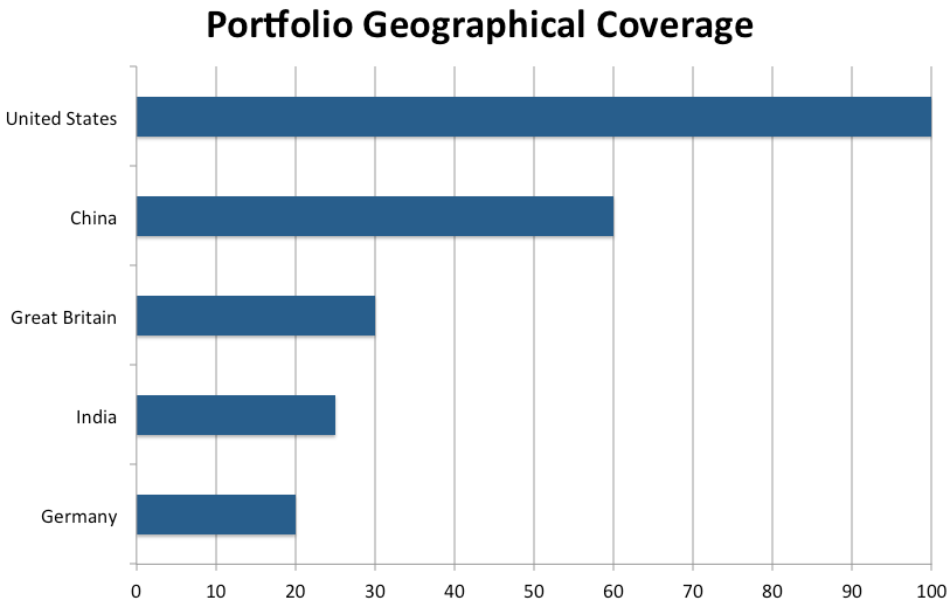

Figure 20: The geographical coverage of an example patent portfolio.

how many of the families that contains a granted U.S. patent for example.

The geographical coverage of a portfolio is important because the player owning a patent on an invention only has control over that invention in the markets where the invention is covered by a patent. As discussed earlier, this then determines the markets that the patent portfolio is applicable to. It is therefore important to consider the fact that since patents are expensive both to obtain and maintain, most companies only patent their inventions in a limited number of countries. This is clearly illustrated by the fact that 62 % of all the patent applications in 2010 was filed at one of the top 3 patent offices; United States, China and Japan [14]. This means that less than 40 % of all the patent applications are designated to any other country in the world. Furthermore the longer a patent portfolio is unused within a company the more likely it is that patents in less attractive markets are dropped in order to cut down costs, which decreases the control that the portfolio owner has over the covered technologies .

The geographical coverage of a patent portfolio therefore directly affects the value of the portfolio, since patents in more countries gives more control which in turn equals more value, but also since the number of patents itself can affect for example a potential selling price .

Another factor that is important to remember is that the geographical coverage not only determines the markets in which the owner controls the covered technologies. The geographical coverage also affects in which jurisdictions the portfolio owner could choose to sue an infringer and thereby

effectively leverage the control of a patent portfolio [10].

The jurisdiction in which a patent infringement case is brought up has shown to have a very big impact both on the time before a ruling is announced as well as the actual outcome of the case as is illustrated in the next sections [15]. Furthermore, as seen in recent cases the possibility to get an injunction and thereby force the other party to negotiate is also highly dependent on the jurisdiction [15]. Therefore the geographical coverage in combination with the properties of the different jurisdictions can be very important for a company to be able to put pressure on a potential licensee or buyer in order to speed up negotiations, even if the company owning the patent portfolio is not interested in starting a litigation for the sole purpose of getting damages [11].

In the next paragraphs some of the different jurisdictions will be further analysed. The jurisdictions that have been chosen here are United States, China, Germany and India. United States, China and Germany are all chosen because they were the top 3 countries when it comes to patent litigations filed between 1997 and 2009, which shows that they are the most prominent jurisdictions in their respective continents as seen in Figure 21 [15]. In addition to these countries, India has been chosen for further analysis here. This is partly because India is one of the most growing markets at the moments, but also because they recently constituted the Intellectual Property Appellate Board, which now handles all appeals under the Patent Act in India [12, 40]. There is also a recent case that indicates that patent litigation in India could be rising and that India could become a quick and beneficial jurisdiction for patent owners [28, 11].

5.3.1 United States

United States was in 2010 the patent office that received the most patent applications [14]. Furthermore between 1997 and 2009 the United States was the country with the most patent infringement cases filed [15]. This indicates that the United States is seen as one of the most important geographies to have patent coverage in, which can positively affect the value of a patent portfolio with a geographical coverage in the United States. The value of having a patent in the United States is further increased by the fact that if someone is infringing a patent in the United States then there are several district courts that can be used by the patent owner when filing a lawsuit. It can also be seen that the different courts in the United States vary quite a lot in the time it takes before a trial starts, the percentage of cases won by the patent owner and the median damages awarded [39]. A comparison between different courts is shown in Figure 23. Therefore a patent in the United States gives access to several courts and the owner of the patent can decide for example if a fast trial is preferred or a higher likelihood of high damages awarded is preferred.

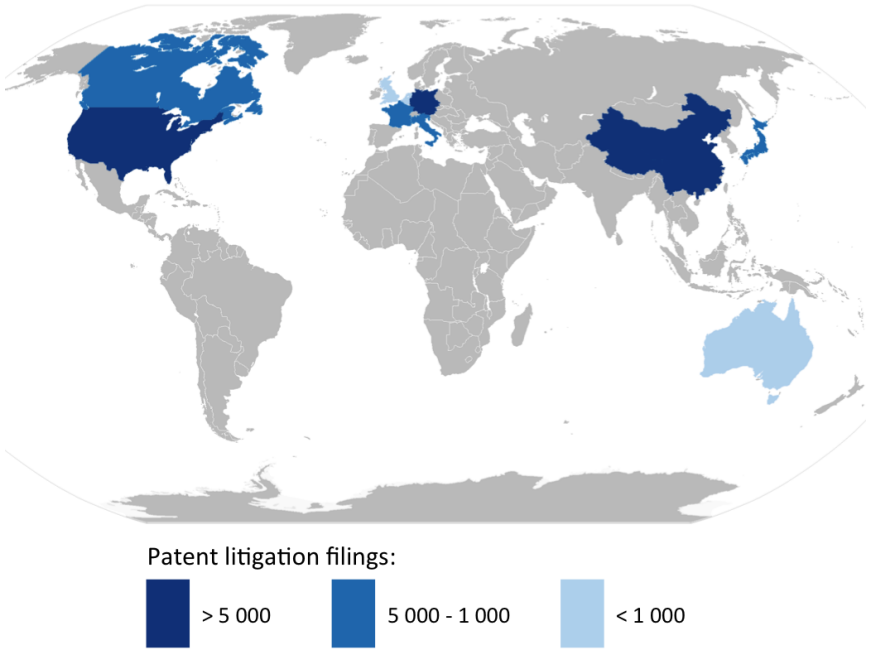

Figure 21: This map shows the top 10 countries with the most patent litigation filings between 1997 and 2009. The colours indicate the number of patent litigation filings. Source for the adapted image: [32], and the data used to adopt the image: [15]

There are several federal district courts with varying median times to trial but it is important to be aware of the fact that the United States is one of the slower jurisdictions when it comes to patent infringement cases, with median times to trial ranging from around 1 year to over 3,5 years [39]. The overall median time to trial in the United States is 2,3 years, which is by far the longest compared to the other jurisdictions described in this report [39].

