



**UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW**

**Process patent: the role they can play in the transformation from a
research institute to a research company**

Tiffany Le Brun and Elin Enehed

Graduate School

Master of Science in Intellectual Capital Management
Master Degree Project No. 2009:84
Supervisor: Lars Andersson

Abstract

Approximately a decade ago, the Swedish research institutes transformed to private corporate entities due to a decision from the Swedish government. The purpose of the thesis is to investigate the role that process patents can play during this transformation for the pulp and paper research sector. For this, we have focused our analysis on the relation and dependence between the business strategy and the patent strategy to enable such a transformation. The results indicate that process patents are problematic tools for business strategies to facilitate the transformation due to the difficulty in monitoring and proving infringement.

The conclusion of the thesis is that process patents are not sufficient tools for business strategies to enable a good transformation; there is also a necessity for a close connection between the patent strategy and the business strategy combined with additional strategies to protect and extract value from surrounding knowhow.

Executive summary

This thesis investigates the internal transformation from a research institute to a research company in the pulp and paper industry in Sweden with the restraint of process patents as the main tools for this transformation.

The idea for this research was the result of a case study performed by the writers at the research institute in pulp and paper in Sweden.

Process patents are prominent in the industry and, most often, the inventions are incremental improvements in processes. Overall, process patents, whether assets for the institute or a company, have revealed to be weak tools for this transformation and therefore need to be leveraged through other means.

An analysis of the differences between a research company and a research institute has shown that process patent play a different role in each context. Process patents are assets in both contexts though their purpose and leverage are drastically different.

During the research, we have identified three components that are deemed essential for this transformation and result in supporting the role of process patents in this transformation. These components are: research results (embodied by process patents), a patent process and a patent strategy.

The patent strategy is based on the purpose of patenting and how to best be able to utilize these in the transformation process. To maximize value created from process patents, the analysis has shown that the patent strategy preferred is a cooperative strategy,

The patent process is constructed of the steps that are necessary to implement the patent strategy chosen. These steps have to be adopted to take the assets that are available into consideration, in this case process patents and the distinctive features those patents have.

The conclusion of this research is that all these components are linked and that it is only their connection and alignment that will enable process patent to achieve their new role in a research company and to enable this transformation.

Contents

Abstract.....	2
Executive summary.....	3
Chapter 1 Introduction	7
1. Aim of Paper	7
2. Hypothesis	7
3. Research question.....	7
4. The method.....	7
5. Delimitations.....	8
5.1 Patents	8
5.2 Innventia	8
5.3 Legal referral	8
5.4 Swedish Legal Acts – Author’s translation	8
6. Definitions.....	8
Chapter 2 Background	10
1. Context – Case study	10
2. Reliability of information.....	10
3. Interviews	10
4. History of pulp and paper institute in Sweden	10
5. The necessity for Patent Process	13
5.1 Patent Rights	13
5.2 Competitive advantage.....	13
5.3 Technology diffusion.....	13
5.4 Financial motivation	13
5.5 Patent Definition	14
5.6 Patenting vs. publication discussion.....	14
5.7 Publication vs. secrecy discussion	16
5.8 Hybrid alternatives	18
5.9 Patent rights in a company	18
Chapter 3 Investigation and analysis	20
1. Research Institute vs. Research Company.....	20

1.1	Research Institute.....	20
1.2	Research Company	22
1.3	Key take-outs.....	26
2.	Process patents in the Pulp and Paper industry for a company	27
2.1	Claim writing	27
2.2	Claim terms for process patents.....	29
2.3	Independent and dependent claims.....	29
2.4	The TRIPs Agreement’s support for process patents	29
2.5	Findings of the writers	31
2.6	Identify infringers	31
2.7	Doctrine of equivalents’ impact on process patents.....	32
2.8	Ease to invent around.....	33
2.9	Case Study.....	33
2.10	Key take-outs.....	35
3.	The Patent Process.....	36
3.1	Groups Involved in the Patent Process.....	36
3.2	Visualization of the Patent Process	37
3.3	The Steps of the Process.....	37
3.4	Follow-up and monitoring.....	41
3.5	Key takes outs	41
4.	Patent strategy.....	42
4.1	Technology and knowhow	43
4.2	Patenting purpose	44
4.3	Strategy methods	45
4.4	Key take-outs.....	47
4.5	Connection to business strategies.....	48
4.6	Alignment between the patent and business strategy.....	53
Chapter 4	Conclusions	54
1.	Challenges and risks associated to this transformation	54
2.	Link 1: Research results to patent strategy	54
3.	Link 2: Patent strategy to patent process.....	55
4.	Link 3: Patent process to research results.....	55

- 5. Links as enabler for the transformation process 55
- Chapter 5 Reference list..... 57
 - 1. Governmental print..... 57
 - 2. Doctrine 57
 - 2.1 Literature..... 57
 - 2.2 Internet 58
 - 3. Interviews 58
 - 3.1 At Innventia 58
 - 3.2 Patent agent..... 58
 - 3.3 Vinnova 58
 - 4. Email 58

Chapter 1 Introduction

1. Aim of Paper

The aim of this thesis is to investigate the transformation of a research institute to a research company in the pulp and paper industry and to identify the role process patents can play in this transformation. This paper aims also at providing light on the requirement to succeed this transformation by looking at all the different aspects that such a transformation requires from the patent process to the patent strategy for the pulp and paper industry and its prominence in process patents.

2. Hypothesis

Our hypothesis throughout this report is based on the assumption that the patent process must be aligned and closely linked to the patent strategy to enable the transformation from a research institute to a research company. We believe that the main problem that will arise is the difficulty of using process patents as the main tool for this transformation due the difficulty of monitoring and enforcing process patents, making them an unreliable tool to base a patent strategy upon. We presume that one of the most efficient and effective solution is to ensure communication within the organization with regards to the patent strategy, the patent process and the necessity to connect them as well as connect to business strategy. We also assume that these elements need to be closely connected to the business strategy for the company to extract full value of its inventions.

3. Research question

Based upon the hypothesis described above we have singled out some research questions to facilitate and guide the research and investigation undergone in this paper. Their purpose is to break down the research into areas that will then be linked to form a conclusion. Therefore, the answers to these questions are the lead for the conclusion of this paper. These questions are:

- How does the patent strategy -focused on process patents- direct the patent process to enable the transformation from a research institute to a research company?
- What are the challenges of process patents and how to circumvent them?
- How is the patent process linked to the patent strategy and what are the requirements to ensure the implementation of the patent strategy in the patent process?
- What are the connections between the business strategy and patent strategy?

4. The method

We are basing our analysis on research done with regards to patent processes, process patents and patent strategies. We have through this analysis been able to identify how the combination of these could result in a structured process most favorable to the transformation of a research institute to a research company within pulp and paper industry. Our investigation has also been focused on the internal patent process, to examine which step should be taken and which consideration should be taken during the process.

We have looked at different approaches to process patents and analyzed how these should be protected to create most constructive protection. By our investigation of different patent strategies and their

connection to some chosen business strategies, we have made an assessment of which of these would be most beneficial for the transformation phase.

The analysis of the risks and difficulties associated to process patents has enabled us to propose a patent strategy and patent process aligned to circumvent these challenges.

5. Delimitations

5.1 Patents

There are numerous reasons why this thesis is solely focusing on patents and not considering the range of IPRs at disposal. Firstly, there is neither time nor resources necessary to enable a thorough research of all IPRs and their contribution in the transformation from an institute to a company. Nevertheless, by not investigating their contribution, we are not denying it either. Secondly, patents are the most prominently used IPRs in the pulp and paper industry and are also the IPRs with the higher source of income, therefore making them an obvious tool in the transformation from institute to company. Where appropriate, trade secrets are discussed and proposed as an alternative to patents.

This thesis is limited to process patents, as they are prominent in the pulp and paper industry¹, and therefore most relevant to the analysis done.

5.2 Innventia

The Swedish pulp and paper institute merged with Packforsk in 2003. This new brand of the institute specializes in packaging, where most of the research results yield product patents. As the focus of this thesis is on process patents, the merger with Packforsk and its impact on the institute will be considered in this thesis.

5.3 Legal referral

In this research, we have utilised the Swedish law as our main legal source. Even though the pulp and paper industry is an international industry, the transformation will take place in Sweden. Also, most of the industrial partners the writers are aware of are Swedish companies within the pulp and paper industry. Therefore we will focus on Swedish law, which would be the most commonly used by the institute. However, when appropriate, we have used other sources of information, such as the TRIPS agreement.

5.4 Swedish Legal Acts – Author’s translation

Swedish Patent Act Patentlag (1967:837)

Act On The Protection Lag (1990:409) om skydd för företagshemligheter
Of Trade Secrets

6. Definitions

TRIPs The agreement on Trade Related Aspects of Intellectual Property Rights

WTO World Trade Organization

¹ Cross reference: Chapter 32 Process patents in the Pulp and Paper industry for a company

PTO Patent and Trademark Office

Patent pool A consortium of at least two companies agreeing to cross-license patents relating to a particular technology.

Chapter 2 Background

1. Context – Case study

This thesis is partly based on a case study and the field knowledge that the writers have gained during a project for a research institute in the pulp and paper industry. This project consisted of an investigation of their patent process, an analysis with regards to performance and conclusions. The first step of the investigation was to gather all the background information necessary to enable a thorough and objective analysis. This information was gathered through various means such as, for example, interviews, questionnaires and access to strategic information within the organization. This exercise enabled us to get an overall picture of the requirements and risks of a patent process in practice within a research institute in the pulp and paper industry that is undergoing the transformation of moving from an institute to a company. It also helped us understand the step of such a transformation.

For confidentiality, strategic and competitive reasons, only selected information is divulged in this thesis and the background knowledge is used in a generic manner so not to jeopardize the wished secrecy of their patent process and patent strategy.

2. Reliability of information

As much as possible, the information was gathered first hand to allow for discussions and further questions. Action were taken to ensure the reliability and representativeness of the information such as asking many people the same standard questions, as a way to validate statements gathered. Questions were only directed towards appropriately qualified and experiences people.

To conclude and finalize the information gathering, the writers created a questionnaire that enabled the information to be gathered in a statistical fashion which would highlight specific matters, which will be discussed along the thesis.

3. Interviews

People on all levels of the organization that are either directly or indirectly involved with the Patent Process have been interviewed with the purpose of gaining an overall and representative picture as well as being able to identify the crucial steps to enable that transformation from a research institute to a research company with process patents as well as the difficulties and challenges faced.

Other people have been interviewed outside of the case study organization. They were interviewed either for their knowledge of the pulp and paper industry and its challenges, their experience of a functional and successful patent process within research institutes and/or research companies, and their knowledge and experience with process patents.

4. History of pulp and paper institute in Sweden²

The purpose of this section is to provide a historical overview of the pulp and paper institute in Sweden and the historical background leading to its status in the industry and university worlds. By identifying the historical reasons behind an institute's funding and collaboration with industry and university actors,

² Rydberg, Papper i perspektiv.

it will help the reader to understand the importance of the transformation from a research institute to a research company.

During the first decades of the 20th Century in Sweden, there was no governmental involvement or support for research. Therefore, it was the Cellulose Association, the Paper Mill Association and the Pulp Association, consisting of companies in the sectors, which pushed for the creation of an institution with a professorship for cellulose technology and wood chemistry. With the help of donations, the professorship was instituted in 1927, followed by an institution in 1931 at Tekniska Högskolan in Stockholm. The salary for the professorship was funded by the state and the associations paid for the office space and central laboratories. This support enabled the progress towards new research and development in the sector.

The first significant step towards a collective research organization was taken in 1942 when the government and the industrial actors decided to establish a central forest industrial research institute. The state and the industry became stakeholders by funding the institute together, which was an incentive to ensure that the institute functioned optimally. The purpose of the institute, called Svenska Träforskningsinstitutet (STFI) Swedish Wood Research Institute, was to do research within the technical-scientific area of forest products, the features of such products and methods to enhance and use these in the best way.

The institute started its practice in 1946; the research was divided into five departments to cover all branches of the pulp and paper industry; wood chemistry, paper technology, general analysis, microbiology and bio chemistry and wood technology.

In the middle of the 1960's, STFI received almost 1MSEK in funding per year. Approximately one third was state funding and the rest was from the industry. At the end of the same decade, the total turnover of the institute was almost 10MSEK from contract work and increased funding. However this raise in funding showed the greater interest from the industry and the state for the research results generated at by institute.

The collaboration with universities, especially KTH was close during this period. KTH had professors in cellulose, paper technology and specialized teachers in wood chemistry, which had specific knowledge that benefited the projects at STFI. In comparison with research heavy sectors such as the pharmaceutical industry and electronics industry, the total research done in the forest industry during the 60's was very modest. This could be explained by the number of larger actors in the sector, making more efficient research in large scale on single processes or products, but also by the long establishment of the industry having already functioning processes to manufacture.

During the 70's, much of the of research within STFI was focused on finding processes for more efficient usage of the wood commodities as well as reducing waste in the manufacturing process as it was feared that the Swedish wood commodity supply would run out.

The funding during the 70's continued to increase and the contract work was brought in one third of the turnover of the institute (45MSEK). The industry was funding more than half of the remaining 30MSEK and the state funded the rest.

The three year programs done at STFI, helped to identify eleven different research areas. The programs involved several actors and were covering most of the pulp and paper sector. The different areas were e.g. grounding of pulp, environmental friendly bleach processes, monitoring system for processes and development of the quality of the commodity, both energy saving processes and fiber stint.

The first three year program in the 1980's had approximately the same set-up as the previous ones, for which the total funding was estimated at 134MSEK. The increase in funding was huge compared to the previous decade, i.e. due to the increased interest from the industry to do collaborative research instead of conducting in-house research. In the early 80's, the preconditions for the institutes in Sweden were changed drastically. The government, who had funded up to half the total amount received by the institute, decided to concentrate several areas of the basic research to the universities, leaving the institutes to concentrate on more specialized research areas instead³. Consequently, the funding was cut considerably. The total funding for the institutes, from 1982 to 2005, was reduced by more than half (100MSEK to less than 50MSEK). This led the institute to change its vision and become more business orientated so that the institute could find the funding for projects without the support from the government, and resulting in the financial preconditions being a little more insecure than before. With this change the industry, which was funding most of the research, became more influential on the research performed. At the same time, the collaborations with universities continued, giving STFI access to basic research results through cooperative projects with e.g. KTH.

With Sweden's membership in the European Union in 1995, the possibilities of conducting research within the EU expanded. The exploratory work conducted often is collaborations with external industrial actors and universities and can be quite extensive.⁴

In 1997 the research institute became limited company, following the decision from the Committee for the Reconstruction of Research Institutes. The newly funded company STFI AB was partly owned by industry partners, STFI association and the governmental funding company IRECO AB (now RISE AB) who owned 29%.⁵

The company becoming limited was the second step in this transformation from research institute to research company. From this point onwards, the board became responsible for the direction of research, budgeting, and identifying and implementing the last steps for this transformation to be finalized. These last steps are the subject of this thesis.

