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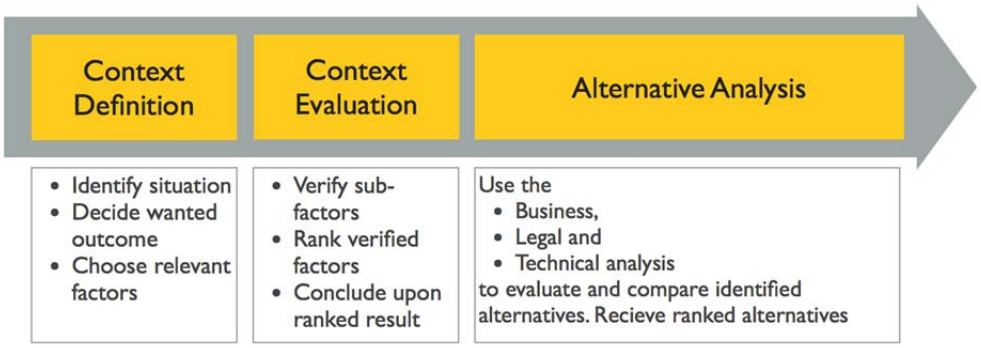

An illustration of the proposed model

Licensing evaluation model

Is it possible to create a model for evaluation of licensing situations?

Master of Science Thesis in the Master Degree Programme,

Business Design

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SUMMARY

The world of business is in a transition towards a knowledge-based economy, which required the actors of being more aware of IPRs and especially patents. The central transactions of patent rights are mostly handled through licenses. Not all companies have the resources to keep up in the development of licensing business and this thesis will aim to create a model that would aid these companies in a licensing situation. The model is to be seen as an introduction that provides guidelines not to be completely relied on in important situation such as negotiations.

Three sources of information have been used; literature studies, interviews and case studies. The empirical data from literature and interviews created the layer of application to the model. A comparison between several decision theories motivated the Analytical Hierarchy Process (AHP) theory with the main argument of its openness when it comes to adaptation. Two case studies test the application integration and dynamics of the proposed model. Main take-out headlines from the empirical data are: Context dependency, Stages of technology dependency, Carrot vs. Stick alternative, Valuation possibilities and the difference between Technology developing and manufacturing companies.

The proposed model builds from the mathematical AHP theory with added tools and aid created from the literature studies and interviews. As the AHP theory is used, the proposed model compares the wanted factors with how well they correlates with the identified alternatives. The process of the model is described in three steps: Context definition, Context Evaluation and Alternative analysis. It is possible to create a model for licensing stations but it needs to be handle with care. The result from testing the model confirms the ambition to just show the user an indication and overview of the alternatives in the licensing situation.

The report is written in English

Keywords: license, licensing, patent, model, decision theory, AHP, situation, context.

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1 Introduction

The following introduction chapter aims to provide the reader with background, research purpose and questions. The ambition is to connect the outset purpose of this thesis with a plausible framing and basic understanding that will enable a higher understanding for coming chapters on theory, empirical findings and case studies.

1.1 Background

Intangible assets have become increasingly important in the world of business over the last few years. Especially interesting developments have taken place recently in terms of patent transactions and full-scale acquisitions of companies with substantial patent portfolios in the computer and telecom industry. Sullivan argues (2000) that the rise of the importance of Intellectual Property (IP) started in the early 1990s, and by the end of that decade the interest in IP had grown immensely, and given recent events and trends in personal computers and handheld digital devices, the importance of IP from a general perspective, is most likely to grow even further.

The currently, most interesting IP asset, in both trade magazines and commercial media, seems to be patents, and their fundamental rights given to the owner of the patent. Large scale transactions such as Google acquiring Motorola Mobile, Microsoft purchasing AOL's patent portfolio and the currently on-going prosecution between Google and Oracle are contemporary evidence of the role of patents in relation to technology development, industry progress and market attractiveness. In relation to this development, transactions of patents are evidently essential and as well as the analysis providing the fundamentals of transactions such as valuation and evaluation. This thesis has the ambition to highlight the perhaps most important part of a patent transaction, from the view of a multinational manufacturing company (MMC), namely the context evaluation and the associated analysis needed to understand and conduct a patent analysis prior a transaction.

Given the above framing of current aggregated patent transaction, the perspective of a manufacturing company might seem slightly far fetched in relation to patents and patent transactions, however the discourse and importance of patents are hardly confined to the startups and multi million dollar ventures of silicon valley, but rather a relevant *business instrument* for manufacturing companies as well as established technology development actors. As argued and discussed by Petrusson (2004) there is a currently an intellectualization of more traditional business settings, industries are today becoming more and more complicated and entangled, where intangibles are increasingly becoming more important, and not only in the traditional excluding setting.

To some extent simplified, the traditional view of a patent right is associated with the right to exclude others from a specific technology during a confined set of years. Thus the patent is a suitable way to differentiate and develop value propositions not easily imitated. However a patent right can be used in far more creative ways then just excluding competition from a specific technology. Granstrand (1999) lists several benefits springing out of the patent right, *technology protection* and *retaliatory power* representing a more traditional view of patents whereas *out-licensing*, *cross-licensing*, *cooperative R&D* and *standard-setting* are perhaps slightly more exotic ways of leveraging patents, and notably growing in importance for both high-tech companies as well as actors in more traditional industries.