Even though it is hard to know the exact reasons behind it, it has been seen that some federal district courts in the United States have become very popular when it comes to patent infringement cases, which is shown by the fact that the top 3 courts out of the 89 courts handled 49,7 % of all cases in 2012 as seen in Figure 22 [38, 1]. The top 3 courts are; first the Eastern District of Texas, second the District of Delaware and third the Central District of California [38]. The fact that the Eastern District of Texas is first could be explained by their reputation of being very friendly to the patent owner, which is shown by the fact that 55,7 % of all patent infringement cases are there won by the patent owner [38]. Furthermore the Eastern District of Texas is also in top 5 when it comes to median damages awarded, with almost 9 000 000 USD in median damages awarded, which could be another reason for why this court is the most popular [39]. It is hard to say why the District of Delaware and the Central District of California have become the other courts in the top 3 but according to the statistics these two are also courts were the median damages awarded are quite high, with Delaware furthermore being a bit faster in median time to trial [39]. Even though the damages awarded is very high in the United States it is important to consider the litigation costs as well which in the United States are considerably higher than in any other country [15].

Since the United States is both a very popular geography to apply for patents in and since it offers a wide variety of district courts to chose from when filing a patent infringement suit, it is clear that the value of a patent portfolio is highly dependent on and increasing if many of the patent families contain U.S. patents.

5.3.2 China

China is also a very important geography since it was the country with the second most patent infringement cases filed between 1997 and 2009 [15]. But even more signs are showing the importance of the Chinese market, for example that the number of patent applications in China went past the number of patent applications in the United States in 2011, thereby placing China as number 1 in the world when it comes to number of patent applications filed in 2011 [55]. This increase in number of patent applications filed also places China in a spot where 24,6 % of all the patents applications worldwide are filed in China [55].

Even though China is become a very important market and the market

District	Cases
Eastern District of Texas	1266
District of Delaware	995
Central District of California	514
Northern District of California	260
Northern District of Illinois	237
Eastern District of Virginia	161
District of New Jersey	160
Southern District of Florida	151
Southern District of California	144
Southern District of New York	143
Total for all districts	**5584**

Figure 22: The top 10 federal district courts in the United States with the most patent infringement cases filed in 2012. Source: [38]

Overall Rank	District	Median time-to-trial (in years)	Rank	Overall success rate	Rank	Median damages awarded	Rank
1	Virginia Eastern District Court	0.97	1	34.1 %	5	$36,025,989	1
2	Delaware District Court	1.90	4	41.7 %	3	$20,636,247	2
3	Texas Eastern District Court	2.17	6	55.7 %	2	$8,782,738	5
4	Wisconsin Western District Court	1.07	2	31.4 %	7	$4,730,027	9
5	Florida Middle District Court	1.74	3	57.1 %	1	$151,392	15
6	California Central District Court	2.28	7	32.4 %	6	$6,728,379	7
7	Texas Southern District/Bankruptcy Courts	2.00	5	20.5 %	15	$11,042,883	4
8	Texas Northern District Court	2.42	9	38.7 %	4	$1,756,750	13
9	New Jersey District Court	2.73	13	28.8 %	11	$16,976,883	3
10	New York Southern District Court	2.65	11	29.3 %	9	$3,269,254	11
11	California Northern District Court	2.72	12	22.6 %	14	$7,848,405	6
12	Florida Southern District Court	2.39	8	23.1 %	13	$2,836,043	12
13	Massachusetts District Court	3.58	15	30.6 %	8	$4,088,947	10
14	Minnesota District Court	2.58	10	28.9 %	10	$1,590,435	14
15	Illinois Northern District Court	3.42	14	24.8 %	12	$5,768,892	8
	Overall (all decisions identified)	**2.30**		**31.6 %**		**$5,302,861**	

Figure 23: Statistics on patent litigation cases from 15 federal district courts in the United States. The data is from 1995 to 2011. Source: [39]

with the second most patent infringement filed between 1997 and 2009 after the U.S., it is important to understand that the Chinese system for patent litigation differs substantially from the on in the U.S.. The Chinese law system is based on civil law as opposed to based on common law as in the U.S. [16]. This means that courts are not bound by earlier decisions but that court decisions are instead based on Chinese Law [43]. It is also worth noting that China have specialised courts for patent litigation, which means that only 76 of the 395 "Intermediate People's Courts" can hear first-instance infringement cases and these specialised courts have specialist patent judges [16].

It is potentially because of these specialised courts that the patent litigation process in China has become very efficient. A trial of a straightforward patent infringement case can be expected to take as little as 6 months and statistics from cases in 2011 and 2012 show that the average time that it takes from the date of acceptance of the filing of the patent infringement case to the date when it is concluded is between 6 and 8 months [16, 42]. This shows that having Chinese patents in a patent portfolio can increase the value of the portfolio since a patent litigation in China can be done very swiftly.

Another big contrast to the U.S. system is that the damages that are awarded to the patent owner when winning a patent litigation is usually very low. Even when a court decides that a patent infringement have been committed the patent holders are often only able to claim statutory damages, which are capped at 1 million RMB (approximately 150 000 USD) [16]. Even though this is quite low compared to the U.S., statistics from actual cases show that in 2011 and 2012 the average damages awarded was even lower, a little bit over 80 000 RMB (approximately 13 000 USD) [42]. This means that filing a patent case in China with the goal of receiving damages is for most companies not worth it, especially compared to the U.S. where the median damages awarded in cases between 1995 and 2011 is as high as 5 000 000 USD [39]. It is however worth noting that statistics from patent litigation cases in China in 2011 and 2012 show that over 80 % of the cases was won by the patent owner (this includes cases where the court recognises some or all of the plaintiff's claims and awards remedies in at least some of the categories of relief sought by the plaintiff) [42].

Furthermore, it is very interesting to note that despite the low damages, having patents in a portfolio that covers China could be very valuable since the chance of receiving a final injunction is high. Statistics on cases from 2012 shows that in 80 % of the cases that went to a final judgement a final injunction was awarded [42].

When it comes to plaintiff win ratio, average damages awarded and the average duration of proceedings for patent litigations in China it can be seen by the statistics provided in Figure 24 that there has not been any big changes in these statistics the last 6 years. As seen in this figure, for

Year	2006	2007	2008	2009	2010	2011	2012
Plaintiff win ratio	78 %	80 %	76 %	74 %	75 %	82 %	84 %
Average duration of proceedings (months)	7	6	6	5	6	8	6
Average damages awarded (USD)	20 300	10 200	58 800	11 300	18 200	14 700	9 800
Injunction ratio	78 %	80 %	75 %	74 %	74 %	80 %	80 %

Figure 24: Statistics on patent litigation cases in China. Source for data: [42]

the last 6 years, China has been a jurisdiction where a patent owner has a very good chance to win and the court proceedings will be fast with a high chance for the patent owner to get a final injunction order but the average damages awarded are very low. This together with the fact that China is the top country when it comes to number of patent applications filed, the value of a patent portfolio is definitely seen to increase when it contains a lot of Chinese patents [16, 42].