³ FOSAM investigation

⁴ Case study, Interview with president of Innventia

⁵ Case study, Information from Innventia

In 2003, STFI merged with Packforsk, which is a packaging research company. The ownership structure then changed; IRECO owned 29%, the STFI association 10%, the Packforsk Association 10% and the rest, 51% was owned by the industry.

In 2009 the STFI-Packforsk changed its name to Innventia.

5. The necessity for Patent Process

The overall purpose of this section is to present the knowledge and information that we have used for this investigation and analysis, which is also used as the basis for all our recommendations.

Firstly, we describe and discuss the purpose of patents and the effect these can have on innovation and research and development in a company. The second aim of this section is to describe these patents within the scope of the Swedish law to fully understand how these can be used. Thirdly, we will discuss and analyze the advantages and risks of the patents and the implications for a company as well as the necessity for processes to optimize the use of these rights.

5.1 Patent Rights

The main objective of patents is to stimulate the technological process. This is done with three incentives -competitive advantage, technology diffusion and financial motivation- that all originate from the exclusive right to exclude others which is granted to patent owners⁶.

5.2 Competitive advantage

The right to exclude others often, but not solely, is accompanied with the right to include others, and thereby actively share access rights to interested parties. By not protecting an invention, the attraction of it declines, since the technology may be obtained anyway. However, with the right to exclude others from having access to a technology and the right to give access to a technology, the patent holder has a competitive advantage that will enhance his value proposition towards potential stakeholders. Therefore it naturally follows that access to a technology has a value and may be traded.

5.3 Technology diffusion

Technology diffusion is the act of “diffusing” technology, which means that the technology is spread and being utilized by many entities for various purposes.

As mentioned above, by granting or denying access, a proprietary technology gains value and becomes sought after for its competitive advantage. Thanks to this competitive advantage, a technology will be utilized and therefore may be diffused. On the other hand, it may be the case that technologies that are not proprietary, however ingenious they may be, are left unexploited.

5.4 Financial motivation

It is most often the case that an inventor will seek patent protection for a technology that is not yet ready for industrial application and therefore requires much more research and development for it to reach the market. This research and development can be an extremely expensive and timely step. The

⁶ Ove Granstrand, *The Economics and Management of Intellectual Property*, p. 83-85

patent application, which is not a guarantee for a granted patent, however acts as a strong value proposition towards investors and is often a financial enabler for further research and development.

The above three incentives show that whilst patents grant the right to exclude others they also render a technology more attractive and enhance the chances of that technology reaching the market by giving it a competitive advantage, leading to funding possibilities and finally technology diffusion.

5.5 Patent Definition

5.5.1 Patentability requirements

In order for a technology to be patentable, it has to fulfill three criteria; if these criteria are fulfilled, the patent is granted. The three patentability requirements are novelty, industrial application and inventive step⁷.

- The novelty requirement means that the invention must be new in relation to what was known before the filing date of the patent application.
- The inventive step requirement means that the invention is non-obvious to a person skilled in the art in relation to the state of the art.
- The industrial application requirement means that a patent will only be granted if the invention is susceptible of being made or used in some kind of industry.

An approved patent will grant the owner/assignee a right, in the countries where the patent has been approved, to exclude others from using, offering for sale, importing or selling the invention as it is claimed in the patent⁸.

5.6 Patenting vs. publication discussion

There has been a long standing debate between the incentives to patent an idea and the incentives to publish an idea, which is a debate on proprietary technology and public knowledge. This is particularly true in research and development in institutes, where funding was public and the entities traditionally were reluctant to proprietary knowledge. But this is a changing paradigm, going into the knowledge economy, where the trend is to make knowledge proprietary, create and extract value.

To fulfill the novelty requirement, a patent application must be filed prior to any publication that would embody prior art. Once the patent application has been filed, it will automatically become published either on the date of granting of patent or 18 months after application date or priority if claimed⁹. The applicant could also get the application published in advance if requested¹⁰. In rare cases, the applicant may demand that part of the application remains confidential¹¹. Patenting and publishing are not mutually exclusive actions but are restricted in time. Patenting does not exclude publishing but only postpones it until the patent application has been filed.

⁷ Swedish Patent Act. Article 1-2

⁸ Ibid. Article 3

⁹ Ibid, Article 22

¹⁰ Swedish Patent Act, Article 22 paragraph 3

¹¹ Ibid, paragraph 5

By patenting an invention, the inventor claims the exclusive right to exclude others from using, offering for sale, importing or selling his inventions. Due to the legislation of patents, the patent application will become disclosed to the public domain 18 months after priority date. On the other hand, if an inventor publishes his invention, he puts his knowledge into the public domain and therefore agrees to share his invention in an unrestrictive fashion. So the main difference between patenting and publishing is the access to an invention.

In both cases, whether an inventor chooses to patent or publish his invention, the invention will most likely undergo more research, which is mostly the case for inventions that will be patented as those have more potential for value extraction and more resources can be assigned for their development. The invention will be developed further until improvements are reached. At this point, neither the patent application nor the publication holds the latest improvements to the invention. Therefore these latest improvements are trade secrets and even though the core of the invention has either been disclosed through patent publication or simple publication, the most valuable improvements are trade secrets, since they are not disclosed in the publication. In both cases, the publication is a marketing tool for the improvements of the invention and access is restricted with secrecy.

5.6.1 Risks and Advantages of patents

The advantages of patents are portrayed in the incentives to patent, discussed above, and are competitive advantage, technology diffusion and financial motivation. A patent owner, whose invention is sought after, is in a strong leveraging position and has a competitive advantage. This means that he controls the market surrounding his technology and can dictate access to his invention to strategic actors. The more his invention is being used and therefore exposed, the more credit the patent owner will receive and the stronger brand he will create. As a result, the patent owner can extract more value from his patent thanks to the extended usage of the invention and the strong bargaining position the patent owner is in.

Patents grant the inventor or assignee with a legal right to exclude others. In most cases, these right results in the owner also having the right to grant access to his invention, however this is not always the case. For example, if a patent is dependent on another patent, then the patent owner cannot grant access to his patent without the approval of the main patent owner and his invention may only be used when using the main invention from the main patent. In addition, an invention can be prohibited from use by national laws such as consumer law or marketing law, in cases where an invention only has negative effects on health and security.

Patents are very expensive to create, apply for and upkeep. There are four types of costs which vary from country to country and are multiplied by the amount of countries where patent protection is wanted¹². Firstly, the national and/or regional application fees and granting fees, patent agent fees for drafting the patent and as a representative when applying outside own country, translation cost for patent application, and the renewal fees for the patent or patent application¹³.

¹² Guriqbal; *Managing patent costs: An Overview*

¹³ The latest application fees are found on respective Patent and Trademark offices' website. Sweden: www.prv.se

Patents are commonly traded and therefore a source of value, resulting in patents being the cause of conflicts¹⁴. Conflicts can arise for example on the validity of patents or ownership issues. This means that many patents are challenged; this can be handled either through negotiations or in court, which is extremely expensive and outcomes are highly unpredictable. Therefore a patent owner must be aware and prepared for the potential side costs that patents demand to upkeep protection. Another unpredictable cost for patents are infringement cases, where resources are required to either prove or counter-prove infringement. A frequent response to infringement accusation is that the accused party will try to invalidate the patent causing the court to investigate the validation of the patent and if the result is positive, they will then investigate the infringement accusation.

5.6.2 Risks and Advantages of publications

Publishing is as expensive and timely as the inventor wishes it to be. Publications can be made through a simple post on a blog, a full article in a specialized paper, or a conference and more. The publication may be anywhere and in any language.

By publishing an invention, the novelty criterion for that invention is destroyed and no one else can seek patent protection for it. Publishing can therefore also be a defensive move, either for an inventor or company who either wants to destroy novelty for their competitors or to ensure that they are recognized as the inventors for a particular idea. Especially within the researcher's world, this kind of recognition has been important for a long time.

So whilst publishing is generally perceived as a passive action, it can in fact be utilized as a very aggressive strategy of claiming inventor-ship and blocking others from patenting, whilst not blocking access to an invention. Publication is a form of credit in the R&D industry and strengthens the brand of a company and the recognition of the inventor.

5.7 Publication vs. secrecy discussion

Trade secrets, unlike patents, will protect any form of confidential information that has business value¹⁵.

The cost of a trade secret depends on the measures taken to protect the secret. Such investments can be the usage of legal tools e.g. contracts, management tools, e.g. secrecy policy and technology tools, e.g. encryption.

A trade secret can be protected as such only for the duration of the time it is kept a secret. If the secret becomes publicly known e.g. through publication or patent application, the protection right of the secret is lost. The value of the previously secret information is thereby diminished.

Requirements¹⁶ for trade secret to gain protection rights:

- Gain commercial value through its secrecy
- The trade secret material must be kept secret
- The owner of the trade secret must show that he has actively kept the information secret

¹⁴ Ulf Petrusson, *Intellectual Property & Entrepreneurship* - p.22 p. 152

¹⁵ Swedish Act on the Protection of Trade Secrets, article 1.

¹⁶ Trade-Related Aspects of Intellectual Property Rights Agreement article 39

5.7.1 Risks and advantages of trade secrets and publications

The advantage of trade secrets is the low cost in comparison with patents, especially if no legal pursuits are undertaken and for the competitive advantage it provides through the tradable knowledge. It can also provide a considerably longer protection time than a patent, since it is not publicly known.

Trade secrets in comparison to publication, which is either achieved through a patent application that becomes public or through a standard publication, give the advantage that trade secrets do not become public knowledge. This way, the information of technology advancement does not get into the hands of competitors or does not guide them into any particular research direction. Often, especially for processes, it is *fairly* easy to invent around once the technology is understood. With a trade secret, no relevant information on the invention would be disclosed to enable a third party to invent around.

Trade secret is a weak form of protection if infringement occurs, because of the little leverage they have in court. In such a case, the trade secret owner would have to prove that a third party has gained knowledge of the trade secret unfairly and/or prove that the owner did not take the necessary measures to protect his secret, which the owner has to prove in court or arbitration. The outcome of a court case or arbitration is highly unpredictable. Even if the owner wins; the trade secret could have become publicly known and thereby lost.

Another downside of trade secrets is the difficulty to ensure secrecy and the potential costs necessary to optimize that secrecy. However, procedures may not be sufficient, as the knowledge of the invention is carried by the employees. Contracts, NDAs and secrecy policies may influence their actions but will not control them and do not provide a guarantee against leakage. A good example of a company that has succeeded in keeping their invention secret is Coca Cola who have separated the knowhow of recipe and the manufacturing process among a few holders. The holders only hold one part of the recipe. This strategy has resulted in the secret being kept for over a 100 years¹⁷.

The risk of course is that if a third party comes across the trade secret by himself and chooses to patent, then the original owner of the trade secret loses his rights. If he can prove that he has been commercially using this invention prior to the date of the third party's patent application, then he will have the right to continue exploiting the trade secret in the same manner as discussed in the prior use article of the Swedish Act¹⁸. The owner of the trade secret may obtain a compulsory license¹⁹. If the third party chooses to publish instead of patenting, the original owner of the trade secret loses his right since there is no compulsory license available for this situation,

Another risk of trade secrets is that the owner can only prevent a third party from using his trade secret if the third party has come across the trade secret unappropriately²⁰. On the other-hand, a third party may come across the invention by reverse-engineering the trade secret, which he has the right to do. Therefore, it is not sufficient to render an invention secret through trade secret if it is deemed that reverse-engineering is feasible. In such cases, the inventor should seek other forms and methods of

¹⁷ Howard M. Eisenberg, *Patent Law you can use™ Patents vs. Trade Secrets*

¹⁸ Swedish Patent Act, Article 4, paragraph 5

¹⁹ Patent Swedish act, Article 48

²⁰ Daizadeh, *A general approach for determining when to patent, publish or protect information as a trade secret.*

protection for his invention. It is not only the feasibility to reverse engineer that must be considered, but also the amount of resources required for such actions with regards to time and costs. In some cases, it may be more interesting for a third party to negotiate a license of a particular technology that is protected by trade secret.

The choice of whether to patent or keep secret an invention might be guided with the use of the invention. For example, there are some administrations that will require full disclosure of a product before it reaches the market; such examples are the FDA for drugs. In such cases, trade secrets are not viable and patenting becomes the obvious choice. On the other hand, it is most suitable to use trade secrets when for example it would require much resources for a third party to reverse engineer or to invent around on invention.

5.8 Hybrid alternatives

One could finally consider a hybrid of the entire alternative mentioned above from patenting to trade secret and publishing²¹. This alternative is most suitable for license agreements where the complementary know-how, that is trade secret would be licensed either alone to complement a publication, or together with a patent to complement that one.

5.9 Patent rights in a company

5.9.1 Purpose of Patent rights and trade secrets

As shown above, there exists multiple ways to protect, claim or disclose an invention and more methods to stop others from using such invention. A summary of these is shown in this table.

	Application necessity	Protection	Fees	Publish	Secrecy
Patent	Yes	Yes, 20 years	High	Yes, after 18months	In rare cases
Trade-secret	No	Yes, though weak in court – dependant on actions taking to ensure secrecy	None	No	Yes
Publication	No	No	None	Yes	Yes, can disclose as much as wanted

Figure 1

In conclusion, a patent will give the owner the right to prevent others from utilizing his invention. As discussed in the incentives of patents, they promote technology diffusion thanks to the value an invention gains from its protection. So for a research company, for whom the main object of trade is its

²¹ Karl F. Jorda, *Trade Secrets and Trade secret Licensing*

inventions –, it becomes essential that these inventions are proprietary in order for them to be traded and their ownership to be un-jeopardized. When an invention is proprietary, it has a bargaining leverage that the same unprotected invention does not have and will therefore increase its market value.

5.9.2 Purpose of Patent Processes

It is now clear that patents are a necessity for a research company for whom the main revenue is generated by the trading of their results. This will be further discussed in Chapter 3 (Research Institute vs. Research Company)

Also, as seen above, there are various ways of protecting an invention though all are not appropriate or optimal in all cases. It therefore becomes important to evaluate the optimal and most appropriate protection method for each invention. This requires for a structure to evaluate these inventions on standard criteria by a chosen team. The patent process and criteria are further discussed in Chapter 3 (The Patent Process).

Chapter 3 Investigation and analysis

To be able to understand how this transformation is to be done, one must look at the intellectual assets available within the institute. The institute has traditionally produced research results which have then been published for the purpose of gaining recognition in the research community. When the institute started patenting the foundation of patents where process patents, since this is and historically has been focused on process research. Process patents will therefore represent the intellectual assets foundation for the institute in the transformation process.