On the note of the growing importance it is evidently so that there are strong converging technology trends especially in the field of electronics. However this trend is rapidly expanding into industries such as

transportation, home appliances and utility control systems. Given the nature of patents and technology development, understanding this convergence and how to manage it is deemed to be essential for all manufacturing companies. As noted by Granstrand, there are ways to do this through a well-balanced patent portfolio and (or) a willingness to pay for access and joint technology development. Though, this approach is fairly complicated and requires delicate balancing and dynamic management in relation to the goals set by the manufacturing organization undertaking this path. As the technology development, on a general aggregated level, is intensified, access to specific technology such as high-technology materials, telecommunication and computer systems does not necessarily need to take the route through in-house technology development, but rather could be acquired, in-licensed or even jointly developed. Obviously this interfaces with external actors and surroundings works both ways, hence the large potential in skilled and tailored R&D efforts within a defined core business.

With this said, and given the scope of this thesis, it would be close to misconduct not discussing the aspects of open innovation and internal capabilities in relation to this thesis purpose and overall context. Open Innovation is concept coined by Henry Chesbrough (2006), a scholar from Berkeley, University of California. The fundamentals behind Chesbrough's theory is that a company can through *collaboration* and *innovation openness* leverage both internal-, external assets and capabilities, and thus yield a potentially higher payoff and successful outcome of a development/research program. The obvious truth is that, regardless of capacity and budget, one cannot develop, employ or deploy all related technologies for a specific market. Even so, if one could do all that, in accordance with Adam Smith's (1776) elegant description of specialization as a driver behind economic development, it is preferred to apply specialization in the context of manufacturing or technology development. In the context of modern day technology development, specialization may very well be developing technology in line with the internal capabilities of an organization leverage, through a open innovation platform. Granstrand (1999) uses a fairly straightforward model constructed around to acquisitions processes (1), Resource base (2) and exploitation processes (3) illustrated below (fig. 1)

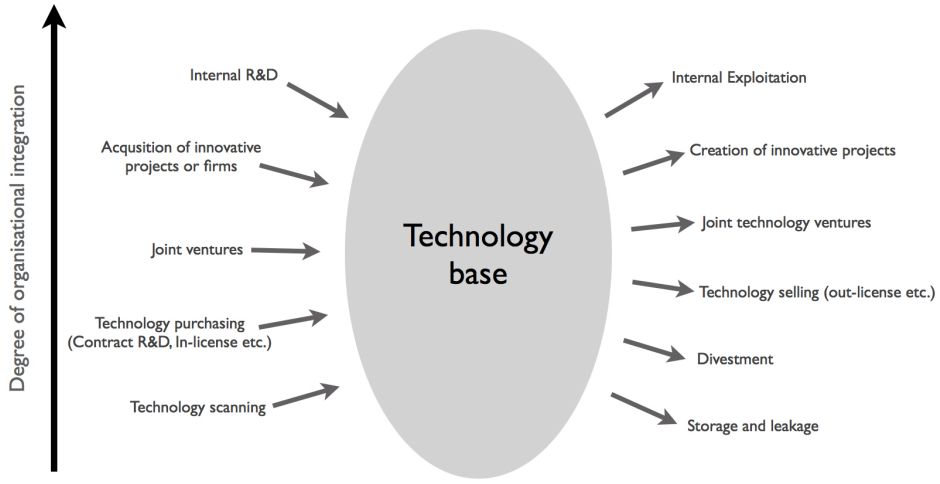


Figure 1: The Potato

This concept of technology development, even though it's fairly general characteristics, is deem to be very illustrative in relation to this thesis purpose. On the left hand side, one finds acquisition strategies in relation to technology, such as *Internal R&D*, *joint technology ventures* and *in-license,* (etc.). In the middle the technology base component is found, which is dictated by the internal capacity and dynamics of the organization. To the

right the commercialization strategies are to be found such as, joint technology ventures, technology selling/out-license and/or creation of innovative projects/firms. Seemingly this is a framework that fits well with well developed open innovation environments such as PARC, IBM and Xerox, but to some extent also reflects the more traditional manufacturing setting applied to tangible assets and physical logistics.

In relation to this framework, We see a need for a contextual approach, that can be used throughout the three identified building blocks designed by Granstrand (1999), in correspondence with the discussed setting or background above, for evaluation of patent licensing scenarios, comprising of both patent specific factors, financial analysis and technology context evaluation.

1.2 Research purpose and questions

1.2.1 Purpose of Study

The purpose of this study is to evaluate and conclude upon the usage of a decision theory in the context of patent licensing evaluation scenarios, including financial factors, technology factors and legal factors. The context in which this study is taking place is a multinational manufacturing corporation (MMC). Thus the purpose, in a clear-cut version is,

Develop a framework for patent licensing evaluation, consisting of financial, technical and legal factors by using a decision theory, in the context of a multinational manufacturing corporation.