5.3.3 Germany

Germany is also one of the most important geographies since it was the third country with the most patent infringement cases filed between 1997 and 2009 [15]. Furthermore, the German patent office was number 6 in most received patent applications in 2010 [14]. This indicates that Germany is also seen as one of the most important geographies. One of the reasons for this could be that in the most used court in Germany, the one in Dusseldorf, where it is estimated that 40 % of the patent litigation in Germany takes place, the owner of a patent have won 63 % of all the cases between 2006 and 2009 [15]. Comparing Germany to the United States it is however seen that damage trials are rarely conducted in Germany, which could stem from the fact that damage awards have historically not been high [15]. On the other hand between 2006 and 2009 a preliminary injunction was granted based on a patent infringement case in 59 % of the cases in Dusseldorf [15]. The high rate of preliminary injunctions together with a fast time to trial, less than 1 year, are probably the main reasons for why the German courts are in top when it comes to patent infringement cases filed [15]. In the same way as in the United States, Germany also have several courts where patent infringement cases can be brought up, which even though there are only 12 first-instance courts further increases the possibility for a patent owner to chose a beneficial court [15].

Since Germany is one of the top countries when it comes to the number of patent applications filed and also since Germany has one of the top courts when it comes to likelihood of receiving a preliminary injunction the value of a patent portfolio is also seen to be increased by having German patents in each patent family [14, 15].

5.3.4 India

The Indian market is becoming more and more important since it is predicted to be one of the fastest growing markets in the coming years [12]. It is however hard to say how the value of a patent portfolio is affected by having patents in India today since the jurisprudence for patent infringement might not as advanced as in the developed nations [35]. But there has been a rise in patent litigation in India the last few years [49]. The fact that the number of patent cases is rising in India could partly be because the system in India for patent infringement cases have recently changed. The Indian Government constituted the Intellectual Property Appellate Board ("IPAB") in 2003 and in 2007 they decided that IPAB should handle all appeals under the Patent Act, thereby making IPAB responsible for handling for example decisions and cases of potential infringement [40]. From 2007 when IPAB was made responsible for patent cases, until the end of 2011, they received 260 patent cases [49]. Comparing this to the 1266 patent cases received only by the U.S. Eastern District of Texas court in only one year, 2012, shows that compared to the U.S., the patent litigation in India is still very small [38].

One very interesting case that indicates that how the Indian market is growing in importance is the recent case between the Swedish mobile network infrastructure maker Ericsson and the Indian handset maker Micromax. In this case, Ericsson sued Micromax for patent infringement of their standard-essential patents relating to the wireless communication technologies 2G, 3G and EDGE [11, 17]. Ericsson say that they have now taken legal action, since three years of negotiation has failed to yield a license agreement [11]. Ericsson now claim Rs 100 crores in damages, which is approximately 18 000 000 USD [11]. The importance of this case is further indicated by the fact that Micromax is the second largest handset manufacturer when it comes to sales in India, the only manufacturer with larger sales in India is Samsung [28]. Furthermore, Micromax state on their own webpage that according to a recent market report they are the 12th largest handset manufacturer in the world [33]. These facts are of course showing the importance for Ericsson of this case and the growing importance of the Indian market.

The most interesting part with this case is that the Delhi High Court recently ordered an interim arrangement on the case in favour of Ericsson, where Micromax is ordered to pay a royalty that is between 1,25 % and 2 % of the sales price for the disputed devices and deposit the amount with the court [11, 17]. Furthermore the arrangement says that Micromax and

the Customs department has to contact Ericsson whenever a shipment with the concerned devices arrive at the border so that a representative from Ericsson can inspect it [17]. It is only after Ericsson have inspected each shipment and told the customs that they have no objection to its release that the shipment is handed over to Micromax [17]. This arrangement will be in place until the dispute is finally settled [17]. Ericsson's representative in the case welcomed the interim order and said "This shows Indian courts can decide very complex patent litigation swiftly" [17].

Even though India is a quite new market for patent litigation, the case shown here really indicates that in the near future, India could be a very valuable geography to have patents in. The case between Ericsson and Micromax also indicates that patent litigation in India is relatively swift and that if an infringement seems likely then the patent owner can easily put pressure on the infringer in order to speed up the negotiation.

5.4 Summary

As described in this chapter there are several different factors that affect the value of a patent portfolio. From a technology perspective factors such as the performance of the technologies covered by the patent portfolio and the diffusion of those technologies in the market can help to give an understanding of the size and growth of the market and thereby the value of the patent portfolio.

Since a patent portfolio covers technologies it has also been described here how this makes the patent portfolio applicable to several different markets, each of which affect the value of the patent portfolio. Furthermore it has been described how the size and trends of the markets can be analysed from a more pure market perspective.

The last section of this chapter described the importance of considering which geographies the patent portfolio contains granted patents in since there are many differences between different jurisdictions. This is clearly shown in Figure 25, where it for example can be seen that United States have the slowest courts but the highest average damages awarded. As discussed it is also important to consider how the different courts within each jurisdiction affects the value of a patent portfolio. All the jurisdictions analysed here were valuable to have granted patents in but it is believed that by looking for the criteria mentioned here, it is easy to compare any jurisdiction with the ones discussed here.

Country	Plaintiff win ratio	Average duration of proceedings	Average damages awarded	Injunction ratio	Data from the years
United States	31,6 %	2,3 years	5 300 000 USD	-	1995-2011
China	78 %	6,4 months	21 000 USD	77 %	2006-2012
Germany (Dusseldorf)	63 %	< 1 year	-	59 %	2006-2009

Figure 25: Statistics on patent litigation cases in United States, China and Germany. Injunction ratio for the United States has not been found. Average damages awarded in Dusseldorf have not been found but are mentioned to be "not high". Sources for data: [39, 42, 15]

6 Value Extraction Strategies

In this chapter, the focus is on the commercialization alternatives. It will be discussed from a general perspective. However, when a company comes to this part of the process, it is really important to use the previous two chapters as a foundation. Combined, an understanding of both the technology and the external market factors makes it possible to make a cohesive definition of the portfolio, i.e. decide what the portfolio is and consists of. This in turn is a requirement in order find a potential stakeholder and to be able to analyse the different commercialization alternatives and then choose the best one from a strategic and value perspective.

The following section will discuss how the value is highly dependent on whom the stakeholder is, followed by a section how to identify potential stakeholders. After that, a number of commercialization alternatives will be discussed in terms of benefits, drawbacks and other strategic considerations.

Note, particularly in this chapter, both buyer and seller will be used to describe the parties taking part of a transaction. A buyer in this context does not necessary imply that the commercialization choice is to sell. Buyer also refers to the receiver of a license or the receiver that get the patents for free. In the same way, when seller is used, it could also mean the licensor of the non-core portfolio.

6.1 The Value is Dependent on the Owner of the Portfolio

This section is about understanding one of the most fundamental aspects of the value of a patent. That the value depends on the parties involved in the transaction. Essentially, it is all about understanding how a potential buyer of the portfolio would value the patents and how the choice of buyer affects the seller.

As a first example, take a typical industrial company producing high technological products and assume that the company infringes on one of the

non-core patents that is going to be commercialized by another company, the seller. Then the first company, the buyer, might realize that they need to take a license. Most high technological products are dependent on many, sometimes thousands, patents. If not the non-core patent is very essential for the product, the value of this extra patent could be assumed to be rather low from the buyer's perspective. Potentially one thousandth of the total value of the product. Hence, the royalty fee for the patent and thereby the value for the seller will also be low.