To reach the goal of the transformation, the focus of this investigation should lie on how the institute could utilize these intellectual assets. In the company setting, these intellectual assets have to be able to convert into tools for accomplishment of the business strategy. The steps for enabling the institute to fully exploit its process patents and use these intellectual assets to be able to transform into the structure of a company are to have a good working patent process and patent strategy and align these to the business strategy.

1. Research Institute vs. Research Company

Historically, research institute and research companies held considerable difference. However, these differences have lessened in recent years as institutes are little funded by the government and have become limited companies. They have to respond to a board of directors and must obtain the funds necessary themselves to perform research. As discussed in the historical overview, this transformation is not complete yet.

This section will discuss the current differences between a research institute and a research company. The differences between the entities will be evaluated on four criteria; funding, patenting, role on market and responsibility towards stakeholders. These criteria are not exhaustive, but were chosen to demonstrate the differences for the reader in an easy comprehensive way.

1.1 Research Institute

1.1.1 Funding

The funding of a research institute has been partly governmental and partly industrial²². In most cases, the governmental funding was unconditional and the institute had the liberty of using this money where they saw fit. The industrial funding was conditional in the sense that the funds were allocated to specific research programs that each had specific tasks.

Today, the governmental funding has more strings attached to it. The SK-funding (SK-medel), which corresponds to 15% of the total budget of the institute, is received on a yearly basis and restricted to financing the implementation of strategic processes and policies and to promote collaborations with other actors within the research area and to strengthen the institute's position internationally.²³

²² Cross-reference 2.4 History of pulp and paper institute in Sweden

²³ RISE conditions for SK-funding, source Innventia.

1.1.2 Patenting

In the past, institutes have had the same approach to publishing results as universities and seen it as the ultimate recognition in the research world²⁴. Institutes started patenting in the late 70's and early 80's, but it was not a central focus and yielded limited revenues in the form of royalties²⁵. Today, institutes have numerous incentives to patent which are not purely financial and can be demanded by the industry partners, required for freedom to operate, or essential as a marketing tool for further funding and a leveraging tool in negotiations for future projects.

1.1.3 Role on market

The underlying motive for conducting research differs from a research institute to a research company. As discussed further, the main objectives for a limited company are profit and stakeholders' satisfaction. Strictly speaking, an institute has a more open role and the results of its research should be beneficial for the industry as a whole, which is a goal mentioned by RISE²⁶. The three year research programs are opened to all interested industrial actors. The close collaboration with universities also has the foundation in the societal good of access to the research, which from a historical perspective is the same goal as the institute²⁷. The collaboration allows the institute access to the basic research done at the university through collaborative projects, which then could work as foundation for the institute in future research²⁸. This in turn attracts industrial actors, due to the large technology base within the institute.

The institute also has to create the brand of a quality stamp, meaning that they establish itself on the market as a producer of high quality research. This will benefit all industry partners which can use the institute brand in commercializing their products.

1.1.4 Responsibility towards stakeholders

The goals of the institute are a reflection of the stakeholders' vision for the institute. The stakeholders would be the government, the industrial partners, and indirectly the society. The industrial partners have normally a lot to say about the research direction and the responsibility towards them would be to construct research programs that are in line with these suggestions²⁹. The responsibility also includes producing the research result that the industry is seeking when possible. From a governmental aspect the institute has the responsibility to maintain a high quality of their research to promote Sweden as a strong actor in the pulp and paper worldwide³⁰. The research conducted at the institute should, in the end, translate into societal benefit.

²⁴ Cf Chapter 2. The necessity for patent process

²⁵ Case study Innventia, interview with IPR responsible

²⁶ Ibid. 6

²⁷ Cross-reference 2.4 History of Pulp and Paper institute in Sweden

²⁸ http://www.ireco.se/irecogruppern_fs.asp, website last visited 20090525

²⁹ Case study Innventia, interview with manager of research group

³⁰ RISE conditions for funding, source Innventia

1.2 Research Company

1.2.1 Funding

A research company is a company whose business model is to provide services by the hour, to sell or license on the results of their research, and to organize collaboration research with industry actors. Alternative and perhaps more ad-hoc business models are to create spin offs of innovations or the selling of products. The goal of the company is to make a profit and to give dividends to its shareholders.

1.2.2 Patenting

A company can take advantage of the leverage created by the protection from a patent by patenting research results³¹. Companies patent processes to prevent copying and to block others as main reasons.³² For a research company whose core business is licensing out technology, the patent facilitates that business model. For optimal results, patenting strategies are used to increase the value proposition from a simple patent license to a complex innovation license that includes surrounding know-how and trade secrets. Patent are not just the source of direct revenue through royalties but contribute to the creation of a strong brand within the industry.

1.2.3 Role on market

A research company is dependent on the technology base within the company³³. This is the foundation for what position the company will have on the market. The research done is often specific and closer to market than that made by an institute³⁴. Research companies can also be involved as a partner in exploratory research i.e. to expand their technology base. Since profit is the primary goal for a research company, research can be dependent on the potential return on investment. Contract work, which is closer to the market and possibly paid by the hour, is a more secure source of income than an exploratory project, which requires investment in advance with an insecure result outcome. Due to the teacher's exemption, the collaborations with universities are not as common as for institute, but they do occur.

The company working with contract work has a higher pressure of producing research results and new inventions to provide its customers with. The research has to maintain high quality and be focused on getting the invention out on the market.

The technology base is the basis for the company to create a competitive edge and establish itself on the market. This is also the foundation for the brand of the company. To get recognition of being a high-quality research company is important to different the company from its competitors. Another way of branding the company is to possess technology knowledge in a new and forthcoming research area.

1.2.4 Responsibility towards stakeholders

The primary stakeholders of a research company are its shareholders, whose expectations are the generation of profit and dividends. The shareholders appoint the board of directors who, in turn, will

³¹ Petrusson, Intellectual Property and Entrepreneurship, p.

³² Grant, Contemporary strategy analysis, p.338

³³ Cross-reference to 3.1.2.5.1.

³⁴ Case study, interview with vice president at Innventia.

decide upon the goals and visions of the research company. These goals and visions should reflect the profit and dividends expectations from the shareholders. This highlights that, inevitably, a research company's primary focus is profit and not research results, though these are the sources of the profit.

1.2.5 Reasons for a research institute to become a research company

The aim of this thesis is to investigate the transformation from a research institute to research company using process patents, patent process and patent strategy as the main tools for this transformation.

The focus of this transformation is not an external transformation, where the institute would lose its status as an institute, but a transformation of the internal structure. The structural change is focused on the patent process and the patent strategy. The status of being an institute is given by the state and even if the institute would like to, it is not up to them to choose to not be an institute any more.

The goal of this discussion is to find the different steps needed to be able to change the internal process from that of an institute to that of a company. Leaving the industrial economy and moving into the knowledge economy, it is impossible for institutes and companies to conduct research and business in the same way as before. The pressure from the market to protect results has influenced and created a need for this transformation.

For exploratory collaboration projects, where some of the funding is governmental such as EU-project or Vinnova-projects, the status of an institute could facilitate and increase funding. The reason behind this status influence is the corresponding goals of an institute versus those of a company, where the institute goal includes the necessity to benefit the industry whilst the company goal is primarily profit orientated.³⁵

The current financial crisis has further complicated the situation for the institute, and research companies. With an economy in recession and no money being available, it has become increasingly difficult for institutes to secure funding for research projects and for companies to obtain license deals. The three year programs at the institute are funded by the partner companies and in exchange they would get royalty-free licenses to the results within the program. This is not the traditional way of handling licenses in collaboration projects; there is often a royalty rate on the licenses given out. The model used means that the institute is heavily dependent on industry funding and the license revenues are very low, making the situation for the future research somewhat unpredictable. A research company is probably in a better position, since the already existing license deal will generate revenues, hopefully enough to survive when the market goes down temporarily. The institute still has to rely on funding coming in before starting research projects. The governmental funding has also decreased a bit, but the exploratory research will probably increase and the industrial research in the research program decrease until the market has stabilized again.

A research institute has historically not had to use process patents as intellectual assets to create revenue. Process patents have been used as marketing tools or to create freedom to operate in research areas which have been of interest to the institute. However, as described above, the harder financial

³⁵ Interview with Gunnar Svedberg, President of Innventia

climate and the changes within the industry, to be able to survive the institute has to be able to transform and utilize these intellectual assets in a new way. To internally transform into a research company means that they have to be able to extract more value from the assets they possess, process patents, to create stable revenue streams that are not entirely dependent on the market. To get revenues from patent licenses creates a long time commitment from the partners, stabilizing the income foreseen for several years.

In consideration of the financial situation, both companies and institute should focus on expanding their network in waiting of a better financial climate. This is best done through an open innovation platform in the pulp and paper industry³⁶.

1.2.5.1 Technology base of the company

This model is taken from the book “The Economics and Management of Intellectual Property”, written by Ove Granstrand. The purpose is to describe and visualize the process of acquiring the knowledge needed and the different ways of exploiting that knowledge. On the left side are examples of how the company can acquire knowledge and on the right side how these can be exploited commercially.

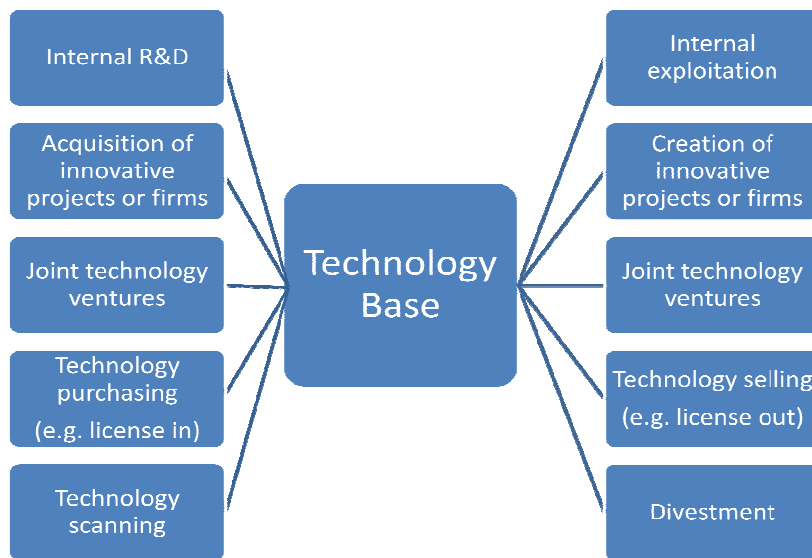


Figure 2

The success of a company is dependent on its ability to develop and take care of their technology base. By foreseeing what kind of knowledge is needed and acquiring it as well as have the ability to utilize the knowledge in the best way, the company will get an important competing advantage on the market³⁷.

A research company within the pulp and paper sector needs knowledge within that sector, making this knowledge the most important component of their technology base. To be able to maintain the

³⁶ Seminar at Inventionia with Henry Chesborough, author of Open Innovation

³⁷ Granstrand, The Economics and Management of Intellectual Property, p. 120

advantage created by the component, the company has to “re-fill” the technology base with new knowledge. The first step would be to look internally and review the knowledge that exists and closely monitor the improvements made to it as well as acknowledging of new inventions, which will built upon the existing technology base. This is the foundation for what the company can achieve.

When the knowledge within the company is not sufficient to fill the technology base needed, the company has to look externally to obtain that knowledge. This can be done through different strategic decisions such as acquisition, mergers, joint ventures, in-licensing etc. The foundation for obtaining external knowledge is a contractual relationship³⁸.

In addition to the main component, other competences are needed to get the innovation from research to market, such as marketing competence. If the institute does not possess this competence itself, external competence can be hired or in applicable cases, internal competence within the joint venture, collaboration etc. can be used for this purpose.

A research company has to combine having a strong technology base and interesting patents with finding the right collaboration partners to be able to commercialize the innovation and bring it to the market.

1.2.5.1.1 Transformation process application

By reviewing and exploiting all knowledge that can be collected from within research projects, in-licensing and other internal knowledge to create a strong technology base is the first step of the transformation process. It is important to be able to look inside and outside of the institute to find the resources available. To have the ability to utilize all these resources to strengthen the technology base will help in the transformation phase. However, if the transformation phase is to be successful, the technology base has to be fully exploited. As stated above, it is not a necessity for the institute to do this by itself, but it is a necessity to be able to identify the actors and resources needed to fulfill this exploitation. A well-functioning patent strategy and patent process is necessary features for the exploitation.

³⁸ Granstrand, *The Economics and Management of Intellectual Property*, p. 120

1.3 Key take-outs

The differences between a research institute and a research company have here been divided into four difference categories.

Research Institute

- **Funding;** state and industry funding.
- **Role on the market;** international research, benefiting industry and society
- **Patenting;** Protection is sought due to industry partner demand, FTO or for marketing purposes.
- **Responsibility towards stakeholders;** result results to industrial partners, establish itself as innovative partner and benefiting society

Research Company

- **Funding;** revenue from contract work and other research projects
- **Role on the market;** producing results, creating a strong brand.
- **Patenting;** market demand, creating competitive edge
- **Responsibility towards stakeholders;** Profit and dividends to shareholders.

Figure 3

The funding of the difference entities are different, the research institute in pulp and paper gets funding from the state and the industry, often in advance of a project starting³⁹. The licenses given out to the result of a project is royalty-free, making the institute dependent on funding before project, since the revenue stream afterwards is very low. The funding of a company can be done in several different ways, but either selling consultancy hours or licensing out results for royalties can be the business model used.

A company's role on the market is to create a position due to competitive edge in comparison with its competitors, e.g. quality of research, speed or price. An institute also have to be seen in their competition, to be chosen by the industrial partners, but their role is also to see to that the research will be beneficial for the industry and the society as a whole.

Research companies have been patenting for a long time, due to the need of competitive edge but also to in a good way be able to package their innovation towards their licensees. Historically, institutes have been publishing result as a recognition action in the more academic world. Recently this has changed when the institute has gotten demands from industry partners as well as starting to use patents as the quality stamp of the research done.

³⁹ Case Study: Interview with legal representative at Vinnova

The stakeholders of a company, mainly the shareholders, are interested in profit of the company, leading to dividends for the shareholders. The stakeholders of a research institute have other goals, such as creating a strong brand for Swedish forest research and a quality stamp for the industry partners using the result of the institute.

2. Process patents in the Pulp and Paper industry for a company

Process patents are prominent in older industries such as the pulp and paper industry or petroleum refining, where research has been on-going for many decades and innovations tend to be incremental improvements rather than break-through products or materials as in newer industries such as biotechnology or information technology. The reason for this prominence in process patents is that these older industries are centered on manufacturing and over the decades, the high focus is on reducing the manufacturing costs, mostly achieved with improvement process technologies as seen in Chapter 2 (History of Pulp and Paper Institute in Sweden)⁴⁰.