The aim is that by the end of this project, a beta version of a plausible framework for licensing evaluation will be developed and tested in relation to the context of a large and international manufacturing company, whom not traditionally have used licensing for acquiring technology and/or increase revenue.

We recognizes the complexity in relation to the rather large task taken upon ourselves, and thus would like to emphasize the framework as a beta version, which is yet to be developed further, by others or ourselves. In addition, the proposed model could potentially be used in other related contexts with regards to Patent and patent transactions.

1.2.2 Problem Introduction

In relation to the above-defined purpose the following problem introduction aims to break down the overall purpose into 4 sub-questions, in order to highlight the different aspects of the purpose as such,

- Describe and analysis established ways valuate licensing from a financial perspective, built upon the specific factors of Multinational manufacturing corporation

There are multiple ways of valuation, and even so within the field of intellectual property. The goal is to review the most common methods that could potentially fit the MMC context, and the needs of such an organization. With a pro and con approach to each model, and a predefined context, the goal is to reach a consensus of a best valuation approach, both for in and out licensing. The aim is to do this combining both literature studies and conducting interviews.

- Describe and analyze patent specific factors that are important from a licensing evaluation point of view, such as claim construction, ease of infringement detection, validity and ease of invent around

One issue, or perhaps hinder, when vaulting intellectual property is that you need to combine patent specific factors in to the valuation, which poses a tricky challenge. In these cases, it will be essential to understand the scope of the IP specific factors in relation to the licensing context.

- Describe and analyze a reasonable approach combining an existing decision theory, with the above-mentioned factors, for context specific patent evaluation.

In order to actually establish a reasonable evaluation approach for a single patent, or a portfolio, in general terms a set of assumptions is needed, regarding markets, technology, and the portfolio/patent itself. The aim is to combine this with a decision theory that produces a contextual based evaluation for the factors of importance in relation to what context you could potentially leverage your patents in. The de

- Analyze and conclude upon the proposed model as we test it on a confined set of patents. This fourth sub-question acts as a synthesis step in relation to the above-described approach.

To fully understand the evaluation model, we shall test the approach on two scenarios, one in-license opportunity and one out-license opportunity. In this setting the ambition is to test the model for sensitivity for specific factors, and also reevaluate certain parts of the framework.

1.2.3 Delimitations

We would like to delimitate us to a narrow, contextual approach in this thesis project. The aim is to understand and develop a framework for *patent specific licensing evaluation* in the context multinational manufacturing corporation, however an outcome could potentially be used as a foundation of framework that would fit other circumstances and contexts. Thus, we are focusing on understanding and developing a decision theory in the context of patent evaluation and associated factors. These factors include financial/income factors, legal factors and technical factors.

In addition, the testing of a model and the associated analysis including a final result of will be limited to pilot studies on two patent licensing scenarios. Thus, the result of the study will be confined to a specific setting, which will be well described and analyzed. How these patents are selected will be described in detail in the methodology chapter.

1.3 Thesis Disposition

For a simplified overview of the thesis content, and how it has been structured, this section aims to introduce the eight following chapters, after this introduction chapter.

Introduction and theory

Chapter 2 and 3 aims to introduce the reader to patents, patent valuation, patent licensing and decision theory used in this thesis.

Research, methodology and interviews

Chapter 4 and 5 introduces the research as such and its methodology, and the outcome of the interviews conducted in relation to the thesis purpose.

Framework and case studies

Concluded from the studies, in chapter 6 and 7 we introduce the proposed licensing evaluation framework and test it in the associated case studies.

Discussion and Conclusions

As a wrap up, the thesis purpose, research questions and proposed framework are discussed and analyzed, as well as presented with conclusions in chapter 8 and 9.

1.4 Acknowledgements

This Master thesis has been written in parallel with an internship at Volvo Corporate Intellectual Property department (VCIP). The internship has been a great opportunity for us to leverage what we have learned during our two years of studies at ICM. We would like to thank our supervisors at VCIP, Janina and Henrik, who helped us to understand the context and reason to why this thesis should be written. It has been very valuable for us to have two such experienced and knowledgeable supervisors.

We would also like to thank our academic supervisors Magnus and Christoffer, they have been of great help to keep the thesis on track and their comments has given us insights that have made improvements of the thesis possible. As well as the interviewees that gave us good feedback on our idea of the proposed model. A special thank to our beloved classmates at ICM that enabled a fun and dynamic environment for us during the thesis time but also through the whole education.

2 Introduction to IP, Patent valuation & Patent Licensing

This chapter aims to provide the reader with the basic understanding of the Patent right, Patent Valuation and Patent Licensing. These three subjects are complicated intellectual constructions, where the context is setting the pace and potential, which in turn correlates with the patent right as such. The ambition is that this chapter should act as a crash course in basic patent knowledge leading into the following chapters directly related to the purpose of this thesis and licensing evaluation.