Compare this to another example where the buyer mentioned above produces a much more simple product. Then the non-core patent might be one of very few patented technologies used in the product and perhaps even very essential for the product's main features. The value of the patent could then be assumed to be very high from the buyer's perspective. Hence, the royalty fee for the patent and thereby the value for the seller will also be high.

In this way, it can be seen that depending who the potential buyer or receiver of the transaction is, the patent will be of different value. To some extent, the value is not only dependent on the buyer but also on the seller. More precisely, the seller does not affect the value of the patent but the value that is possible to capture since it depends on the alternatives the seller can choose between.

Depending on factors like the brand and the strategy of the selling company, some buyers might be out of the question already from the start. Even though those buyers would pay the most and be the best choice from a value perspective, the seller is forced to choose another buyer. Reasons for not choosing a certain buyer could be that it is a competitor or a company that the seller does not want to do business with since they do not want to be associated with them. Examples of such companies could be someone that do not follow ethical rules or have a bad reputation. Of course, the deal might be confidential but there is always a risk that information about it leaks to the public.

Another way the selling company affects the value or rather the commercialization alternatives it has is by its resources. Depending on the resources, different commercialization alternatives are possible to perform. For example, the most value might be captured if the seller files an infringement litigation against another company. However, to do a successful litigation, knowledge and experience as well as both monetary and human resources are required. So litigate is perhaps not an alternative for all companies.

So the point with this section is that even though it will not generate the most value, companies are sometimes forced to neglect the most valuable alternative and choose another commercialization alternative, due to different reasons, some of them mentioned above.

6.2 Identifying a Potential Stakeholder

In the case where the commercialization activity involves another party, i.e. a receiver of the transaction, such receiver or stakeholder must be identified. Sometimes this comes naturally. Like in the case where there is a product that has been identified to infringe on some of the patents in the portfolio. Then there is no question about the fact that this company could be a potential buyer since there is an obvious infringement case. Another potential stakeholder, not as obvious, could be a company currently involved in a negotiation with another company and where an additional good patent would help strengthen the former company's arguments.

The following sections will highlight some approaches to take when the potential receiver is not obvious. Some of the approaches will use similar methods to the ones used in chapter *4 Portfolio Analysis*, but the focus is different and will provide some useful insights.

6.2.1 Product Analysis

The natural approach and perhaps the most obvious when trying to find a potential buyer is to use the internal portfolio analysis from section 4, which hopefully gave a good understanding of which products that the technology in the portfolio covers. Combined with the external market analysis, a list of companies producing related products, ranked after for example total units sold, could be produced and be a great basis for choosing which company to target as a potential stakeholder.

This is an effective approach and not very complicated. It could be used more or less independent on the commercialization strategy, i.e. both for litigation, licensing or selling the non-core portfolio. One negative aspect or the risk with this approach is that the mindset is a little bit narrow and not all the products that are potential infringement cases will be analysed. This might be due to the fact that some products and companies are more well known than others. For some products it is easier to understand the underlying technology than others, and the latter could be missed in this case. Another aspect is that in a high technology industry, the products are seldom produced by the selling company themselves. More often, the parts of the products are bought from other production companies. In these cases, the production companies are the ones that are infringing and could be the target for the commercialization process. However, these companies could sometimes be hard to identify without making thorough breakdown of the product's technology in question. Furthermore, the components could be produced by many small production companies which isolated are not attractive for a commercialization process due to the sheer fact that they are too small to generate enough value in a potential licensing deal.

6.2.2 Technology Analysis

Very similar to the product approach is an approach where the focus is on the technology. From the portfolio analysis, there were perhaps no infringement case discovered but a technology was found to be similar to some of the technologies covered by the non-core portfolio. If the technology which was found is inferior to the one covered in the portfolio, the company owning and using the found technology might want to upgrade its products by acquiring the rights to this better technology in the non-core portfolio. Hence, a potential buyer is found.

This approach is more time-consuming and more uncertain since the value for buyer is not clear from the beginning. The selling company spends time and effort to convince the buyer that they should invest in this better technology. At the same time, there must be enough time left until the portfolio expires, Otherwise, the buyer is most likely to not be interested at all. As the purpose of this report is to focus on patents and portfolios that have about maximum 5 years left until they expire, it could be questionable how suitable this approach is in this situation. So this is perhaps not the best approach to choose primarily. Still, if the approach can find a stakeholder that in turn could be valuable even though the stakeholder is not chosen for the commercialization process. The fact to just know that there are many alternatives and stakeholders out there might push up the value in a negotiation with the stakeholder that is chosen in the end.

6.2.3 Market Analysis

Changing from looking at existing stakeholders within the industry specified by the technologies in the portfolio, a broader approach is to look a little bit broader within the industry and relating industries. With the assumption that the portfolio has enough time left until it expires and that the technologies in the portfolio is enough to allow someone freedom to operate, players not yet using the technology covered might be interested in it. The freedom to operate does not even need to be fully met. However, since the time until expiration will not protect the company's future products, they would rather buy it to use it today than to have as a basis for research and development of future products. Let us say that a company is producing computer keyboards and that the portfolio covers the whole computer mouse. Then, acquiring the portfolio is a great way for the company to quickly get access to the computer mice industry, which is very relevant to them and fit with their business strategy.

A way of identifying such companies could be to use a technology tree. This might already have been created during the portfolio analysis. The only adjustment that needs to be done is to change each category from a technology to a company name that produces such technology, resulting in

a tree over relevant companies. This will show how related each company is to the technology in question. Stakeholders both upstream and downstream in the value-chain are shown as different levels in the tree. The closer a company is in the tree, the closer they are technology-wise to the technology that is going to be commercialized. Hence there is a higher likelihood that they are interested of the portfolio that is going to be commercialized.

The benefit with this method is obviously that it opens up for a broader perspective where potential stakeholders could be found by looking outside the industry boundaries. The drawback with this approach is though, as already mentioned, that it requires the portfolio to allow freedom to operate to even be considered as an option. Furthermore, similar to the technology approach mentioned in the previous section, this approach is time-consuming. First, it could be hard to find a company that want to expand their business into this new area. Second, when identified, the seller needs to convince the company that this expansion makes good business sense. Even though they are convinced and the decision is taken, transforming the business is not an easy task and takes time.

Another consideration regarding this approach is whether the technology covered by the portfolio will be attractive enough, 15 years or so after the patent were filed, for a company to invest in expanding its business into this area. For the keyboard and mouse example above, the technology development is rather slow but within most high technological industries, the technology developments are so fast that after 15 years, the technology will not be attractive enough in order to make investments in.

6.2.4 Citation Analysis

If the three approaches mentioned above have had some similarities, using citation analysis differs a bit. In the *4.1.2 Citations*, citation analysis was used to identify relevant technologies, both prior art and newer art. Focusing on the non-core portfolio's forward citations, patents that use the non-core portfolio's patents as prior art can be found. The technologies in those forward cited patents are likely to build upon the patents in the non-core portfolio to the extent that they are dependent on that portfolio. The nice thing about this is that every patent has an assignee and by looking at the assignees of the forward cited patents, companies that are operating in the same technological field as the technologies in the non-core portfolio, are identified. Perhaps some of them even are infringing the portfolio.

This approach is very interesting, especially in the case when it is hard to find good market data online on who uses and produces technologies similar to the one in the patent. Not every component in a high technological product is well known, nor are the producers of such components. It is also possible that a company has filed for a patent relevant to a product but is not producing the product at all at the moment, but are going to do so very

soon. Then there is likely no other way of getting such company on the radar except from using citation analysis.