In manufacturing industries such as the pulp and paper industry, the production is one of the most crucial and expensive areas of the industry and costs must be minimized as much as possible. Therefore the research in these manufacturing industries is mostly focused on reducing the costs of production either by using alternative products or making the production process more efficient.

Quoting August Giebelhaus and Dr. Usselman on Pulp and Paper R&D: “Most observers have seen the industry as being dominated by incremental improvements in process”⁴¹. Dr Usselman is a specialist in the pulp and paper industry and has been conducting research on the technology development and this industry going as far back as the 1920’s.

In most cases, the production line technologies are fairly established and have been used for some decades. Innovations in this area are not for the whole production line but rather for a small part of the production line. Therefore the process innovations are complementary to existing technologies. In the pulp and paper industry, most of the process technologies have been used for more than 20 years and their patent protection if ever existent has therefore expired⁴².

2.1 Claim writing

Patents and the claims in particular are difficult to write qualitatively and only a low proportion of applications are granted⁴³. For example, between 2000 and 2004⁴⁴, the PRV granted 45-50% of the patent application. The statistics for 2005-2008 are not yet compiled but the expectancy from the PRV is

⁴⁰ Whiteman, Recent trends and developments in global markets for pulp and paper

⁴¹ Final Report for CPBIS Research Project, “Policy, Organization, and Innovation in American Pulp and Paper since 1914: Historical Perspectives on Contemporary Problems”

⁴² Case Study Innventia: Interview with a researcher in pulp and paper who has 10 years of experience in pulp and paper industry

⁴³ Statistics obtained from the PRV.

⁴⁴ Only using the statistics from 2000 to 2004, since the statistics after 2004 do not represent the allowance rate from Sweden since many of the patents filed in these years have still to be approved or rejected.

that the rate will be rather consistent. This is a fairly low rate in comparison to the USPTO allowance rate of 60% in 2006⁴⁵.

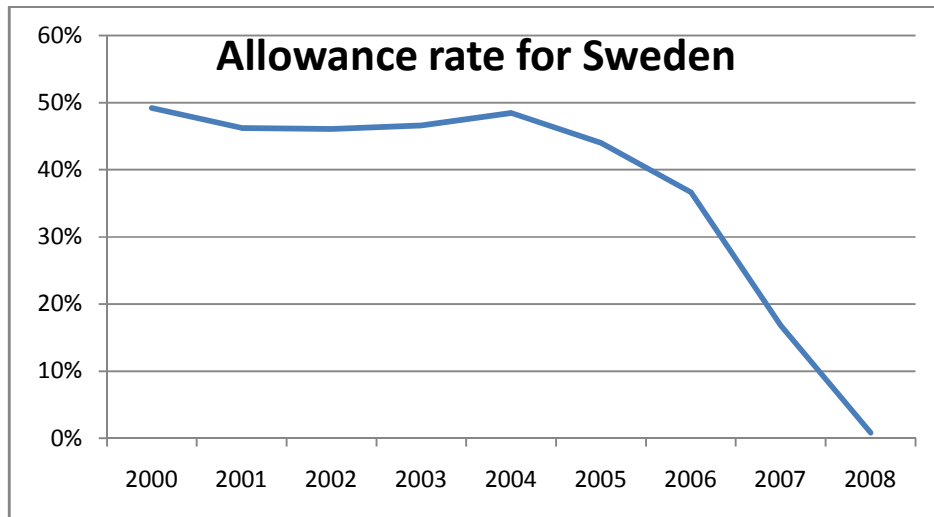


Figure 4: Patent allowance rate, PRV

The allowance rate in the US has been decreasing in the past 4 years. A USPTO spokesman has explained that the decrease of “the allowance rate is a function of many aspects, including the quality of the application received”. The main “quality” problems referred to are primarily with regards to the patent requirements -novelty, inventive step and industrial application- which are not fulfilled⁴⁶.

As reflected on the low allowance rate, the writing of the patent in consideration of the patentability criteria is critical and an increased challenge for process patents where the inventive step is an incremental improvement. The claims of a patent are the part of the patent that will set the scope of protection of the patent and are also most often the cause for patent application rejections⁴⁷. There are many ways to write a patent, which allows for different tricks resulting in enhanced scopes of protection and stronger claims. Therefore it is recommended that patent agents help with the claim writing to minimize such risks.

Infringement of patents is dependent on the claim interpretation. For that reason, claims must be drafted with much care to facilitate the interpretation intended and avoid confusing and jeopardizing interpretations.

Interviews with patent agents revealed their strategy for writing process patents in the pulp and paper industry, which are to broaden the patent scope as much as possible, to “productify” the process patents

⁴⁵ USPTO article: “Fiscal Year 2006: A Record-Breaking Year for the USPTO Patent and trademark quality best on record in over 20 years “.

⁴⁶ OECD statistics of US allowance rate. The writers have not been able to obtain older statistics than 2000 for Sweden, however it is believed that the US allowance rate trends is reflection of the international rate.

⁴⁷ Other reasons are, though less frequent, lack of clarity in the description or the patentability requirements that are not fulfilled.

and to claim as many applications as possible⁴⁸⁴⁹. Embodiment of these strategies in patents is discussed below.

2.2 Claim terms for process patents

Claim writing requires particular skills and experience mastered by e.g. patent agents. There are many techniques that can be used to manipulate claims and strategize the scope of protection. Furthermore, terms and formulation vary according to Patent and Trademark Offices (PTOs) which have national preferences. Patent agents are specifically qualified in that field, and their services should be utilized when writing claims. The general patent terms apply to process patents, and we have found no information regarding specific terms for process claims, besides the usual vocabulary relevant to a process technology⁵⁰.

2.3 Independent and dependent claims

2.3.1 Independent claim

An independent claim is one that does not refer to any preceding or following claims and therefore stands on its own. The independent claim is broad and introduces the essential elements of the process and how these elements inter-relate.

2.3.2 Dependent claim

A dependant claim is one that refers back to another claim, which can be either independent or dependent. A dependent claim adds a single new element to the referred claim or claims; therefore dependant claims are more specific than independent claims. The purpose of a dependent claim is to ensure that a more specific version of the claim survives if the broader independent claim on which it is based was found to be invalid.

To execute the strategy of having as broad a patent as possible further described in Chapter 3 (The Patent Strategy), the patent agent will use dependant claims⁵¹. By using these, the patent's scope is extended to all the specification stated in these dependent claims.

2.4 The TRIPs Agreement's support for process patents

The agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs) is one of the agreements under the World Trade Organization (WTO), which are mandatory for WTO members to sign. The purpose of the agreement is to establish a uniform framework of regulations for intellectual property rights. The agreement contains regulations on patents, their enforcement and resolution procedures. Sweden ratified the agreement in 1996⁵². The purpose of the TRIPs agreement is to harmonize the intellectual property rights among the member states and facilitate international trade using these rights. The regulations stated are minimum requirements that the member states have to fulfill, but they

⁴⁸ "Productify" is an expression used by the patent agents we have interviewed

⁴⁹ Disclaimer: all of these strategies are used where and when appropriate, based on case by case situations

⁵⁰ Case study Innventia: Interview with Patent Agent

⁵¹ Case study Innventia: Interview with Patent Agent

⁵² http://www.riksdagen.se/Webbnav/index.aspx?nid=37&dok_id=GS01LU27

also have the possibility, on a national level, to extend that protection. Currently the agreement has approximately 150 member states and including the European Community.

2.4.1 Process patent

The TRIPs agreement contains articles dedicated to patents, and article 34 is directed to process patents. This article gives the process patent holder the same rights to block others as a product patent holder i.e. preventing third parties from using, selling, offering for sale or importing the patented technology or products created by the use of such technology.

However, due to the inherent character of a process patent, it is especially difficult to enforce such patent rights. Process patents claim a process to achieve e.g. a particular product and are very hard to monitor infringements on, due to the secretive nature of manufacturing plants and thereby creating the *probatio diabolica*, an impossible proof situation. To get proof in such a matter, access to the manufacturing plant is needed, and that cannot be demanded without any proof.

For this reason the TRIPs agreement contains an article whose purpose is to resolve this situation and balance the rights and obligations of the parties. The article contains special enforcement procedure concerning process patents to assist in the search for proofs of infringement. The article has the effect of reversing the burden of proof to the alleged infringer instead. The patent holder has only to show the possibility of that their process is being used for producing the product for the court to order the defendant to prove the opposite. This reduces the burden on the patent holder, both to prove infringement but also the burden of monitoring competitors, since the level of proof needed only is likely infringement.

Subparagraphs (a) and (b) of the article refer to the two exceptions of this burden of proof task inflicted onto an alleged infringer. Firstly, the burden of proof article may only be referred to if the product obtained by the patented process is new. The infringed process cannot have been used for several years as a trade secret of the defendant, and then the article does not apply. In such case, it can be possible for the defendant to obtain a compulsory license under national law.⁵³

The second exception of this article means that the suspecting patent holder has to make legitimate efforts to prove that a third party is infringing his patent, and only in the case where he has been unsuccessful despite his efforts may the burden of proof apply onto the alleged infringer. This means that even though this article has been constructed to protect further the patent holder in the case of process patents, it also demands a certain amount of efforts on his behalf. The exception will also protect the third party in case the patent holder has been mistaken, whether on purpose to find out about the third party's trade-secret or not.

2.4.2 Key take-outs

The TRIPs agreement creates a reversed burden of proof in infringement suits concerning patented processes. This reverse burden balances the rights and obligations of patent holders and the infringer since infringement on processes can be proven. There are two exceptions to the article; the product

⁵³ Anderman, "The interface between intellectual property rights and competition policy" p 15

produced has to be new and the patent holder has to take the legal measures possible to detect the infringement himself. The main point is that this article even out the imbalance in the patent system and shows the understanding for the difficulties of monitoring and detects infringement concerning process patents.

2.5 Findings of the writers

Our case-study of a pulp and paper research organization, whose most patents are process patents⁵⁴ have lead to the following conclusions. The conclusions are mostly based on this case study and might not be applicable for other companies within the same industry or to other industries.

2.6 Identify infringers

It is very difficult to identify and prove infringement on patented processes. One example is when that patented process enables to manufacture the same product but in a cheaper fashion and more efficient manner. Therefore, the patent owner cannot simply seek competitors who are manufacturing the same product but has to investigate further up the manufacturing chain to identify an infringement. This would be almost impossible for the patent owner, but the TRIPs agreement's article 34 helps to balance the unevenness out. If the patented process is used in another industry, the discovery of an infringement can be even harder. In that case, the patent owner has most likely not the resources or need to monitor other industries, however, this knowledge would be valuable as he could gain additional license revenues. This is a frequent case where owners of process patent are only receiving a little part of the potential of their patented process in other sectors.

Other reasons why it is so hard to identify infringers, are firstly that the infringers are aware of their doing and therefore very secretive and protective of their activities, secondly because it is a natural attitude for manufacturing plants to be secretive of their processes, regardless of whether they are infringing or not. Another difficulty to monitor process patents is because the infringer has separated the process into steps and has different parties handling these steps individually. Even though his actions make it harder to identify his infringement it makes it no less of an infringement.

2.6.1 Patent owner's and inventor's knowledge of the field for infringement

The patent owner(s), whether a company or the inventors, are generally experts in the field of applicability of the patent and have a very good understanding and knowledge of the industry with regards to actors and competitors, standards and processes used and so forth. For this reason, it is a fairly cost-saving and reliable method to rely on the stakeholders of a patent to keep on "eye-open" for such infringements.

2.6.2 In-house monitoring

A specific team (3.4.2 Follow-up and monitoring) of either lawyers and/or scientists can be appointed the responsibility of actively monitoring a company's portfolio. Ideally, this should be a team of mostly researchers accompanied with an IP lawyer, and they would investigate on a regular and ad-hoc basis their competitors, also taking part in all seminars and monitoring the industries development with

⁵⁴ Cross reference Chapter 24History of pulp and paper institute in Sweden

regards to patent filing and publications. By following such trends, they might also be able to foresee some of these infringements.

2.6.3 Out-sourced monitoring

There are many existing outsourcing companies that are specialized in investigating product patent infringement, however the writers have not found any company that specialized in process patent monitoring⁵⁵. When choosing this option, one must consider the high costs associated to such services as well as their high-uncertainty of yielding any results. The use of this option is further discussed in 3.4.2 Follow-up and monitoring.

2.7 Doctrine of equivalents' impact on process patents

The doctrine of equivalence has the purpose of increasing the scope of protection of a patent and facilitating the claim interpretation. With the doctrine of equivalents, a patent is infringed not only in literal infringement but nevertheless equivalent to the claimed invention⁵⁶. The reason for having a doctrine of equivalence is to avoid unreasonable results when a court assesses the claims of a patent. In Sweden the court evaluates six criteria when assessing if an infringement has been done due to the doctrine of equivalence. These are;

1. The innovation is a simple construction solution,
2. The feature which is not fulfilled is a central element according to the patent,
3. The innovation and the infringing subject are solving different problems,
4. The man skilled in the art would not be able to take the step from the patent claim to the infringing subject,
5. An interpretation of the doctrine of equivalence would overlap with the status of the technology on the application date of the patent and,
6. A deliberate limitation has been done of the disputed feature during the application phase.

⁵⁷

If any of these criteria are fulfilled, the court will not do an assessment of the case in the light of the doctrine of equivalence.

The doctrine of equivalents is particularly useful in the case of process patents where one may interchange small steps of the process yet keeping the same utility and function of the process. This would fall under the doctrine of equivalents and protect the patent owner. The new writing of the EPC, article 69 is seen as an allowance of the doctrine of equivalence through the legal act, before the doctrine did not have any legal support in any act, only in case law. The Swedish interpretation of this has not changed the previous understanding of the extent of the doctrine; it is still used but the expansion of the claims allowed is quite narrow.⁵⁸

⁵⁵ The writers have contacted numerous companies but have received no response at the date of printing. It is most likely that those companies would provide the same monitoring service for process patents. However, we also presume that they would increase their disclaimer and fee.

⁵⁶ Reference to Swedish patent act needed

⁵⁷ Domeij, Patenträtt, p.110

⁵⁸ Domeij, Patenträtt, p.108

The most common case is that one or several of the criteria is fulfilled meaning that the court will not apply the doctrine when interpreting the patent claims. The doctrine has so far rarely been used, only in cases where the technology did have unusually large technological significance⁵⁹. The extensive flow of patents has made it a necessity to apply a more strict interpretation of the range of the protection, making the practical usage of the doctrine almost obsolete.

2.8 Ease to invent around

As process patents claim property on the processes to achieve a product/material, one needs only invent around, or use another method to invent around and achieve the same product/material. A process patent –when only comprised of process claims- only protects the process and not the outcome of using the process. The outcome is essentially what is always sought after, whilst the process is only the method used to achieve this outcome. However, the importance and value of process innovations is that they will most often reduce the cost of production, which is a very important aspect of manufacturing.