2.1.1 Patents and the Patent right

As introduced in the Background section in chapter 1, patents can and should be considered a business instrument that can be used for building value propositions, market position strategies and dynamic innovation processes. However, the most common view of a patent is perhaps that it is a property right that grants an inventor the right to a monopoly on a new invention or technology. The historical background to the patent system, at least on theoretical level, is that the structure should serve as a incentive for inventions and technical development which would benefit the society. For a person not introduced to the world of patents this might seem like a straightforward practice, where giant pharmaceutical companies or high-tech conglomerates in Silicon Valley can obtain the right of excluding others from using their invented technology. In reality, however, obtaining and enforcing a patent is a rather complex matter. Hence the need for this chapter, to highlight fundamental aspects of a patent and what is associated with a patent right.

2.1.2 The fundamentals of patentability

To simplify somewhat, there are two main patent jurisdictions of the world, the United States Patent Office (USPTO) and the European Patent Office (EPO). Perhaps one could argue that this is about to change with the emerging economies of Asia, but as of now, these two jurisdictions are setting the pace of patenting activity and how the evaluation of the patent right is being conducted.

The USPTO grants patents on the basis of the following three categories, in accordance with the US Patent Act (U.S. Patent Act -- 35 USCS Sects. Part II)

- Utility patents may be granted to anyone who invents or discovers any new and useful process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof;
- Design patents may be granted to anyone who invents a new, original, and ornamental design for an article of manufacture; and
- Plant patents may be granted to anyone who invents or discovers and asexually reproduces any distinct and new variety of plant.

The EPO system, which is a harmonized system in Europe for patents, has a narrower staring point for what is patentable, excluding business models, design, computer programs and most plants as non-patentable, according to the European Patent convention (EPC 1973, article 52, 53).

Furthermore, USPTO and EPO differ in the context of the patentability criteria. USPTO requires *non-obviousness, utility* and *novelty* for a invention to be granted a patent. EPO instead has the following 3 criteria, *industrial application*, *novelty* and *inventive step*, for granting a invention the protection of the patent right. These

criteria, both USPTO and EPO, is the key concepts in which the right of a patent is defined, and thus when debated in court, the outcome of a patent analysis based upon these criteria, could potentially lead to large sums in damages for an infringing actor (Levin 2007). Hence these are the basics of any patent evaluation approach, to assess the value or strength of a patent in relation to an infringement. Commonly shared with the two jurisdiction is that they are trying to convey the necessity of industrial application and/or utility in relation to the invention. The USPTO non-obvious concept is to rule out potential obvious inventions in relation to a person *skilled in the art*, which is similar to EPO requirement of the inventive step. Novelty is a worldwide criteria, and thus, if an invention has been disclosed anywhere in the world it could not be patented, which of course is subjected to how the invention has been disclosed.

Even the patent application process could be described in rather complex terms. Though describing the application process in detail is deemed to fall outside of the scope of this thesis, the simplified story takes a starting point in an invention. The invention, invented by an inventor who wishes to file for a patent, will do so with the help a patent attorney drafting the patent in accordance with the standards of a patent application. This application is submitted to a patent office (anyone of choice), and kept confidential for 18 months and then published for public display and after an additional 18 months the patent is granted.

2.1.3 Legislations

The national patent and trademark offices are the organization that analyze, decides and grants patent (Levin 2007). This process includes a patentability analysis by a patent examiner, in relation to the discussion above. Normally this process should take approximately 3 years, but according to Malek and Zerihoun (2008) the average patent application process takes longer than the 3 years and thus in many cases fail to answer to the outset regulations of the granting process. Another important aspect in relation to a subjected patent application grant, is that the filing needs to withstand potential claims for other parties once the patent has been published. This is, in practice, not a very easy process, as it is subjected to interpretations and negotiations as most legal disputes, and could potentially end up in court.

The litigation process, can with some advantage as it illustrates the complexity of a patent right, be described in accordance with the reasoning of Petrusson (2005) and Malek et al (2008), where three specific arenas effects the patent from its inception phase (filing) throughout its 20 year long lifespan. A patent has to be filed and granted in the administrative arena, incorporated into a product or a transactional setting in the business arena and potentially processed in a court of law i.e. in the judicial arena.

2.1.4 Infringement

Infringement analysis is utmost important in relation to patent licensing or commercialization scenarios, as it dictates the estimated financial value of the patent(s). An infringement in general refers to a prohibited use of a technology claimed by a patent. However, patent infringement can according to Littorin et al (2010), be done in two ways, either through a direct infringement or an indirect infringement. As argued by Littorin et al (2010) no indirect infringement can take places unless there is a direct infringement being conducted by someone. Also distinct differences between the two infringements types are that direct infringement needs to be intentional, whereas indirect infringement must not be intentional in relation to a lawsuit. There are two classes of indirect infringement, inductive and contributory. As their names indicates inductive infringements requires encouragement of direct infringement, and contributory indirect infringement is subjected to active participation in the supply of components (or similar).