The negative with this aspect is that is does not identify stakeholders as clearly as in the case were the focus is on products. Nor does it include any market data. The market data is important to include in the analysis in order to get a good understanding of the extent to which the technology in question is used. Perhaps all the owners of the forward cited patents are small companies or operate in a country where the patent is not valid. In both cases, the attractiveness of such company as a potential stakeholder is low.

6.2.5 Identify Companies that are in a Litigation Process

Another way to is to look in magazines and online to find companies that are in a litigation process and that might value the portfolio. This approach is interesting since it differs from the others already mentioned by having a different basis for the valuation of the patent. The previous approaches have been related mostly to the technology. In this section, the focus is on the patent as an intellectual right used as a tool or aid in a business negotiation. A company that is in litigation or suing process with another company could see high value in an additional patent that will strengthen their arguments and standing point. Putting the patent in a context like this, where it could help the company to win the negotiation, the value of such patent is much higher compared to if the patent is valued solely, without a context.

Many negotiations between companies, like regarding royalty rates in a contract, are not public. Litigation processes or lawsuits are however many times public in the sense that the public know about them. Searching online will provide information about on-going processes. The argumentation taking place in those processes are not public but the awareness of that they take place is enough. If the process seems to be relevant to the non-core portfolio, a phone call to any of the parties involved in the process is enough to establish if they are interested in reinforcement of a good patent portfolio.

This approach, to find a matching litigation or lawsuit, is probably not something to count on but it is important to realize that there is a potential value in the case where such process is found.

6.2.6 Patent Assertion Entity

There is a special type of stakeholders that are not captured in any of the approaches already mentioned, except in the case that they are part of a process as discussed in the previous section. The stakeholder in question is the kind of non-practicing entities sometimes called PAE. Their core business is to buy and assert patents that then give income in terms of royalty fees which most of their revenue is derived from. They will not be found by

using product or technology analysis. Nor will they be found by looking at citations as they does not file for patents themselves. However, as their main business activity is to assert patents, they might be as interested as anyone else to acquire the patents in the portfolio.

To increase the likelihood that a PAE will be interested in in the portfolio, focusing on PAE:s that operate within the relevant industry is a good start. Furthermore, it must be relatively simple to detect an infringement on the portfolio. Otherwise, it will be too difficult for the PAE to find potential licensees. In addition, the strength should be high enough to be able to build a litigation process upon it, in case the infringer does not want to take a license. In general, looking at a PAE as a potential stakeholder is rather beneficial since they are not very sensitive to whether the patents has long time until expiration or not.

6.3 Identify and Choose Commercialization Option

After having done both an analysis of the portfolio and an analysis of external factors that influence the value, the critical part of the value-extracting process is to decide how to commercialize the patents. In order to do this, an understanding of the different options is necessary and the process surrounding them. These two aspects are going to be considered in the following sections.

Which commercialization alternatives or combinations of them that are available as an option and the best choice of them is dependent on the context. All the previous analysis about the characteristics of the patents, how the market looks like and how the selling companies internal strategy looks like are essential when determining how the commercialization of the portfolio should look like. Therefore, the alternatives given are only a few possibilities and versions of what is actually possible to do.

Strategic implications when involving another party

Before digging into the different commercialization alternatives, there are a few common strategic considerations that are valuable to know about. They all refer to the cases where a second party is involved, like in litigation, license negotiations or as a potential buyer, rather than in the cases of pruning, keeping and giving away the patents.

For the type of portfolio considered in this report, where the patents have a limited time of just a few years left until they expire, the time perspective is the most important strategic consideration. The benefit of such a portfolio is that fewer predictions about technology trends should be needed when trying to value the patents in the portfolio. The technical development should be rather clear within the next 3 - 4 years leading to that the importance of the patents should be rather clear. At the same time, the limited time translate into limited potential value, like revenue ranging from royalties.

Other companies will also value the patents less than patents with 15-10 years until expiration.

Furthermore, the time-perspective will affect which commercialization alternatives that are possible to do as well as the character of them. For example, with one year until expiration, a license deal might not be reasonable. The best thing is perhaps instead to sell the patent to someone that will use it in a litigation process. The character of the alternatives would also be to focus on present and well-established products, i.e. it all more or less boils down to find infringement cases on those products. Even though the patents might cover a new and up-coming product, that product will not have reached high enough market value, being the basis for a license deal or selling price, until the patent has expired.

The second consideration is that the company needs to have enough resources in order to be able to perform a certain commercialization alternative in a good way. For example, to litigate or to set up a license deal usually requires many different skills. There need to be technical experts, lawyers and so on. The negotiations with another company, taking place in those situations, are not an easy task and requires experience. Furthermore, the time perspective affects which commercialization alternatives that are possible as most of them require the process to be rather quick which demands efficient human resources and quick decision making within the company's management. In fact, this applies to both parties of the transaction. If the potential licensor does not have the resources required, it could delay a license negotiation substantially. Furthermore, litigate, as an example, also includes high costs, which mean that the company need to have enough capital resources to drive such case. The pure knowledge of that the company has great internal resources for driving the case will be helpful in adding power to the negotiation. For example, if a small start-up would try to litigate against a larger player, the larger player would know about the start-up company's limited human and capital resources and could act in a way that just will drain the resources from the start-up.

The third consideration regards the fact that only because the company thinks it has found a solid infringement case and thinks it could just approach the infringer and demand a license, it is not always as simple like this. The first counteraction the potential infringer could do it to simple claim that there is no infringement taking place, delaying the process. More seriously, potential infringer could try to invalidate the patent and in this way delay the process. If successfully invalidated, not only will the case be lost but also any future potential income. The delaying of the process might also be so long that the patent will expired before the deal is closed and no value is captured.

6.3.1 Sell

Selling patents is a great way to quickly get cash. It is very suitable for a situation where a single stakeholder is prepared to pay enough money for this option to be attractive. Once sold, there are no costs associated with the patent. Furthermore, the fact that the buyer will get the total control over the IP in the portfolio could be seen as a positive argument for the buyer to acquire the portfolio. It can do whatever it would like to do after the transaction is done.

The risks or negative aspect with this option is that the control over the technology is lost and there is no way to undo the decision whilst settled. Therefore is it important to be certain that this is the option to go for. For a patent with only a few years left, this is usually not an issue since there are no uncertainties about the technological development over this short period of time. Another aspect is that the value of the patent must be clear and be proven to be high already before a potential buyer is approached. For example, an infringement case must have been found or a product involving the technology must be well spread on the market to catch the interest of the buyer. Furthermore, the price is dependent on the present value of the portfolio and not future (potential) value. The risk is always that the real value of the portfolio is discovered after the transaction is completed. The seller will in that case not gain anything extra from this [41]. However, as said above, the few years until expire will limit the risk of selling a portfolio that suddenly increases in value after a while. To prove a high value of the portfolio is important to do but could be a hard task in itself and could require both time and resources, which is another drawback with selling patents.

6.3.2 License

Licensing the rights to a technology that is patented is a very common business activity, especially within high technological industries. The benefit of this approach is that it allows the company to keep the control over the patent rights. This means that it is possible to target multiple companies and establish license deals for each of them, summing up to a larger royalty base.

What is special with this approach it that the value for the licensor will usually be dependent on the success of the licensee. In a product situation, if the products perform well, a lot of revenue will be generated and hence also royalties for the licensor. Of course, this dependency is also a drawback since vice versa applies. If the product flops on the market, the royalties generated will be low. However, from the licensee's perspective the dependency will minimize the financial investment risk, as their cost will be in relation to the success of the product. This argument could perhaps make this approach

more attractive for a potential buyer compared to if they have to buy the patents.