2.9 Case Study

2.9.1 STFI Patent

The patent under study in this section is a patent owned by STFI titled: “Process for making wood chips”⁶⁰. The patent is granted in the US in 1999.

The reason why this patent was chosen as a case example is for its representation of the type of patents in the Pulp & Paper industry⁶¹.

⁵⁹ Case T 9724-00, Svea Hovrätt

⁶⁰ Patent number: 6003572 at the USPTO

⁶¹ Case study Innventia: Patent agent confirmed that this patent represents the industry

2.9.2 Patent claim analysis

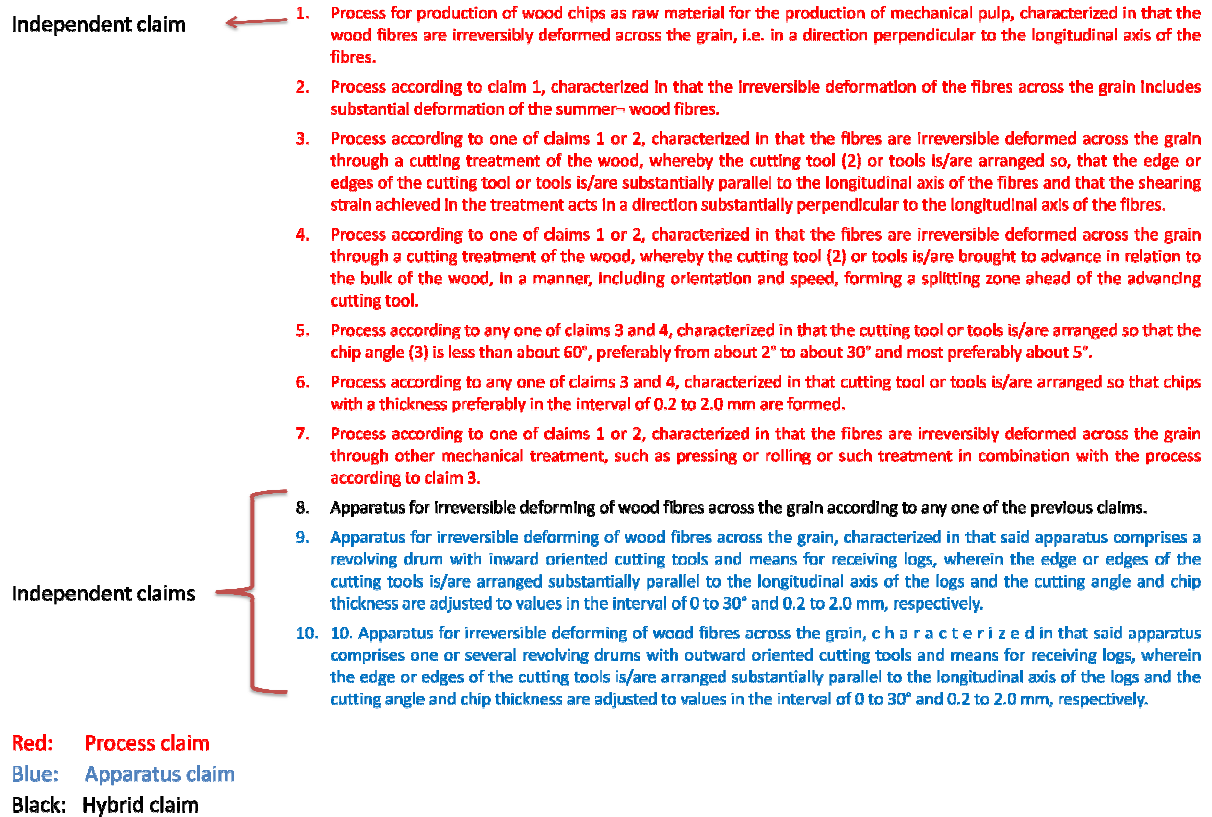


Figure 5

One of the strategies used by patent agents to both strengthen and broaden the patent scope is to “productify” the process patent. This is achieved through hybrid claims (described below) followed by apparatus claims as seen in this patent under study. In the picture above, the red claims are all process claims, the black claim is a hybrid claim and the blue claims are apparatus claims. With an overall look at the structure of the patent claims, one notices the incline of the patent towards claiming the process, for which there are more claims, and which comes first in the list. Then it is the hybrid claim, as a transition and finally the apparatus claims. The hybrid and apparatus claims are independent, so to broaden again the scope of protection of the patent. In this patent, claim 8, 9 and 10 represent the attempt of the patent agent to “productify” the process patent.

Hybrid claims correspond to claims that have mixed subject matters, for example both a process and an apparatus, or mechanical and chemical components. These types of claims are not approved by all PTOs and one should be wary as they may render the claim interpretation confusing and thereby jeopardize the patent.

The picture below attempts to graphically represent the structure of the claims of the patent under study with regards to dependence and independence. The green boxes represent claims that are

independent and the red boxes are for dependant claims. The red

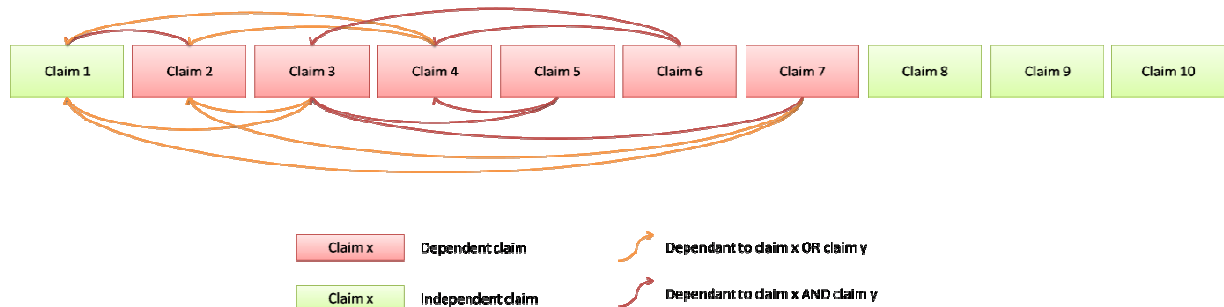


Figure 6

arrows, which always stem from red boxes, show that the claim is dependent on all the boxes it is referred to. The orange arrows mean that the claim is only dependent on one of the claims it is referred to. Again, this graphical representation of the claims shows that the core of the protections sought for this patent is held within claim 1 to 7, and that claim 8, 9 and 10 are used to increase the strength and breadth of the patent protection.

2.10 Key take-outs

The investigation of process patent and the case study has brought the following conclusions. Process technologies are most often connected to existing technologies and represent incremental improvements making it harder to create a strong patent. These incremental improvements often have the purpose of “effectivizing” the manufacturing and saving costs, whilst the outcome of the process -the product- remains unchanged.

Due to their nature, process patents are difficult to protect and monitor. There are high costs associated with monitoring for infringement and enforcing the patent rights. The cost and difficulty to monitor is increase the further away the process is from the market. However, Article 34 of the TRIPS agreement makes the protection of process patents stronger and increases the rights of the patent owner by giving him the opportunity to investigate alleged infringers. In addition, the doctrine of equivalence is seldom used, especially on process patents since the inventions are incremental improvements. Finally, Process patents are reasonably easy to invent around.

In consideration of the above, we have come to the conclusion that process patents are an unreliable and challenging tool for revenue which is their primary role as a tool in a research company⁶². For this reason, we argue that process patents need to be supported by an efficient patent process and patent strategy to ensure optimal value extraction of these patents⁶³. On the other hand, in the context of an institute, process patents fulfill their role of freedom to operate and marketing, as patent strength is not required for those two roles.

⁶² Cross reference: Chapter 31.3 Key take-outs

⁶³ The patent process and patent strategy are discussed below in this chapter. The support of those to process patents is further developed in the conclusion.

3. The Patent Process

The internal patent process in an organization is the process that enables ideas to become patents. This process should involve people on all levels of the organization as well as, potentially, external actors. The picture below shows the groups involved in the process, as well as their main responsibilities and the type of out-put that is expected from these groups.

3.1 Groups Involved in the Patent Process

There are primarily four groups involved along the process⁶⁴. All have a set of responsibilities and expected tasks to deliver, which are further described.

3.1.1 Scientists Group

This group represents the starting point of the patent process, since they are the source of each and every patent. They are the inventors, bring invention disclosures to the management group, and are involved in the patent writing process. Their role and contribution is extremely important to the patent process, therefore, their understanding of the process is crucial to its well functioning.

3.1.2 Decision Committee Group⁶⁵

This group includes all the participants of the decision committee apart from the patent agent. The reason why the patent agent is not included in this group is that he is not always part of the organization.

The decision committee should at least include a member involved in the strategy of the company, a research manager from each research department of the organization, the person responsible for innovations and a patent agent and a marketing manager. Additional participants can be included though it is not necessarily recommended, as small groups are often more effective.

The responsibility of the management group is to evaluate ideas for patenting against a set of pre-determined criteria⁶⁶ and give the “green light” for patenting. They will decide upon a strategy for each idea individually, will handle the management of the patent portfolio, and will give feedback to the scientists for each idea disclosure received.

3.1.3 Patent Agent Group

Depending on the size of the organization, they may have one, a few or no patent agents. However, it is recommended that an organization should have a dedicated patent agent, whether internally or externally, as a close relationship will facilitate the patent writing process. It is also preferred to have a patent agent participating in the decision committee for his knowledge will guide the discussion on patentability and he will be able to advise on the patent strategy to use according to the applicable options of patent writing.

3.1.4 Other Group

This group includes other very important roles in the organization. Even though not directly involved with either patents or the patent strategy, they will use patents or have been part of the creation and

⁶⁴ Case Study: Investigation of patent process

⁶⁵ Case Study Innventia: The idea for this group and its constitution is based on the case study

⁶⁶ Cross-reference to Chapter 33.3.3 Evaluation of Ideas for patenting

formulation of the strategy for the company and is responsible for the marketing of the organization, search for collaboration partners and discussing funding. Their knowledge of the patent portfolio is therefore essential to their role.

3.2 Visualization of the Patent Process

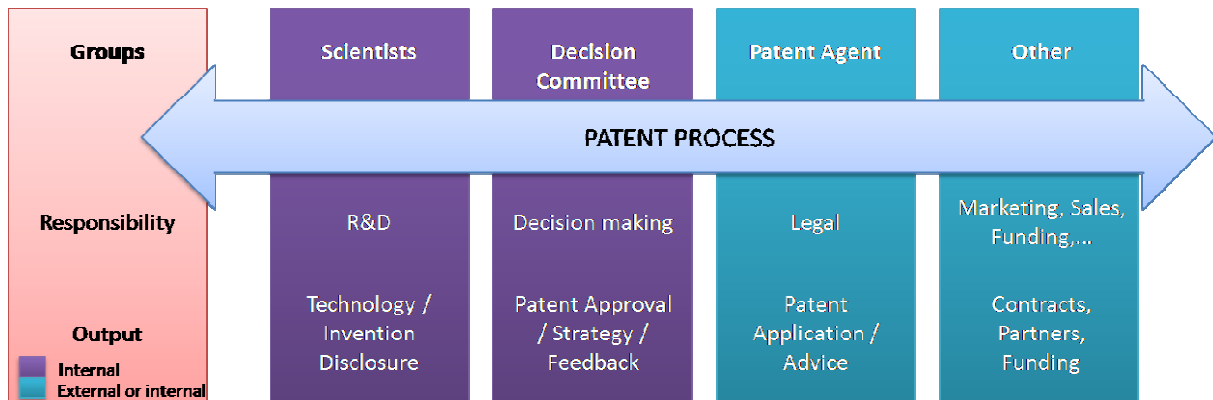


Figure 7

This picture also highlights the timeline of the patent process, with the arrow, where ideas immerge from scientists, the decision committee will evaluate these ideas and decide upon a strategy, the patent agent will draft the patent application with support from the scientists and the other will undertake the downstream usage and exploitation of the patent.

The patent process goes through a number of steps which start with the idea disclosure, then the evaluation of ideas for patenting, the development of a strategy for each idea to be patented, monitoring of patents and finally patent portfolio management.

The purpose of the arrow on both ends of the timeline is to emphasize the fact that this process can be iterative and that some of the groups are involved repeatedly during the process. For example, an idea disclosure can be re-evaluated once the scientist has either research the invention further or investigated prior art, commercial application and so forth.

3.3 The Steps of the Process⁶⁷

Using the information gathered during our project for a research in the pulp and paper industry as well as our prior knowledge and theories in text books, we have been able to identify the critical steps of the patent process.

3.3.1 Finding Ideas

As already mentioned, all patents originate from ideas developed by scientists. Consequently, the scientists need to be informed of the organization's vision for patents and direction of research, as well as knowing what is patentable so to be able to identify a patentable idea when it arises. This is achieved with high communication amongst the organization and availability of information⁶⁸. Also, it is preferable

⁶⁷ Granstrand, *The Economics and Management of Intellectual Property*, p 264- 278

⁶⁸ Case study: Investigation of patent process

that the scientists have basic knowledge of patents, such as the patentability requirements of novelty, industrial application and inventive step. They should also be trained for patent claim writing as this will considerably reduce the amount of resources, time and cost, spent on this stage of the patent process.

3.3.2 Idea Disclosure

The idea disclosure is the document that the scientist should hand-in to the decision committee for each idea that he has identified as patentable, in-line with the business strategy and the patent strategy of the organization. The scientist's knowledge on patentability and the organization's strategies will act as a first evaluation of inventions and whether they should be brought forwards to the decision committee. This knowledge will therefore reduce the amount of idea disclosures that the decision committee will have to evaluate. Therefore, the modest investment in the education of the scientist for patent knowledge will result in reducing the work-load of the decision committee.

The idea disclosure should include all the information necessary to be able to evaluate the idea against the pre-determined criteria. These criteria should be made available and easy access within the organization, it is even suggested that there should be a folder on the intranet that is dedicated to the patent process. It should include the latest update of the patent strategy which shall be linked to the business strategy, basic patent information, the patent portfolio, the patentability criteria, and the invention disclosure template.

The Invention disclosure should include⁶⁹:

- The invention description - compulsory
- Basic prior art search - optional
- Market size - optional
- Invention application - optional
- Preliminary commercialization plan – optional
- Need for further research on the invention – optional
- Market Need – optional
- Suggested customers, licensees, buyers - optional

Even though most items are not compulsory, it is highly recommended that they should be included in the invention disclosure, as they will enable a better evaluation of the potential of the invention.