2.2 Financial patent valuation

The financial literature is fairly dense, so we have chosen to focus upon the most relevant valuation approach for patent specific financial valuation. And from the references reviewed We can conclude, without be too limited, that there three general ways of valuation from a general stand point of view (Shigeki 2006),

1) Cost-based valuation
2) Market based valuation and
3) Income based valuation

Below three approaches are described from the perspective of general advantages and drawbacks, and also highlighted (when applicable) different subcategories in relation to the methodology.

2.2.1 Cost-based valuation

The cost based approach is built upon the assessment process of established costs in relation to a service or a product. In the context of patent valuation cost structures such as technology development, costs associated with patent filing and annual payments are to be included. In general the term *creation cost* describes the gist of the approach, where all the cost associated to the development phase is summarized and added to the valuation calculation. Creation costs in combination with methods such, as *cost-plus* where the aimed level of financial return is added to the costs is a fairly established methodology. According to Razgaitis (2009) and Grönberg et al (2009). In the context of patent valuation this creation costs are either established by calculating the total costs of development (as described above) or by assessing the cost structure of alternative technology and/or developing an alternative technology, thus estimating an *invent-around cost* for developing a specific technology.

The main advantage of Cost-based valuation is that is deemed to be fairly straightforward and easily implemented according to Shigeki (2006). As the methodology is logical from a basic economic perspective there is little room for argumentation of accuracy in the model. Subjected to how transaction intensive (acquisitions) the specific field of patents is, IP associated costs in relation to such a transaction could potentially be relevant from a valuation perspective. However, such information is usually very hard to come by, and could potentially also be misleading according to Grönberg et al (2009). From the perspective of accounting a patent portfolio could get its baseline value from its costs, i.e. the value should at least represent the cost of patent portfolio (both development and maintenance costs).

According to Razgaitis (2009) the income based approach could be questioned in the context of patent valuation, as it does not reflect the customer/user utility. The development cost of an invention does seldom reflect the actual value of the invention that could potentially save millions, but only cost a few euros to develop. Obviously that argumentation works in both directions, as an invention that has costs million of euros to develop does not always correspond to the market pricing mechanism. As for low development costs, the limited monopoly granted to the patent right (see above), offsets the function of the market driving the utility value towards the costs of development, which at least in theory, would be the case of the market dynamics with an optimized equilibrium.

2.2.2 Market-based valuation

The essence of a market based valuation approach is to compare a current transaction with previous transaction and the end price for such analysis, according to Razgaitis (2009). The basic reasoning is for this method is that the market place, with the function of price setting, i.e. valuation should be a suitable benchmark for a valuation of a patent. In market based valuation process factors such as industry standard as

well as ranking/rating systems are used to illustrate and correlate the current patents being valued with previous transactions.

This approach is well established on markets with established technology, which is comparable. It the context of patents, market valuation could be used when a previous patent transaction has been made of a specific technical function, and the information is publicly known. The idea is that a similar patent with similar usage and scope would be valued similarly. The approach is, according to Razgaitis (2009), a suitable when preparing negotiations and *proof packages* (please see below, section 2.3) with high similarity to the current technology and context.

When it comes to the drawbacks of market valuation methodology for patents, is the often evident lack of reliable information, even though these days information on patent transactions are more public than earlier, at least if in terms of auctions and acquiring patent portfolios. In the context of licensing the needed information seldom, if ever, reaches the light of day in line with Razgaitis reasoning (2009).

In addition, a patent, per say, is unique, which on at least a theoretical level undermines all market based evaluation approaches. However, as mentioned above, when a similar technical function, which is covered by a patent, have been transacted before, it is likely that some synergies exist. Aggregated patent data according to Allison et al (2004), from large patent portfolio transactions, is widely used as patent value indicators. Factors as citations, number of claims and claim construction are established indicators. However that approach would only bear value if a large patent portfolio is transacted, and not few or a single patent, as such statistical models/approach comes with high uncertainties, especially if the sample is small.

Another aspect of the market valuation approach is that patent licensing is usually a package solution, where background and complementary assets are included. This situation complicates the valuation, as it in such a context has to be in the package. That is most likely invisible from outside of the negotiation (Grönberg et al 2009).

2.2.3 Income-based valuation

The income-based valuation is built around the income specific assets, in this case one or several patents with a lifetime of up to 20 years, and their attributed revenues. The most common, and also most excepted, income-based approach is the discounted cash-flow analysis (DCF), where the core is built around a discount rate that enables the analysis to conclude upon a net present value (NPV). The discount rate is received through a straightforward economic model, the CAPM calculation (Reilly et al 2004),

$$E(R_i) = R_f + \beta_i * \left(E(R_m) - R_f\right)$$

$E(R_i)$ - Expected rate of return
R_f - Rate of return on a risk free investment
β - Beta
R_m - Risk premium for the specific market

The ambition is that the discount rate should take the inflation, liquidity and risk premium into account. The above equation, known as CAPM, is an established way of calculating the discount rate. The equation consists of two components, a systemic and non-systemic risk. Thus, the combining the CAPM approach the expected cash flows of a specific patent(s) enables to incorporate a alternative cost into the discount rate and thus rise the analysis level in terms of specific risks and comparable investments (Grönberg et al 2009).