In the situation where the goal is to capitalize a portfolio with little time left, the time perspective introduces some strategic implications of licensing. First of all, establishing a license deal is usually not done if there is too little time left until the patents expire. This approach might therefore not be an option at all. Second, getting both parties to agree on the terms of the licensing contract is time-consuming, which is a drawback with this option.

6.3.3 Give Away

To give away patents might sound like a strange thing to do. However, it could sometimes be a strategically clever alternative. There are two options, either you give away the patents for free or demand a license to part of the receiver's portfolio. Giving away patents is suitable when the value of them is hard to establish or when the value of them is too low for any company to buy or license them. In both scenarios, it should be a rather quick and straightforward process, which is good due to the time perspective. Instead of pruning the patents, giving them away for free will, as for pruning, cut costs but there is also a likelihood to get some implicit value. The business relationship with the receiver could improve if they get a portfolio of patents for free. There is also a chance that they might find a way to use them in a litigation process against a common competitor. If the common competitor is being included in a litigation process, they need to spend resources and capital into the litigation, which of course is beneficial for all other parties in the same industry having them as a competitor.

Give away the patents and ask for a license to the receiver's portfolio is a great way to capture some value. The risk and investment for the receiver is rather low since they get a couple of patents, which they do not need to pay for with money. So it should not be too difficult to find a stakeholder that would accept a deal like this. Meanwhile, the company giving away the patents will both cut costs and get access to new technology through the license. However, it is important that the two portfolios are of approximately the same value. Otherwise, a monetary transaction might be necessary to compensate for the difference.

The drawback with giving away patents like this is that, at least in the first case where it is done for free, the non-monetary value of the patents is probably quite low. Otherwise one of the other alternatives should have been the choice. It could therefore be questioned how realistic this alternative is. In the second scenario, even though the gain is a license to a new portfolio, there is no real monetary gain. The value is also highly dependent on what the license covers.

6.3.4 Litigate

Litigation is often the last outcome when the negotiation between two companies cannot be solved in another way. This can for example be the case when a patent owner believes that another company is infringing the patent owner's patent portfolio and should therefore take a license but the other company believes that they are not infringing and therefore refuses to take a license. Litigation is an action which most operating companies avoid whereas it can be common among some PAE:s. By litigation, the judicial arena is getting involved which has the power to force a settlement between the parties. If the court finds that the sued company is infringing the patent portfolio then the court could force the sued company to pay a license in order to be able to continue to produce its products. Furthermore, the court could issue an injunction that prohibits the sued company to produce the infringed products. In some jurisdictions it is also quite common that the company that filed the lawsuit is awarded damages for past infringements committed by the sued company. The benefit with the litigation option is that the potential awarded damages could be very high and that the negotiation reaches an end.

The drawbacks with this action are that it usually comes with high costs, is very time-consuming and resource-intense. Especially if all the preparations are included. For example, preparing the infringement case so it is solid and strong enough to hold in court. Yet, there is no guarantee that the company filing the lawsuit will be the winner of the case. Hence, the action involves the risk of just bring a lot of cost to the company. If the litigation is successful however, the potential revenue could be really high.

Another drawback is that litigation can only be done in the country where there is a valid patent and will only affect the sued company's activities on that market. It is also important for the company filing the lawsuit to have a good understanding of the judicial arena of the country in question. As we have seen in section *5.3 Geographies and the Role of Different Jurisdictions*, regarding e.g. cost and time, there are some more favourable and some less favourable countries to litigate in.

6.3.5 Prune

Pruning patents means to end the validity of a patent by not continue to pay the maintenance fees. Typically the patent has been identified to not have any or very little value and the expected gain from having it is low compared to the costs associated with keeping it. So, the real benefit with this option is really that it cut costs. In addition, it is quite simple to implement with no need for external interactions except perhaps with patent offices. As companies usually have a family of patents, where each patent is applicable to the same technology but covers different regions, it is possible to partly

cut costs by pruning some of the country patents and keep the rest.

The drawback with this approach is that the gain cannot be higher than the costs cut. It might even be so that the maintenance fee for keeping a patent is paid for multiple years at a time [46]. In the U.S, the last payment is done after 11 years from the date of issue [46]. That means that pruning a patent with 5 years until it expires will not even cut costs!

Another strategic consideration when evaluating if pruning the patent is a good choice is to include the fact just having a patent could have a value. For a company, to be able to claim that their portfolio is very big with a lot of patents have a certain brand value. In this context, the quality of a patent is not considered. Being too aggressive with pruning activities could therefore affect the brand value implicitly in a negative way.

6.3.6 Keep

Just keeping the patents is a safe action, as it does not change anything. In some sense it is a non-action. It will not give any income nor will it cut any costs. Therefore it is both a quick and easy decision to take. In addition, keeping the patent makes it possible to regret and revise the decision at a later stage in time.

The reason for keeping the portfolio could be that the value of the patent is hard to define and therefore it is hard to choose what to do with it. This alternative then involves no risk and little costs. The result is then however that the commercialization attempt did not give any extra value to the company. Another reason to keep a patent is that it actually has been identified during the portfolio analysis to have some value in terms of being part of the defence for the company. The patent will be valuable, as it will strengthen the negotiation with another companies in a present or potential future dispute. Then, the commercialization attempt has actually extracted some value as it brought this patent into the focus of the company.

The drawbacks of this action are as mentioned earlier that no costs are cut and this alternative does not provide any direct monetary gain for the company. Another aspect of this action is that it allows the manager of the commercialization portfolio to play the safe card. The risk is that this action is used too often due to pure laziness or unwillingness to take any risks. After having analysed the portfolio and market, a few patents with obvious value will be commercialized. The rest is just going to be kept. To keep patents due to laziness are not recommended. The goal is to extract value from the portfolio so it is recommended to more proactively take a small risk and decide to, for example, prune some of the patents. That will at least will save some costs for the company.

6.4 Preparing a Patent Portfolio for a Transaction

If the analysis of a non-core patent portfolio leads to the decision to sell, license or give away the portfolio or a part of it, it is important to make sure to prepare that part of the portfolio in a good way for a transaction. As with any product, it is here important that the company owning the patent portfolio can clearly show the value of the patent portfolio. In order for the transaction to be easier to handle and for the patent owner to better be able to display the value of the portfolio to a potential buyer, the portfolio that is being prepared for transaction should be divided into "patent lots" with somewhere between 15 and 50 patent families per lot [34].

The patents in each patent lot should cover technologies used in one market or for one type of product. Through sorting the patents into different lots in this way, each patent lot will appeal to buyers with interest in one specific market. It is also very important that each of the patent families in a patent lot are complete, meaning that all the patents that belong the family is part of the patent lot since buyers rarely acquire incomplete patent families. [34]

When preparing the patent lots it is also important to make sure that each lot has one or a few really good patents that can be used to indicate the value of the patent lot. Since the point with these patents are to show that the value of the whole patent lot is high, it is very important that these patents are good and that it is possible to show this in a good way to a potential buyer. Patents that are good to use to show the value of a patent lot can for example have been:[34]

- Successfully been used in litigation.
- Been re-examined before without being weakened.
- References several times in other patent applications
- Cover parts of a technology standard.
- Successfully generated licensing royalties in the past.
- Have claims that cover products that currently are sold.