3.3.3 Evaluation of Ideas for patenting

The decision committee should meet as frequently as necessary dependent of the amount of idea disclosures and necessary for optimal results of the patent process. It is considered advantageous that the scientist attends the decision committee meeting so that he has the opportunity to present and explain his invention. This is important for many reasons. Firstly, it makes the scientist feel more involved in the patent process and more enthusiastic with regards to his invention⁷⁰. This could be of importance for further development of the invention. Secondly, it gives the scientist a chance to defend and argue

⁶⁹ Case study Innventia: interview with IPR responsible at Innventia

⁷⁰ Case study Innventia: interview with researchers at Innventia

for his invention to be patented. This diffuses the risks of scientists feeling that only some of the scientists' ideas are being patented and creating both a bad atmosphere within the organization and resentment towards other scientists or the management group⁷¹.

The ideas should be evaluated against a set of pre-determined criteria. These criteria are:

- Patentability requirements: Novelty, inventive step and industrial application. This is the first criteria that needs to be fulfilled and will utilize the help of the Patent Agent. If this criterion is not fulfilled, then there is no need to go forward with the Patent Process. However, a quick evaluation needs to be made regarding the possibility of making improvements to the invention that would enable it to fulfill the patentability requirements. To be able to make a thorough judgment of these requirements, the Decision Committee will require a thorough prior art search, which can either be performed by the Scientists using his expertise in the field, and exterior body who specializes in these searches such as patent agents, or leaving this to the Patent Office. There are risks associated with the last option, which are that firstly much effort will have been invested before this search is performed allowing the risk of having to abandon the patent application due to prior art, and also that all Patent Offices do not provide with the same quality searches allowing for the risk that the patent could be invalidated if challenged in court.
- Patent strategy and business strategy: The field of the invention and its potential usage needs to be in line with the patent and business strategies of the organization as well as its vision and goals for research. This assessment should firstly be made by the Scientist, providing he has access to this information to enable such a judgment so that he only presents ideas that fall in line with these visions. In a grey zone case, the Decision Committee shall take the final decision.

Once these criteria have been fulfilled and the Decision Committee has decided to go forward with this invention, they should inform the inventor so that he can start gathering more information for the next steps of the Patent Process. These steps involve deciding upon a plan for this invention and draw up a strategy. These are discussed below.

If, on the other hand, the Decision committee has decided not to go forward with the invention, they must give feedback to the inventor with clear details as to why the idea was denied against the criteria they have used. Also, they should inform the inventor whether the invention is in the scope of the business of the company, in which case, the invention must remain secret and belongs to the company. Alternatively, if the invention is outside the scope of the business of the company, then the inventor must be informed that he may use the invention to his own ends.

3.3.4 Purpose of protection

Once the above mentioned two criteria are fulfilled, the Decision Committee must draw up a plan for this invention in order to extrapolate the most value in consideration of resources, business line, technology field, market environment and so forth.

⁷¹ Case study: Interview with scientists

- Budget considerations? The cost of a patent application needs to be considered at this early stage, for it may incline the decision process. Most companies, especially in this down-turn climate, have little budget in reserve for patenting, especially for inventions with large uncertainty associated to them. Therefore, another criterion that needs to be considered is the value of the invention and the “certainty” of that value. The information that will be utilized for this evaluation is the “Market size, Preliminary commercialization plan, Need for further research on the invention, Market need, Suggested customers and/or licensees”. If it is decided that the idea should not be patented purely due to budget restrictions, then there are other options to “protect” the invention: trade secret or publication⁷².
- Reason for protecting the invention⁷³? Depending on the use that will be made of the protected invention, there are various protection methods to consider, which are patenting, publishing, trade-secret or a mixture of the three. Following is a discussion of the various use and suggested actions and strategies to take accordingly.
 - Licensing or other revenue streams such as selling? In this situation, it is recommended to protect the invention with a patent, since it is the strongest of IPRs and is the easiest to trade with and fight over in court⁷⁴. To ensure a strong position in negotiation and to increase the value of the patent, one can structure the patent in such a way that some of the critical information for the use of the invention is neither included in the patent claims nor disclosed in the patent⁷⁵. If the aim of the invention being protected is to trade the right to use it and licenses are sought, then one should prepare for infringement situations and the risk of the patent validity being challenged⁷⁶. For that reason, it is recommended to draft a strong patent and invest the resources necessary to that outcome. Another consideration to take into account for the strategy is “where” the licensing will take place, as the patent must be applied for in each of these location for it to be protected and therefore useful.
 - Blocking others? If the sole purpose is to block others, such as competitors, then a cheaper and quicker option should be taken to ensure an early priority date. The best option for that is to apply for a provisional patent application. This will have to consequences, which are firstly to stop competitors from patenting the same invention at a low cost, and secondly allows more time for the organization to decide whether to take the patent application further whilst still destroying novelty for competitors.
 - Marketing? If the purpose of protecting this invention is to show the industry the capabilities of the company and using the invention as a tool to market the company, then a low protection method is needed. This means that a patent can be applied for,

⁷² Cross reference to 2.5 the necessity for Patent Process

⁷³ Case study Innventia: interview with vice president at Innventia and IPR responsible

⁷⁴ Teece, *Managing Intellectual Capital*, p 16

⁷⁵ Cross reference to Chapter 33The Patent Process

⁷⁶ Cross reference to 2.5.3.1. Risks and Advantages of Patents

but the strength of the patent is not of high importance and little resources need to be invested in writing the patent application. A large geographical protection is not necessary either.

- Leverage for access to other technologies? If the purpose of patenting this invention is to get access to other inventions, then the patent needs not be very strong but should be leverage-able in negotiations for cross-licensing.
- Freedom to operate? If the sole purpose of patenting the invention is to enable freedom to operate, then the patent needs not be strong and protection should only be sought for in the country where the invention will be utilized.
- Patent portfolio creation? The invention should be mapped against the other patented inventions of the company, in consideration of the type of portfolio that is sought after. For example, if the portfolio is used as a blanket, then this new patent should be perfectly fitted to increase the blanket strength.

3.4 Follow-up and monitoring

3.4.1 Patent portfolio Management

Patent up-keeping is very expensive and therefore must be supervised, so that all patent are being paid for purposely. It is preferable that, on a yearly basis, the decision committee should reevaluate the value up-keeping the patents due for renewal. The value, as discussed above, is not purely financial, as each patent has a different purpose. The evaluation criterion is simply to check whether the patent is fulfilling its purpose. In a positive response, the patent renewals fees will be paid at the right time. In a negative response, there are two options; firstly one must consider the value of the patent for other entities and thereby be able to sell; secondly, if no others are interested in the patent, then the patent should be abandoned by declining to pay annual renewal fees. The patent will in that case no longer be valid.

3.4.2 Monitoring for infringements

The action of monitoring for infringement is only necessary for patents that have the purpose of earning money. The reason why this is limited to patents with these purpose is that, as suggested above, other patents are not strong enough and would likely not stand against a validation challenge. Also, monitoring patents is an expensive activity, so the resources for it should only be dedicated if this is the purpose of a particular patent.

Monitoring of patents can either be done internally or externally, depending on the competences of the organization and the resources available. There are many companies that focus on patent monitoring services; however we have found none that specialize in process patent monitoring.

3.5 Key takes outs

The key groups essential for the patent process to be functional are the scientist, the decision committee, the patent agent and the other. It is the interplay from these groups that sets the efficiency of the process.

The good implementation and efficiency of this process is dependent on communication amongst the groups involved to ensure that the information –most importantly the patent and business strategies, the patent process steps, the patent purpose and the patenting criteria- is available to all and well understood. The importance of this understanding is unveiled in the efficiency of resources used. To ensure this understanding, it is preferred that the scientist receive some education on patents, as this will facilitate the patent writing procedure with the patent agent, it will also enable them to identify a patentable invention when one arises.

4. Patent strategy

A company or institute that starts patenting inventions needs a strategy for doing so. This strategy should contain goals and purpose of patenting as well as future usage of the patented inventions. In this section we will analyze the different features that have to be taken into consideration when choosing a patent strategy. We will also analyze different business strategies and highlight important features in them. We will, based on these analyses, purpose a strategy that will facilitate the transformation process.

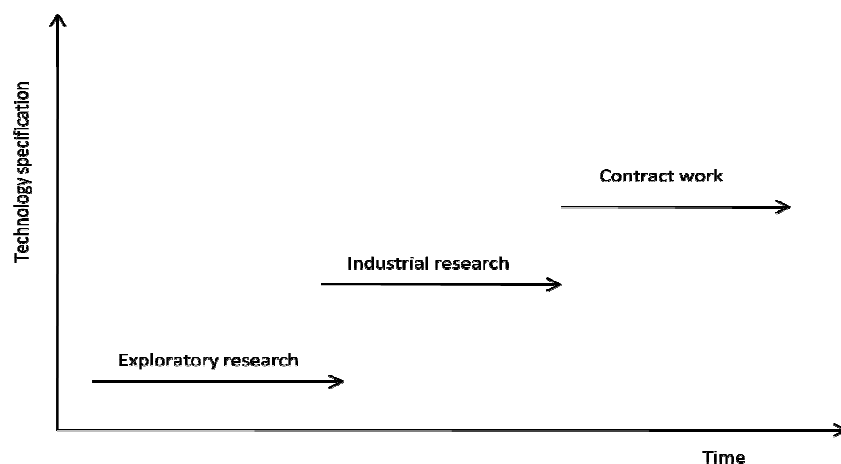


Figure 8

The research done within the institute is often done in three different kinds of projects, the exploratory research, industrial research and contract work. The exploratory research is often large collaborations with governmental funding and external industry partners where the research is done on a more experimental level. The industrial research is projects within the three year program at the institute with partner companies with pre-decided research areas. Contract work is consultant work done for a specific company, where the subject for the research is decided by the client.⁷⁷The goal with this structure is to use the exploratory projects as a first instance to try out ideas and innovation. If successful and there is enough interested partner companies, the innovation can be further developed within an industrial research project and the results patented by the institute. If there is additional interest in modifying or specified research in a specific direction, contract work can be done for the client interested.

⁷⁷ Case study, Interview with Vice President Innventia.

From a company perspective, the consultant work is the most common source of income. The reason for this is that the research done is research that is close to the market and more specified than that of an institute. This should be the starting point for the transformation process between the two. By identifying the intellectual assets specific enough to attract contract work and package these as value propositions towards these customers, the institute can move away from the exploratory research with low technology specification.

4.1 Technology and knowhow

The technology is illustrated as the middle circle in the picture. It contains all the technical features that have been invented, whereas the patentable technology (the inner circle) only contains a part of this information. By not disclosing all the technological features of the invention in the patent, it creates a leverage position for the patent holder in relation to possible competitors, licensees, and reduces infringement cases. When constructing a patent application, the applicant has to evaluate and decide which parts of the technology to patent and which to leave out⁷⁸.

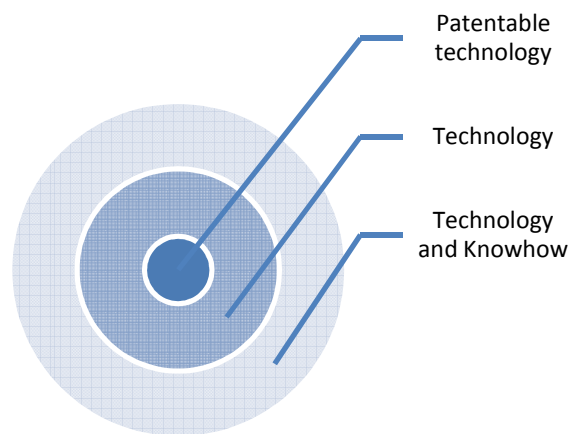


Figure 9

A strategic approach of leaving out technology of a patent could increase the interest of the technology, attracting licensees. It may also increase the difficulty of inventing around for competitors, forcing them to request a license. However, leaving out technology information from the patent could result in others discovering the missing parts on their own and in worse case, patenting them⁷⁹.

The external circle contains both technology and knowhow. Knowhow is all surrounding knowledge that is necessary for the use of the invention e.g. which applications the invention has and which additional technology it can be compatible with.

The knowhow can in some cases be the most important feature for the invention. For example, a patent application may include all the technical details for usage of the patented invention; however, it will not include the specific details to obtain optimal results. This is, with the technology, a great leverage in

⁷⁸ Case study, Interview with patent agent.

⁷⁹ Further discussed under 2.5.4

negotiations and should be handled carefully. The leverage obtained through the trade secret is cancelled if the trade secret becomes public knowledge.

If information would leak, the license offer could decrease a great deal for the competitor or customer, since they then would have the possibility to access the information for free. Even though a patent would protect the core of the technology, it could be easier to invent-around it if the knowhow is known, especially concerning process patents. Often the process consists of several steps, where just changing one of them could make the process fall out of the scope of the patent and thereby no constitute an infringement⁸⁰.

4.2 Patenting purpose

The decision of choosing a patent strategy has to be based on and adapted to the purpose for patenting in order to fulfill the goal of the strategy. At the beginning of Chapter 3, in the section on Research Institutes and Research Companies, several reasons for patenting are mentioned, and in this section we will only analyze the ones that are enabling the transformation process and the patent strategies needed to fulfill that need.

4.2.1 Industry demand

Research is performed either as contract work or in collaboration with industry partners. These partners are interested in using the results coming out of research projects and may demand that the institute try to patent results where possible or advantageous to ensure exclusivity access to this research results. In the pulp and paper industry, the inventive steps are often small and the research can take a long time, resulting in protection and control over the existing technology becoming an important feature. The technology base in this sector is fairly constant, where processes are used for several years and the focus for the research is on improving efficiency and reducing costs within the manufacturing process. All improvements that can decrease costs of the process result in substantial savings for the industry. Consequently, pressure of patenting improvement is high. The pressure to patent can come either from partners or as a response to market competition⁸¹.

4.2.2 Future research areas

To secure future research areas is another reason for the institute or a company to patent. By trying to patent areas where patenting is less heavy, a broader patent can be made to cover future research areas as well. This could either be done by initiative from the institute or company itself, if they have a good understanding of where the potential white spots within the research area is going to be in the future, but it can also be pushed forward by industrial partners that have a future strategy of going into a new area⁸².

From a company perspective having a broad patent covering future applications as well could create a competitive advantage for the company. By covering a large area of future research, the company can force others to request licenses and thereby securing future revenues for some time forward. Creating

⁸⁰ Case study, interview with patent agent

⁸¹ Case study, interview with researcher at Innventia

⁸² Case study, interview with manager of research group

this kind of freedom to operate is important when there are several potential stakeholders in the new area.

4.2.3 Financial purpose

The financial incentive of patenting is embodied in the possibility to trade with the patented invention or patent application. The patent or patent application can be sold, licensed, cross-licensed for access to other inventions and/or exchanged for another patent. It can also be used to increase the value proposition towards potential customers or to obtain funding for research, or as a marketing tool, which is an indirect way to attract funding⁸³.