Associate to the income-based valuation methodology there are several more exotic approaches to valuing patents, such as Monte Carlo simulations, Black-Scholes option pricing model and binomial trees (Razgaitis, 2009). We have made the assessment that those methods falls outside of the scope of this thesis, however deemed to be important to inform the reader that the Income-based valuation approaches comes with several other sub-methods, which are fairly complex in their character.

As for advantages with the Income-based approach, or more precisely the DCF analysis, is that the model includes the value of utility, at least in theory, according to Shigeki (2006). This in combination with the models widespread establishment adds to the ease of use and communicative advantages. As the model is built around the discount rate, risk can be included into the calculations, the model could be considered to be dynamic and adaptable for any given situation subjected to a cash flow.

When it comes to drawbacks of the DCF analysis the main disadvantage is the assumptions that needs to be made and the inaccuracy that faulty assumptions might bring to the valuation. Thus, the analysis should ideally be made be a person specifically skilled in the valuation in relation to a context, so that assumptions can be identified and accounted for. Valuing a novel technology, that has yet to be incorporated into a product is a fairly complicated task, and would require several assumptions both on the patent level and the market and financial estimations according to Razgaitis (2009).

2.3 Patent Licensing

Patent licensing takes as starting point in the Patent right, which is described above (see section 2.1), where the owner of the patent right can grant other actors or individuals the right to, under restricted (subjected to the terms of the license) forms, usage and exploit the rights of the technology covered by the patent. The licenses fundamental component is that the potential licensees are conducting an infringement (either direct or indirect, please se above section 2.1.4). The illustration below visualize the starting point of the licensing business model,

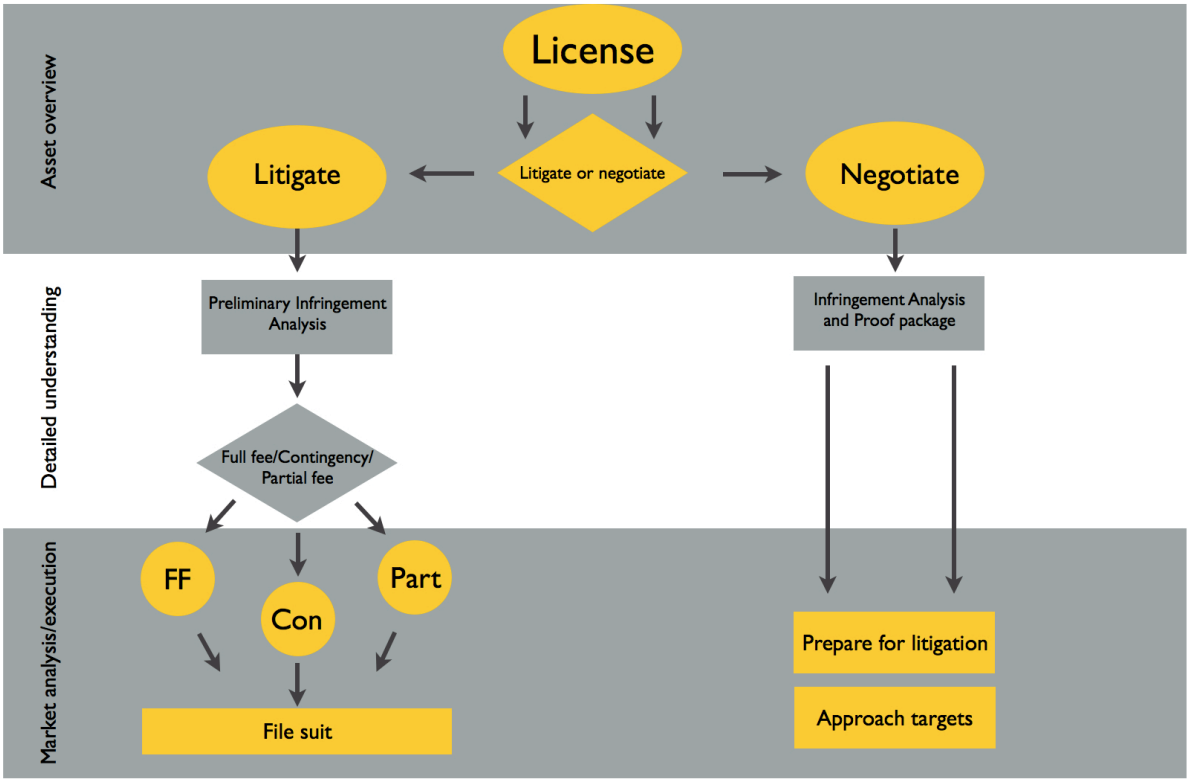


Figure 2: Licensing overview illustration

This illustration provides a fairly straightforward process in relation to monetizing patents through licensing, however, as argued by Opperman and Kaufman (IAM, 2012), patent monetization is a non-trivial, complex task that requires deep pockets and a strong confidence. This section aims to describe this complexity, to the extent possible, and illustrate the different general steps associated with a licensing business model.