  Source: [34]

When creating the patent lots from all the patents that are going to be commercialised one can of course start by identifying the patents that are good to show the value and then group these together with the other patents to create the patent lots. The other way to do it is to first create the patent lots and after that try to find one or a few patents in each lot that can be used to show the value of each lot [34].

When the patents have been successfully sorted into patent lots, each with one or a few patents that it easy to show the value of, the next step is to produce the material that will be used to show the value of the lots to a buyer. It is here important to understand that one of the main value drivers in a patent transaction is if an infringement of the patent can be shown [34]. One really important part of creating marketing material for a patent portfolio is therefore to create claim charts that show that there are products that infringe the patents [34]. When these steps have been taken then the patent portfolio is ready to be commercialised in a way that brings in as much value as possible. More information about the process of selling patents can be found in [34].

6.5 Summary

Having all the different commercialization alternatives mentioned earlier in mind, the question is to choose between them. Trying to state here in this report what the right thing to do has really no point. As seen, there are so many things that depend on the context. The discussion in this report will hopefully give enough insights in order to understand what the options are in order to be able to adopt the commercialization process to each specific situation.

In general terms, most of the times, the commercialization will most probably turn out to be a mix of the alternatives rather than just a single alternative. Some patents are likely to be kept for defence (or due to laziness), a few will be pruned and some valuable ones will be sold, most likely to a PAE.

7 Result

The theory in this report was, as mentioned in chapter *3 Method*, used in a case study. This made it possible to conclude upon the usefulness of each part of the commercialization process. Those conclusions are incorporated in this chapter were the overall result of the report is presented. First, the results from the three chapters; Portfolio Analysis, Market Analysis and Value Extraction Strategies are presented. For each chapter, the usefulness of the different methods that were used will also be discussed (see also Figure 26 for a summary). Then in order to sum up the results from the whole thesis, the overall result is presented as the Value Extraction framework , which describes the three different steps that are needed to go through in order to extract value from a patent portfolio.

7.1 Portfolio Analysis

As seen in chapter *4 Portfolio Analysis*, it is important to do an analysis of the patents in a non-core patent portfolio as a first step to extract value from it. When doing an analysis of the patents in a non-core patent portfolio it has been shown here that the first step is to gain an understanding of the technologies in the patent portfolio. The next step that should be done is to structure the patents in the portfolio, which can be done in several different ways. This is to get an overview of the content of the portfolio. Before going to the next part of the analysis, it is also important to check the legal status of the patents in order to avoid including patents not suitable for the value extraction process.

The steps that should be taken in order to conduct this portfolio analysis are therefore:

- Identify technologies covered by the portfolio
- Structure the patents in the portfolio
- Confirm the legal status of the patents

7.1.1 Evaluation of the Methods

When going through each of the steps presented above, several different methods where used. This section will describe which of these methods that proved to be useful and which of them that was not.

For the first step of identifying the technologies covered by the portfolio, reading through the abstract and claims of all the patents was very valuable. This gave a very good overview of the content of the portfolio not requiring much time. On the other hand, looking at citations was not that useful and barely enhanced the understanding of the content of the portfolio at all. The

last method, using the patent classification system, helped a little bit to gain a high-level overview of the portfolio but was not really useful in order to get a good picture of the content.

The second step was to structure the patents in the portfolio. For this, structuring according to detectability and tier showed to be the most valuable method since it gave a really good understanding of which patents in the portfolio that was most valuable from a value extraction standpoint. Structuring according to a technology tree was also valuable since it gave a good understanding of which technologies that was covered. Structuring the patents according to patent classification systems, functionality and benefit, and direct product mapping all showed to be a little bit hard to do and did not really enhance the understanding of the content of the portfolio.

The last step of confirming the legal status of the patents was quite easy and did not need a specific method. It was also considered to be important, as there were no room to include any patent in the analysis without being sure that it could be used in the end.

7.2 Market Analysis

As seen in chapter *5 Market Analysis*, the next step is to assess the markets for the non-core patent portfolio. This can be done from three different perspectives. The first one is to analyse the performance trends and diffusion of the technologies covered by the patent portfolio. The second one is to look at which markets that the patent portfolio is applicable to and what the size and growth are of those markets. The third aspect is to look at which geographies the patent portfolio covers and how the different jurisdictions in those geographies work.

The steps that should be taken in order to conduct this market analysis are therefore:

- Analyse technology trends and diffusion
- Identify applicable markets and assess size and growth of those
- Assess the covered geographies and the role of their jurisdictions

7.2.1 Evaluation of the Methods

Also for the market analysis, each of the different steps showed and methods used turned out to be more or less valuable.

Looking at technology trends and diffusion was very valuable to do on a high-level. However in order to do be as efficient as possible it is recommended that this step is not done very thoroughly. A high-level understanding of technology trends and diffusion gives a good hint about the market size, but is not very important when choosing a value extraction strategy.

To look at the value-chain positioning and the market size and trends showed to be very valuable. This information is highly relevant when choosing a value extraction strategy and should therefore be done thoroughly.

The role of geographies and different jurisdictions is quite important and also affects the choice of value extraction strategy. It is recommended that this is only done on a high-level unless some of the aspects are believed to highly influence the choice of value extraction strategy.

7.3 Value Extraction Strategies

As seen in chapter *6 Value Extraction Strategies*, the last step is to assess the different options that are available for extracting value from the non-core patent portfolio. First it is assessed which options that are available based on the overall strategy of the company owning the portfolio. The second step is to identify potential buyers of the patent portfolio. The third step is to identify and chose the best option for value extraction. The last step is to prepare the patent portfolio for a transaction, if that is part of the chosen value extraction.

The steps that should be taken in order to choose and execute a value extraction option are therefore:

- Assess the options that are available based on the overall strategy of the company owning the portfolio
- Identify potential buyers of the patent portfolio
- Identify and chose the best option for value extraction
- Prepare the patent portfolio for a transaction

7.3.1 Evaluation of the Methods

The different steps presented in chapter *6 Value Extraction Strategies* are all very important since they form the basic understanding needed in order to choose the optimal value extraction strategy. It was confirmed by the fact that all the different aspects in chapter *6 Value Extraction Strategies* were considered during the case study. When trying to identify potential stakeholders, product analysis, market analysis and looking at PAE:s was the most useful. Furthermore, the last section describing how to prepare a patent portfolio for a transaction is of course only applicable if a strategy that involves a transaction is chosen.

7.4 Proposed Framework for Value Extraction

Based on the results from all the different chapters of the report and the experienced gained from the case study, a framework was developed that is

			Useful	Useful to some extent	Not useful
Portfolio analysis	Identify the covered technologies	Reading through the abstract and claims	x		
		Citation analysis			x
		Patent classification systems		x	
	Structure the patents in the portfolio	Detectability and tier	x		
		Technology Tree	x		
		Patent classification systems		x	
		Functionality and benefit		x	
		Direct product mapping		x	
	Checking the legal status	-	x		
Market analysis	Technology trends	-		x	
	Technology diffusion	-		x	
	Value-chain positioning	-	x		
	Market size and trends	-	x		
	Role of geographies and different jurisdictions	-	x		
Value extraction strategies	Value is dependent on the owner	-	x		
	Identifying potential stakeholder	Product analysis	x		
		Technology analysis		x	
		Market analysis	x		
		Citation analysis		x	
		Identify companies that are in a litiagtion process		x	
		Patent Assertion Entity	x		
	Identify and choose commercialization option	All methods	x		
	Prepare a patent portfolio for transaction	-		x	

Figure 26: This table summarises the findings about how useful the different methods that was used for each analysis turned out to be.