4.3 Strategy methods

The implications and usage of a patent strategy are dependent on which strategic methods one chooses to utilize. In this sections we will describe three standard strategies; defensive, co-operative and prospecting⁸⁴. We will then analyze them in the context of the transformation process of a pulp and paper institute becoming a company.

4.3.1 Defensive

The purpose of a defensive strategy is to protect the technology and relating technology. This type of strategy is used when the desire is to exploit and develop the technology internally or within the research projects. By directing the internal research and patenting towards a specific research area, a patent wall can be created to work as a defense against others. This in combination with possible in-license agreements needed to fulfill the protection within the area creates an effective defense⁸⁵.

To be able to prolong protection time for a patented technology, one strategy is to build a wall of patents originating from the same invention. To do so, the improvements to the existing patent or process surrounding the patent are patented⁸⁶. Concerning a process patent, which has the original character of being easy to invent around, this strategy method could be of especial importance. It is also a way of expanding the original protection area, since the new patents cover new improvements and applications.

A defensive strategy is a sound approach to enabling the transformation of an institute to a company in the pulp and paper industry. The institute has little resources to monitor or pursue infringers and using the defensive method could balance this method. The cost of creating the patent wall, thanks to the in-licensing of technology, will be lesser than the amount potentially spent on monitoring fees and infringement suits. The main goal of protecting the invention is not necessarily to be able to use it themselves, but so their partner companies can do so.

⁸³ Case study, questionnaire sent out

⁸⁴ Hufker and Alpert, Patents: A Managerial Perspective.

⁸⁵ Ibid.

⁸⁶ Ibid.

4.3.2 *Co-operative*

In some industries, cross-licensing and patent pools are common due to high R&D costs⁸⁷. In order to conduct research in heavily patented areas, a company can exchange its own technology and research results (being patented or not) to get access to other's technology. In the pulp and paper industry in Sweden, there has been a long history of industry partners collaborating for R&D, especially through the institute's three years programs. The collaborations do not have the structure of a patent pool, but there is some cross-licensing. Cross-licensing is an efficient way of gaining access to other's technology, thereby creating a faster technology diffusion which will be in the public's interest as well.⁸⁸

The advantages of this strategy are reduced R&D cost and access to a large number of patented technologies at a reduced cost. The downsides are mainly that protected technologies are widely spread even to direct competitors sometimes. This means that partner companies obtaining licenses within the collaboration would be reluctant to give access to competitors outside of the alliance. Consequently, the strategic use of their technology becomes somewhat difficult, since it may jeopardize the value proposition of the technology or the technology could be "locked up" in the collaboration.

The pulp and paper industry is experiencing a down fall accentuated by the current financial crisis.⁸⁹ Additionally, R&D costs are large within the industry due to the expensive manufacturing plants and processes used. The industry has, since the 1940's, collaborated for research, both basic research and more specified research, through the institute. Historically, three-year basis projects have been the foundation for the collaboration with the industry partners, in combination with specific projects for individual partners.⁹⁰ The institute's industrial research funded through research projects, each of which includes many partners as a way to secure funding. This way, if a partner pulls out of a project, the project needs not be cancelled. By using the co-operative method, the investments done by direct competitors will increase. The competitors in such collaboration would get equal access rights to the research results, putting neither of the partners at a disadvantage.

The co-operative method is an efficient way for the institute to strengthen the technology base by gaining access to partners' technologies, and create a strong network. Both of these are key elements for the transformation process into a company.

4.3.3 *Prospecting strategy*

The most prominent or up-coming areas of research can be identified by monitoring the industry actors, research publications and patent activities. The same can be done to identify the white spot in the industry. To be able to find these potential white spots, the institute or companies need to have a good view of the patent landscape and activity in their research areas. This can be done in numerous ways such as attending conferences, monitoring competitors, reading articles, being a member of an open innovation platform and strong network. This knowledge will enable an understanding of the research direction in the sector and will enable the organization to be ahead of the game.

⁸⁷ Such as telecommunication and pharmacy.

⁸⁸ Hufker and Alpert, Patents: A Managerial Perspective.

⁸⁹ STFI Annual report 2007,

⁹⁰ Further discussed in 2.4 History

The prospecting strategy is based on the usage of reverse-engineering to be able to find alternative technologies or modification of existing technologies with the help of existing patents owned by others. This is a legitimate way of improving or inventing around existing technologies. The purpose of the strategy is to reduce R&D costs by inventing around existing technology and therefore not have to put down the basic research to discover the basic invention.⁹¹

A downside of this strategy is that the risk of infringing on existing technology could increase. By focusing on reverse-engineering and making improvements, the risk of incorporating the existing technology when commercializing a specific process or product could result in an infringement suit from the original patent holder. When utilizing this strategy, it is therefore very important to thoroughly investigate the existing patented technology to avoid any mistakes of using that technology for commercial purpose. An infringement suit can be costly, and in worst case it can stop production or the usage of a process for a long time, since it is possible to get interim decision before the final verdict is taken by the court.

This strategy is not so appropriate for a pulp and paper institute, since it implies substantial costs for monitoring and reverse-engineering the new research results and technologies in the field. However, in-house researchers are generally very knowledgeable of the latest activities in their field, and could convert this information into a patent landscape view of the research area. The researcher attends fairs and seminars where other researchers present their results where he gathers a lot of “free” information. However, the best solution to obtain such information could be to have partner companies within the industry registering trends and initiating project within the areas they find interesting. The time and cost for the investigations would thereby lie on the partner company, but the benefits of finding these areas would be reflected on the research conducted by the institute. This strategy could facilitate the transformation process since it will direct the research into areas where there is an interest in the patent technology. However, for a research institute or a research company to solely base the research conducted on existing technology could be harmful, since the risk of missing out on new research areas could be substantial.

4.4 Key take-outs

Based on the analysis done on the different strategies, a suggestion of the most appropriate patent strategy shall be made.

By using the co-operative strategy as the foundation and continuing with the three year programs the cost of patenting and accessing information is diminished. Due to the license structure of these programs, the number of companies willing to invest even though direct competitors do so, will be steady. The co-operative strategy also gives the institute a large network of partners, whom could become customers in the transformation process. The licenses given out within collaboration projects should have a royalty rate, but that does not say that it has to be very high. The large number of licensees within the project would secure a steady revenue stream even with a very low royalty rate.

This strategy will enable the process patent to claim a stronger position, since the license structure will multiply the number of stakeholders in such a patent and therefore create the needed strength for

⁹¹ Hufker and Alpert, Patents: A Managerial Perspective.

utilizing process patents as the key intellectual assets for the transformation. The strong support created is important for the company to be able to attract partners.

The large network obtained by the co-operative strategy should also be utilized to help monitoring the research field for possible infringements. This support is particularly valuable at the beginning of the transformation, when has little resources to ensure this monitoring. Infringement suits can be very costly and by having stakeholder willing to share these costs to uphold the protection for the technology, these costs can be shared.

The defensive strategy would be the second step in the transformation process. When the organization has established its position on the market and become perceived as technology provider, the strategy should be changed to be more defensive. The network built by the cooperative strategy should be kept when changing to the defensive strategy. The role of process patent in this strategy is as important as before and the defensive strategy leaves the organization more vulnerable, since they would take on the responsibility for all patented technology itself in the future. Therefore it is of importance to still be able to utilize the strong network in situations where in can be needed. This way, the company would have the ability to create its value proposition for its customers by using the co-operative strategy and keeping their position on the market by having well-protected technologies obtained with the defensive strategy.

4.5 Connection to business strategies

When deciding on a patent strategy, the company has to ensure the alignment of such a strategy with the business strategy of the company. We have analyzed a couple of well-used business strategies to be able to apply these on the pulp and paper industry. Thereafter a suggestion on the most beneficial strategy for the transformation process will be given.

The purpose of a business strategy is for a company to be able to fulfill its goals, its vision and mission. Therefore it is of significance that these embody the business strategy chosen. The alternatives discussed below are just a few of the existing ones and every company has to develop the one that is most suitable for their business.

The vision of a company is the first step in the value-creating dimension⁹². For this vision to mean anything outside of the company the value of a patented technology has to be conceptualized as a value proposition towards the customers of the company, otherwise it would be of no interest to the outside actors. When the customer accepts the value proposition given, the customer can comprehend the value experience of the patent for that customer. The value experience is the perceived value of the patented technology for the customer.

⁹² Petrusson, Intellectual Property and Entrepreneurship, p.206

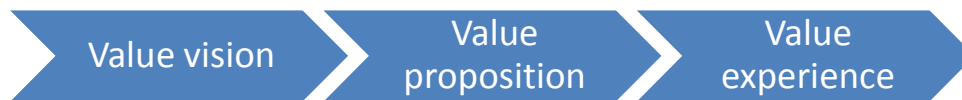


Figure 10

It is important to keep in mind that the vision for the company will be fairly stable, but the value proposition and the value experience for the customer could differ very much depending on the customers intended need or usage of the patent or technology.

4.5.1 License methods

The usage of patent by others than the patent holder is regulated by license agreements between the parties. The agreement regulates under what conditions the licensee is permitted to use the technology. The agreement can include both the patented technology and the surrounding technology and knowhow⁹³. The purpose of a license agreement is the technology being used and exploited, either by several licensees or only one⁹⁴. The gain for the licensor is in most cases royalties being paid for the access right to the patented technology. Other gains can be lump sum payments, grant-back clauses granting access or ownership to improvements done by the licensee or other kinds of technological exchange between the parties.

There are different types of license agreements. An exclusive license gives the licensee an exclusive right within the agreed upon field of use to commercialize the technology. A non-exclusive license can be given to several licensees within the same field of use. The patent holder is in that case entitled to both use the technology himself and give out licenses to a number of licensees. A middle-alternative for the patent holder is to give out a sole license, giving exclusivity for the licensee, with the exception of the patent holder himself. The patent holder can then use the technology, but cannot give out any more licenses in the agreed upon area⁹⁵.

The reasons for choosing one alternative or another are dependent on the market structure and what kind of leverage the patent holder has. If there are several potential licensees and they are not directly competitors, exclusive licenses within different areas is an alternative. Exclusivity gives the licensee a unique market position. Exclusivity usually gives higher royalties or other payments and is therefore more attractive for the licensor.⁹⁶ If the patent holder himself has interest in using the technology or has the possibility to exploit the technology, giving out a sole license to the licensee could be the alternative. This could, if rightly negotiated, be more valuable than an exclusive license but it could also put the patent holder in a more vulnerable situation, since they are dependent on the licensee for exploitation of the technology.

⁹³ Levin, Immaterialrätt, p. 502

⁹⁴ Petrusson, Intellectual Property and Entrepreneurship, p. 213

⁹⁵ Domeij, Patenträtt, p.139

⁹⁶ Ibid. p. 138

If there are several potential licensees within the same field of use, non-exclusive licenses are the alternative to choose, since this enables several licenses and multiple revenue streams within the same area⁹⁷.

The partners contributing to the project usually get a non-exclusive license to the results, and within the project there can be several direct competitors. However, giving out additional licenses to others within the industry, or the same area could be a sensitive subject. The partner companies could resent such licensees and even if the institute has the right to give out additional licenses, the risk of defaulted future investment in projects could be the result of such license.

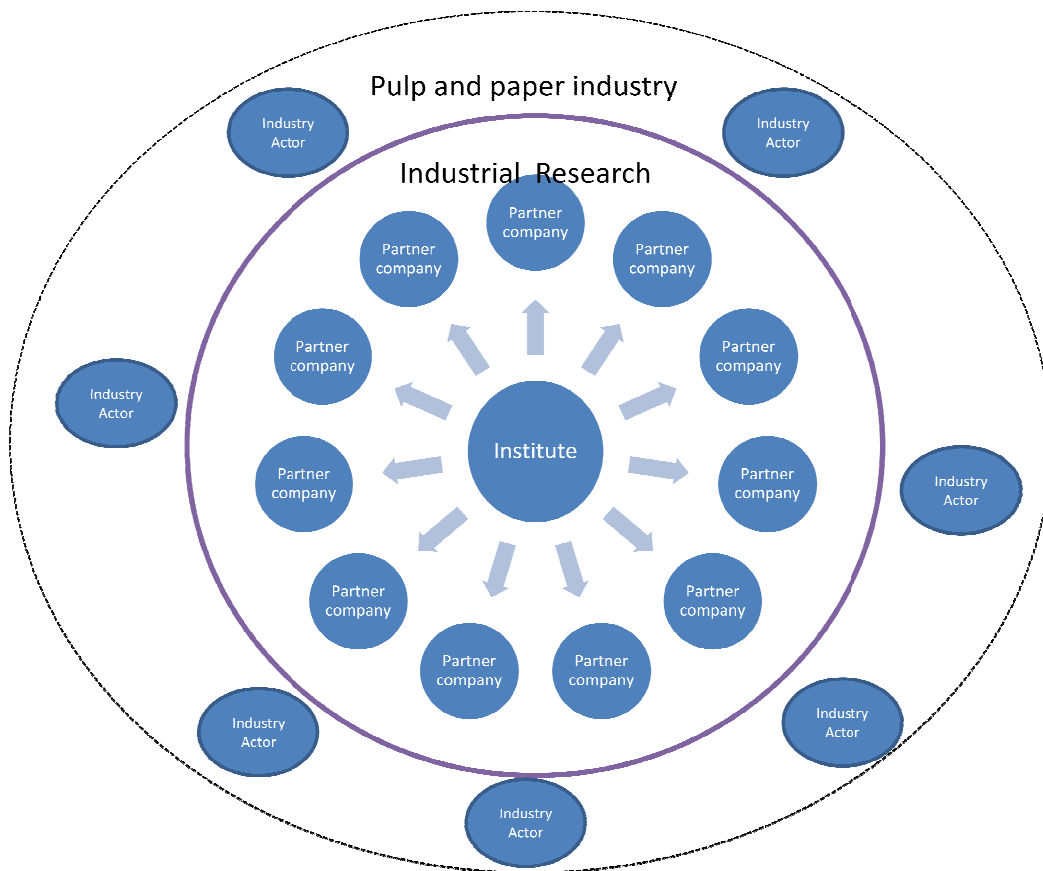


Figure 11

In the pulp and paper industry the total amount of actors in the field are quite few, compared to other industries. The institute has a good reputation within the pulp and paper field and several actors are partner companies in the industrial research programs at the institute. This means that there are only a few actors that are not a part of the program and thereby will not get licenses to the results made within these programs. The research projects can contain partners which are competitors within the same field. Since the terms of entering such agreement, especially concerning access to research results, are the same for all participants, the potential issues of having direct competitors in the same project are

⁹⁷ Levin, Immaterialrätt, p. 500

minimized. The institute could, however, be restricted to give out licenses to the actors outside of the circle. These restrictions are not legal restrictions, but rather political restrictions, since the partners would resent license given out to competitors not inside of the research projects. The potential political cost of this for the institute could be that the partner is unwilling to fund more research projects in the future.⁹⁸

4.5.2 *Strategic alliances*

A strategic alliance is based on the common need for additional competences from all parties. They all hold something of value for the other parties. A strategic alliance can be based on several different competences such as e.g. marketing purposes or but for the purpose of this thesis, the strategic alliance will only be looked at from the aspects concerning patenting of research results.