The illustration shows two alternative starting points for a license, *litigation* and *negotiation*. Another used name of litigation is stick licensing and negotiation is commonly referred to as a carrot licensing, with some variances. However both approaches comes down to the essence of being able and willing to proceed to a court of law, where the potential dispute should be regulated, according to Opperman and Kaufman (IAM, 2012). The litigation approach is perhaps more determined to go all the way, as there is no identified room for negotiation. The steps of the infringement analysis consist of mapping the claims of the infringed patent to the infringement as such, building up a *proof package*. The negotiation approach, which is not radically different, takes a starting in point in identifying potential infringers and how the infringement correlates with the patent claims, in similarity with the litigation approach. The negotiation approach however takes a starting point in a zone of possible agreement in relation to the infringement, and aims to settle the dispute before it reaches a court of law.

Before the licensing path is to be chosen the patents (assets) needs to be reviewed, Opperman and Kaufman (IAM, 2012) propose the following approach, consisting of 3 basic steps,

1) Asset overview
2) Detailed asset understanding
3) Market analysis and execution

Asset overview refers to the basic is step of assessing what the patent vault might treasure. Obviously this a very important step, as the context of *what* patents and *how* these patents could be leverage is crucial. It might seem trivial, but according to Opperman and Kaufman (IAM, 2012), a large amount of corporations has a low understanding for their own IP portfolio, in some regards not even possible to assess from a portfolio perspective. Hence one of the main tasks in this step is group and aggregate patents into different categories and portfolios, with connections to the current business objectives.

The detailed asset understanding is on the claim level of the grouped patent portfolios. Which in practice means to fully understand what the claim covers, and to what extent some external actor is infringing them. This is a time consuming activity, which need experts from different technology areas and also legal experts in relation to the infringement situation according to Opperman and Kaufman (IAM, 2012).

The 3rd step, comprising of a combination of market analysis and execution is where the analysis and evidence built up is being put to test. This is where either a settlement is reached or a the proceedings of a court is tested (depending upon chosen path). This is also the step where the estimated value and contextual aspects of the patents are put to the test.

2.4 Concluding patent introductory remarks

This chapter could perhaps been viewed as rather rushed in relation to the magnitude of its content. We apologies for any shortcomings and lack of pedagogic detail in relation to the content of this chapter, however by reading this chapter the reader should have basic understanding of the concepts of patents, valuation and licensing. Obviously extending this chapter would have aided to unversed reader further, however the literature on these topics is vast, and from the purpose of this thesis, perhaps would have caused more stir and confusion than enlightenment.

3 Underlying decision theory

This chapter describes the chosen underlying decision theory, which is the Analytical Hierarchy Process created by Saaty in late 1970s. The chapter will go through the basics of decision theory, then a comparison with a motivation of chosen theory, and finally illustrate with an example of the mathematical process in the AHP theory.

The Analytical Hierarchy Process (AHP) is a mathematical theory that aims to provide clearance in the complicated and troublesome decision chains. It is ideal to evaluate different alternative in relation to each other, as it weights the factors and computes the relative most important factors in the analysis. The ambition is that the theory is to be used in the proposed model to structure, rank and help the user to navigate through a licensing process.

3.1 Introduction

AHP was developed during the late 1970's by Thomas L. Saaty and published in 1980. The methodology is based upon the mathematical approach where factors of valuation are assigned a number in relation to another factor. Thus, the different factors included in the process are weighted towards each other, to establish a coherent and precise evaluation of the factors, in this case factors of patent valuation. The process can be described as the following 5 steps according to Saaty (1980),

1) Model the problem - describe the problem as a hierarchy containing a decision goal. The alternatives for research the goal and criteria for doing so shall be included in the process.
2) Establish priorities among the elements - primarily built upon judgments, sources of information and/or assumptions.
3) Synthesize the judgments - based upon the information source to build an overall hierarchy with imbedded priorities.
4) Analyze the consistency - The judgments in the process should be analyzed from a consistency perspective.
5) Final value - Based on the hierarchy and the value assigned to each element

Many decision models are today adapted to be quantitative calculated by a computer, the factors are reduced to numbers measured in seconds, kilos or dollars. The loyalty in these models depends on the quality of the simplification and assumptions. The incorrect results from these are then blamed on the capricious human behavior, politics or other factors but it is these types of factors, which exists in many models applied today, that a loyal model must eliminate. The AHP model is doing this by include and then measure all important tangible or intangible, qualitative or quantitative factor.

The AHP is based on the innate process in of operation of the human mind. When a person faces a complex situation containing a multitude of elements, they aggregate the elements into groups depending on the properties of the elements. The elements can also, one after the other, by comparing the properties be set a higher level than another element. In the end, the elements are ranked and a top element is decided, which often is the goal of the decision making process.

3.2 Alternative decision theories

The choice of using AHP in this model was not obvious; there are many decision theories out there. *Nils* Rosén (2009) mentioned in his thesis models suitable for similar situations as this model and they are summarizes in table (1) below.