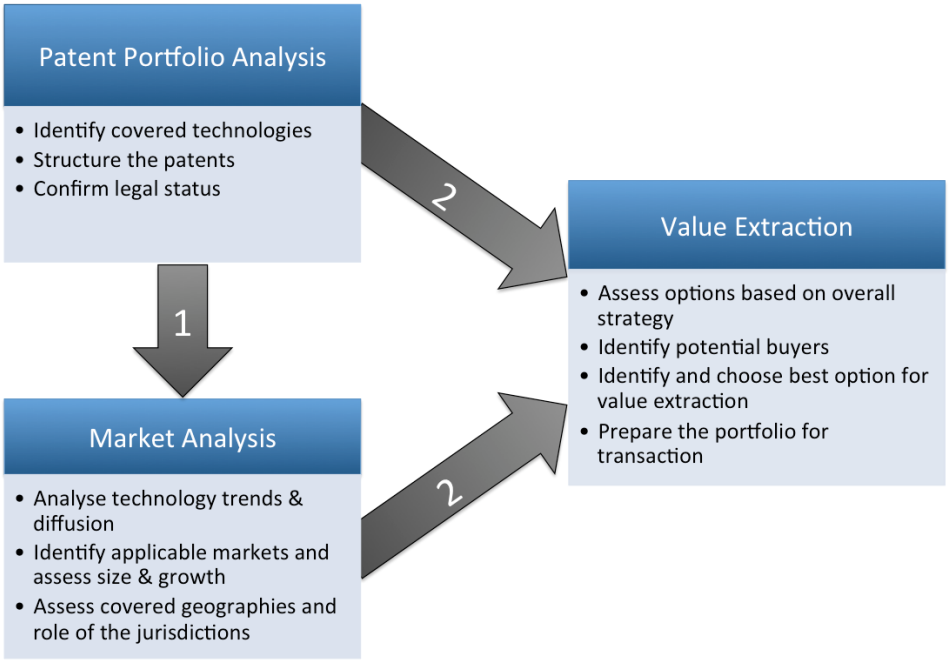

Figure 27: The proposed Value Extraction framework that contains all the different steps described in the report for extracting value from a non-core patent portfolio.

suggested to be used when extracting value from a non-core patent portfolio. The framework is called the Value Extraction framework and can be seen in Figure 27. This framework shows the three different steps recommended to go through in order to extract value from a non-core patent portfolio. It also shows how information from the portfolio analysis is used in the market analysis and later how both the portfolio analysis and the market analysis are used when the best option for value extraction is decided. This Value Extraction framework contain all the different aspects that have been described in this report and that needs to be considered in order to successfully extract value from a non-core patent portfolio. This framework were used during the case study and turned out to be very useful.

8 Discussion

This chapter begins by discussing the result of the report and then discussing if the research of the report is in line with other research within the field. The last part discusses the methodology used.

8.1 Expected Result

As seen in this thesis the optimal way to extract value of a patent portfolio is highly dependent on several factors. Seeing how complex intellectual property is, since it is a legal right that gives access to a technology, it was already from the beginning expected that the optimal way to extract value would be dependent on several factors. However it was thought that it would depend on the covered technologies and the market size for those. When analysing it further it was realised that there were several more aspects, such as the role of different jurisdictions, that were important. Furthermore it was realised that the first step to in a good way identify what the patent portfolio actually covers was quite hard and could be done in several different ways, each offering a different level of detail.

Despite this, the end result was quite close to the expected result where the two main factors that affect the optimal way to extract value from a patent portfolio are what the patent portfolio actually covers and the market for it.

It was also realised that even when information about the patent portfolio and the market for it had been gained, a quite broad and good understanding of the different options for value extraction was needed. Without understanding all the different options for value extraction, it is not possible to understand which of them that is optimal.

8.2 Current Research within the Field

To our understanding the results presented in this thesis are in line with the previous research that has been done within this field. However, it is believed that previous research lacks the more practical description of how to extract value from a non-core patent portfolio that is described in this thesis. The previous research that has been found has often been quite narrow and very detailed. This of course adds a lot of value for those that are knowledgeable in the field but makes it harder for practitioners to use the results.

This type of report, that in a practical way describes all the steps that needs to be taken in order to extract value from a non-core patent portfolio, is thought to be more helpful for different patent owners. Even though many aspects in relation to value extraction of a non-core patent portfolio is considered of which not all are applicable to every situation, the report is believed to give the reader everything that is needed to be able to take a

non-core patent portfolio and start to extract value from it.

8.3 Research Methodology

This research report is to a large extent based on experiences gained from the education as well as work experience within the field. Furthermore the research is based on a confidential case study. This, of course, increases the risk that the results presented here are valid only in certain cases and not generally applicable since the case study only represents one company and one industry. Therefore, the experience has been combined with the reading of academic papers, books and news articles when writing the thesis. This has been done in order to avoid that the report is not affected by experiences that are not generally applicable. That said, the case study has of course influenced the report to a high degree.

Based on all of these things, the research questions have been defined and the factors that affect the different parts of the analysis have been analysed. The structuring of the analysis of how to extract value from a patent portfolio into three different chapters is assumed to be generally applicable to most situations. Furthermore, the ambition was to include all known factors into each of these chapters, in order to be as exhaustive as possible in the analysis. However, as earlier mentioned not all factors are applicable to all situations. In addition, there is of course a possible that there are other factors, than those presented in this report, that affects the optimal way to extract value from a patent portfolio but which have not been found in this research.

9 Proposal for Future Research

The primary area for future research would be to test the Value Extraction framework on more cases, maybe on cases where the patent owner is not very knowledgeable in the field of management of intellectual property or on cases where the patents cover a technology field where each product is only covered by a few patents. This would prove whether the thesis successfully describes how to extract value from a non-core patent portfolio in a practical way regardless of the context.

Secondly, it would be interesting to extend the scope of the research to also cover patents that have a longer time until they expire as well as include patents that are core, i.e. not non-core.

Another area for future research that is proposed is that the Value Extraction framework is used to develop quantitative parameters for all the different factors in the framework. These parameters can then be used to calculate the monetary value of a patent portfolio. It is understood that this is highly contextual but since the most important aspects to consider in order to extract value from a patent portfolio are described in this thesis, it might be possible.

The last proposal for future research is that a similar report is written that describes the next steps, after having chosen the commercialization alternative. For example, how a company can actually set up a licensing deal or sell a patent portfolio. This type of report would be a very good complement to this thesis, since this thesis ends where the patent owner has found the optimal way to extract value from a patent portfolio and prepared the portfolio for such transaction.

10 Conclusion

As seen, the process for extracting value of a non-core patent portfolio is quite complex and the optimal way to extract value is highly dependent on the context. However, it is possible to do it and the process can be broken down into three parts, each having a specific contribution to the analysis of the commercialization process. The importance of these three parts is being highlighted as they form part of the Value Extraction framework presented in this thesis.

Using the framework in a real situation confirmed how useful it is as it adds structure to the analysis. It is believed that the Value Extraction framework can help companies to extract value from non-core patent portfolios and thereby increase their revenue ranging from an effective management of their intellectual property.

The outcome from this report, the Value Extraction framework , is therefore believed to be highly relevant for companies with large patent portfolios, where the risk that some patents end up in the "pile" of non-core patents is high.

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