An important collaboration partner for generating patentable results is a university, since it is often focused on basic research within a field⁹⁹. This can give an institute or a company access to important basic research results that can work as the foundation for more specified projects in the future. The efficiency of the internal research can be increased, due to the opportunity of negotiating with several partners at the same time.

An important thing to consider when doing such collaborations is to sort out the ownership structure of the patentable technology that arises during the collaboration¹⁰⁰. Due to the teacher's exemption in Sweden, the university is not automatically the owner of such result but the researcher himself. This should therefore be handled through a contractual structure to gain access and avoid future access issues. Ownership structure concerning research results should of course be considered in all collaborations, since it is of importance to clear out all of these issues before going into such collaboration. However, going into collaboration with a university this could be of special importance, since the university is often the collaboration partner, but not necessarily the owner of the research results generate.

A strategic alliance can have the form of different types of collaboration, such as open innovation platforms, joint ventures, collaboration within specific projects etc. The common goal of all of these is that the members, co-owners etc. have started the collaboration with the intent of sharing the resources and existing technology to be able to develop an invention or concept further. The final step of this process is most likely that the product or process should be commercialized by one or several of the members of the alliance.

This does not mean that all members have to be involved in all the steps, an institute or university can be responsible for the R&D of the technology, a venture capitalist or other financier can be responsible for the financing and a manufacturing company can be responsible of getting the product or process out on the relevant market. The actors within the collaboration complement each others' knowledge and networks, creating the wanted win-win situation.

⁹⁸ Case study, interview with vice president at Innventia.

⁹⁹ Further discussed under 2.4 History

¹⁰⁰ Levin, Immaterialrätt, p.502

Within the pulp and paper industry, there could be several benefits of being part of a strategic alliance. Since the technology development here is very narrow compared to other industries, gaining access to improvements as early as possible could be of interest due for the industry companies. Even little improvements can reduce costs largely. For an institute with no manufacturing, this could be a good way of monitoring and directing research so that they do not “re-invent the wheel”.

The weakness of participating in a strategic alliance is that it can be very time consuming. To set up such collaboration, both time and resources from the company are needed. There would be several meetings and negotiations needed to set up the framework and the rules for the collaboration, especially concerning the right to the results and improvements made to the patented technology. It is important to have as clear picture as possible before setting up an alliance, since the members will rarely have the same advantages going into the collaboration. The institute should assess their potential value propositions towards the other participants as well as defining their desired value propositions from these actors.

Another weakness of a strategic alliance, especially in the form of an open innovation platform is the weakened ability to keep surrounding technology and knowhow secret. Since the aim of the alliance is to in one way or another share resources and technology, the usage of that technology could depend on the surrounding knowhow etc.

4.5.3 Market positioning

A patent gives the holder an exclusive position on the market since it gives the holder a right to exclude others from using, selling, offering or importing the patented technology¹⁰¹. It does not automatically give the holder a right to use the patented technology himself, since there could be national law or safety regulations that can prohibit the usage, but otherwise the patent holder has the exclusive right to utilize and commercialize the technology on the market¹⁰².

This gives the holder a monopoly position towards its competitors on the market¹⁰³. To be able to keep that leverage and even enhance the position, the company must both establish itself on the market to get recognition from its customers and at the same time continue to improve the patented technology to always stay one step ahead of its competitors.

This is an important factor in the pulp and paper industry, even though there are not very many actors within the field there is competition in the research area. The large actors have big resources to spend on research and development and the field of pulp and paper has very many different sub-fields. This gives possibilities for the research institutes and research companies to specialize and create a leverage position in their part of the market as well as being the enabler for the partner companies to sustain their positions on the market.

¹⁰¹ Swedish Patent Act § 3

¹⁰² Levin, Immaterialrätt, p.299

¹⁰³ Ibid. p.297

4.5.4 Key take-outs

Based on the analysis done of the different business strategies, we propose a combination of entering a strategic alliance and a licensing strategy. The strategic alliance will give the institute possibility to access technology that they normally would not have access to, which lessens the burden of having to create and protect all inventions themselves. The strategic alliance also creates a powerful network for sharing knowledge as well as strong partners. A strategic alliance could be able to facilitate both sides of the transformation process, accessing and creating research results and by using the network utilizing the technology accessed. However, the utilizing could be dependent on the interest of the other members; therefore combining this strategy with a licensing strategy would help the institute to better exploit the outcome from the technology base. This will further strengthen the role of process patents in the transformation process, creating a strong base of stakeholders that will support the patent against future possible infringers.

Licenses are a good foundation for creating long-term revenue streams as well as establishing a network of customers trusting the quality of the research conducted. This could also be a facilitator of the transformation process, where the network created and the bands with licensees would give the opportunity to fully exploit the technology base of the institute.

4.6 Alignment between the patent and business strategy

The combination of the cooperative and defensive patent strategies, together with the alignment of these to the purposed business strategy will result in the optimal realization of the transformation process. To have the opportunity to realize these strategies, the institute has to have proprietorship of the results created within the research conducted. To have the possibility to license out or to be attractive as a strategic alliance partner, the institute has to control this technology.

The business strategy chosen should facilitate the proprietorship of research results with focus on the ones that are patentable or possible to protect as trade secrets. These results should then through the patent process and patent strategy, works as a catalyst in the transformation process.

The alignment of the patent strategy and the business strategy will thereby not only create a foundation for the output from the technology base. They will together also create an internal incentive of managing the results to be able to protect them for the purpose of packaging it as value propositions towards future customers.

Chapter 4 Conclusions

Our analysis has led us to the following conclusions. The transformation from a research institute to a research company is achieved not only through the creation and implementation of a patent strategy and patent process but also through the links between the patent strategy, the patent process and the research results and the alignment of these three. These links are shown in the picture and discussed individually below.

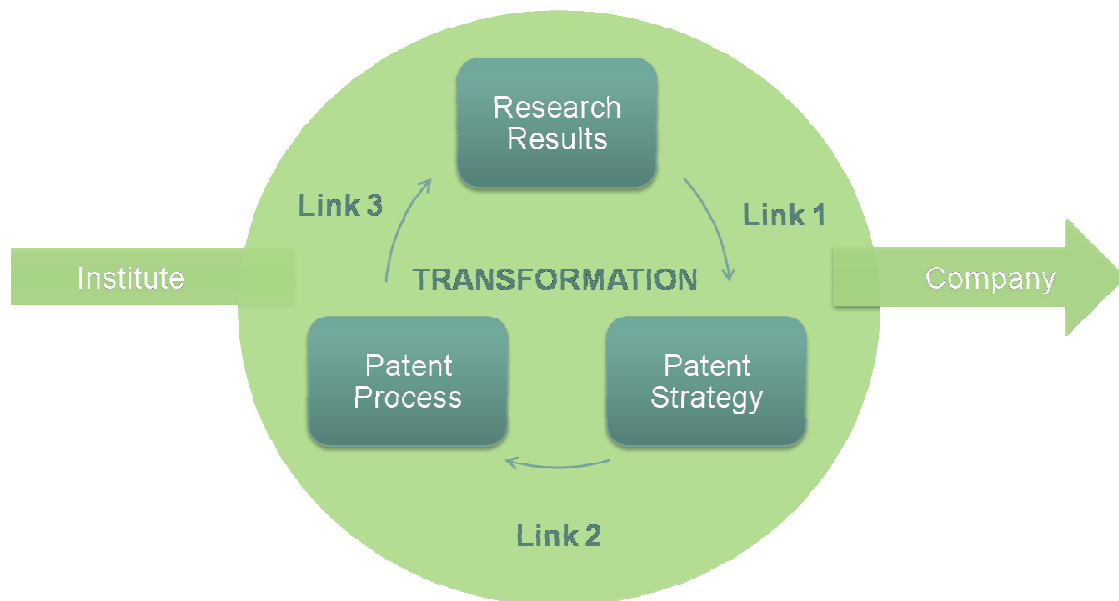


Figure 12

1. Challenges and risks associated to this transformation

In the transformation process from a research institute to a research company, one of the largest challenges is to change the internal culture to enable the transformation. The long history of publishing research results for gaining recognition is hard to break into a habit of patenting. In parallel there is a need for an internal understanding of the purpose of a patent process and patent strategy to ensure willingness of the employees for their implementation. This challenge arises as employees may be, at first, reluctant or not sufficiently educated on the value of intellectual property to grasp their purpose.

A transformation that is “too successful” may result in the difficulty to obtain funding from governmental organizations. With a “too successful” transformation, the perceived status of the institute will shift to that of a company amongst clients, industry actors and consequently governmental organizations. This raises the challenge of remaining eligible for funding from governmental organizations and the necessity to fund research projects itself.

2. Link 1: Research results to patent strategy

The link between the research results and the patent strategy has the purpose of steering the research, obtaining research results, and then extracting value from these research results.

To enable this link, we believe that the following actions need to be followed:

- Communication of the patent strategy to the researchers and research managers
- All research must conform with the direction set in the patent strategy
- The patent strategy must represent the goals of the business strategy

3. Link 2: Patent strategy to patent process

The link between the patent strategy and the patent process has the purpose of implementing the patent strategy, ensuring the utmost value extraction for the research results, ensuring effective usage of the resources allocated to the patent process, and ensuring appropriate protection of research results.

To enable this link, we believe that the following actions need to be followed:

- Communication of the patent strategy to the decision committee to secure a deeper understanding on a management level.
- Allocation of tasks such as monitoring and enforcement of patent, patent writing, prior art searches, market evaluation, management of patent portfolio and searching for deals (licensing, technology exchange, ...)
- Create model for the decision committee to follow to support the choice of protection for patentable inventions

4. Link 3: Patent process to research results

The link between the patent process and the research results has the purpose of ensuring that the patent process is as efficient as possible, protecting research results and ensuring value extraction for research results.

To enable this link, we believe that the following actions need to be followed:

- Education of the research to enable them to identify a patentable invention when it arises
- Communication of the patenting criteria to the researchers to ensure efficiency of patent process
- Education of the researchers with regards to patent writing, prior art search and market evaluation to ensure effectiveness of the process and reduce wasted resources
- Feedback to the research on invention disclosures

5. Links as enabler for the transformation process

The research results, the patent process and the patent strategy are important components in the internal transformation of a research institute to a research company. As described above, the realization of all of them are dependent upon each other, without the possibility of excluding any of them from the closed circle. This transformation is facilitated by implementation actions suggested above. These three features linked together will create new and more stable revenue streams. To extract the optimal potential value, these should also be aligned with the business strategy.

Process patents are not sufficient tools to be able to carry the transformation process. By the alignment of the patent process and the patent strategy, the institute will be able to extract the value created in

invented processes. This alignment should also result in that the surrounding technology and knowhow are leveraged and become a part of the value proposition toward the potential customers. The business strategy should be aligned with the components to ensure that inventions are attractive to customers and exploited on the market. The institute has to be able to move away from the old culture of looking upon research results as something that should only be beneficial to the entire research community and move into the knowledge economy by protecting these results through patents; otherwise the transformation process cannot be completed.

These steps should enable the institute to transform the internal organization into that of a company.

The consequences of the transformation process with these components implemented and aligned with the business strategy will be a changed relationship with the stakeholders of the organization, as well as a changed focus and goal, since the intellectual assets will be fully utilized and thereby create a stronger relationship with customers.

Chapter 5 Reference list

1. Governmental print

Agreement on Trade Related Aspects of Intellectual Property Rights

SOU 1980:46, HÖGSKOLAN I FOU-SAMVERKAN. Betänkande av forskningssamverkanskommittén

2. Doctrine

2.1 Literature

2.1.1 Text Books

Anderman, Steven D; ect “The interface between intellectual property rights and competition policy”. Cambridge University Press 2007.

Domeij Bengt, “Patenträtt”, Iustus Förlag, 2007

Granstrand Ove, “The Economics and Management of Intellectual Property: Towards Intellectual Capitalism”, Edward Elgar Publ. Ltd, 1999

Levin Marianne, “Lärobok i Immaterialrätt”, Norstedts Juridik, ninth edition, 2007

Petrusson Ulf, “Intellectual Property and Entrepreneurship”, Center for Intellectual Property Studies, 2004

Rydberg Sven, “Papper I perspektiv – Svensk skogsindustri under 100 år”, Gidlunds förlag, 1990

Teece, David J.; “Managing Intellectual Capital: Organizational, Strategic and policy dimensions”, Oxford University Press, 2000

Whiteman Adrian, *Recent trends and developments in global markets for pulp and paper*, Food and Agriculture Organization of the United Nations, Economist, Forestry Department.

2.1.2 Articles

Daizadeh Iraj, **Miller** David, **Leamer** Mike, **Nandi** Ron, and **Numark** Clifford I. A general approach for determining when to patent, publish or protect information as a trade secret. *Nature Biotechnology* 20, 1053-1054, 2002

Hufker Tim and **Alpert** Frank, “Patents: A Managerial Perspective”. *Journal of Product & Brand Management*, Volume 3, number 4, 1994 p. 44-54

Singh Jaiya Guriqbal, **Kalanje** Christopher M.; “Managing patent costs: An Overview”. http://www.OMPI.ch/export/sites/www/sme/en/documents/pdf/managing_patent_costs.pdf. Last visited on 1st June 2009.

2.2 Internet

Definition patent pool

http://en.wikipedia.org/wiki/Patent_pool - Last visited on 1st June 2009

Definition Probatio Diabolica

http://en.wikipedia.org/wiki/Probatio_diabolica - Last visited on 1st June 2009

Ratification of the TRIPs agreement

http://www.riksdagen.se/Webbnav/index.aspx?nid=37&dok_id=GS01LU27 - Last visited on 1st June 2009

Institute collaboration with universities

http://www.ireco.se/irecogruppern_fs.asp - Last visited on 1st June 2009

3. Interviews

3.1 At Innventia

Interview with President, Gunnar Svedberg

Interview with Vice President for Business, Anders Engström

Interview with Vice President for Research, Anders Pettersson

Interview with IPR responsible person, Pia Wåberg

Interviews with research group managers

Interviews with researchers

Interview with Marketing Manager

3.2 Patent agent

Interview with Patent Agent used by Innventia

3.3 Vinnova

Interview with legal representative at Vinnova

4. Email

PRV contact for the Allowance Rate Statistics in Sweden since 2000

Mikael Gerhard, Static Controller