Name	Origin	Characteristics
Multiple-Criteria Decision Aid	Vlahavas et al., 1999	MCDA as a methodology aimed at evaluation problems where the final result depends upon on many criteria.
Analytical Hierarchical Process	Tomas Saaty, 1970s	Applicable to a very wide range of decision-making problems. Examples of classic applications of AHP tools within the decision-making realm are planning, selecting a best alternative, resource allocations, resolving conflict.
The PECA process for COTS evaluation	Software Engineering Institute, 2000s	The process could help organizations make informed and well reasoned decisions when procuring software products.
Goal Question Metric	Basili, 1984	This methodology is goal- driven and the outcome of applying GQM to a certain problem is a specification on a measurement system that targets a particular set of issues and rules.

Table 1:*Decision theories*

All decision theories have its advantages and disadvantages but Saaty's decision theory has been chosen in the model due to its flexibility. Saaty's theory has not been developed to be used in a specific purpose but rather to imitate human's natural decision process, which was the main reason why AHP was chosen. The second alternative was MCDA that is similar to AHP but was not chosen due to it was more complex and predefined compared to the AHP theory.

To describe the motivation for AHP even further it lays in human's oblivious ranking process when making decisions. That hierarchy thinking is often used to describe to rank and organize elements but in most cases the hierarchy is defined by a rough diagram and chart without mention how much the elements differ from each other. It is in the hierarchy part AHP contributes most, as it has a mathematical way of describing the ranking between the elements in the meaning of which is most important.

It should though be said that Saaty's theory has some disadvantages when it comes to the application area discussed in this thesis. The most critical, that has been identified, is the insecurity of the result. The theory does not have the possibility to handle insecurity that is brought up in the decision process. The possibility to add and later see in the hierarchy result what types of insecurities identified is a feature that would make Saaty's theory fit better into the proposed model.

Other criticism pointed at AHP, which did not affect the choice of theory in the model but considered, was made by Forman et al. 1999. They argued that the phenomenon about Reverse ranking is a disadvantage in AHP. Decision making processes involves ranking alternatives in terms of factors from those alternatives. For some decision theories it is obvious that when new alternatives are added to the decision problem, the

previous ranking of the factors or alternatives must not change, which means that Rank reversal most not happen. AHP does not adhere to the rank reversal, which could be a danger in some situations according to them. This issue was not considered to be of momentousness in the process of choosing decision theory.

3.3 When to use it

AHP has according to (Coyle, 2004) a very wide spectrum of use, but to give an idea of a decision situation where it could be used, imaging the following hypothetical situation:

A company wants to improve its machine park and is in the need of a new piece of equipment of a certain type. The equipment has four aspect that the purchase depends on: expense, E; operability, O; reliability, R; and adaptability for other uses, or flexibility, F. Three types of equipment, X, Y and Z, are identified and sold by three different competing manufactures. The company's engineers have looked at the different alternatives and have come up with that X is cheap and easy to operate but is not very stable and it is hard to adapt it to different application areas. Secondly Y is a bit more expensive, is pretty easy to operate, and is very reliable but not very adaptable to different areas. Finally, Z is very expensive, not that easy to operate, is a little less reliable than Y but is claimed by the manufacturer to be very adaptable to alternative uses. Each of X, Y and Z will satisfy the company's need but in different ways. The AHP theory will sort out what equipment that will best meets this company's needs?

Due to the theory's is relatively openness and that it is created to be used in a widely spread range of applications as long as it has to do with decision making depending on property factors (Coyle, 2004). It has been widely used since its introduction 1980 and according to the creator, it is especially popular in military decisions. Below are some published application areas: (Saaty, Decision making with the analytic hierarchy process, 2008)

- In 2001, it was used to determine the best relocation site for the earthquake devastated Turkish city Adapazari.
- British Airways used it in 1998 to choose the entertainment system vendor for its entire fleet of airplanes.
- A company used it in 1987 to choose the best type of platform to build to drill for oil in the North Atlantic. A platform costs around 3 billion dollars to build, but the demolition cost was an even more significant factor in the decision.
- The process was applied to the US versus China conflict in the intellectual property rights battle of 1995 over Chinese individuals copying music, video and software tapes and CD's. An AHP analysis involving three hierarchies for
- The General Services Administration (GSA) of the USA used AHP to support their annual Information Technology Council (ITC) and Council of Controllers (COC) meeting to prioritize their major information technology initiatives. They used the process to refine their analytical framework, prioritize their criteria and then rate each IT initiative against them. The result was the first-ever GSA-wide prioritization of major IT initiatives, which included a benefit-cost analysis and a benefit-risk analysis.

The variety of the application area mentioned by Saaty shows the strength in the theory; it could be adapted to many types of situations where different types of factors govern the decision.

An evaluation theory is one of the underlying theories in the proposed model, the role of the theory is to aid the user of the model to prioritize between the situation's alternatives but it does also give the user the possibility to think and reflect upon the needs.

3.4 Technical introduction and methodology

The overall process of the methodology of the theory looks like figure 3 (below). It is based upon one sub-process that is iterated over several steps to achieve a satisfying hierarchy and guidance that will help in the decision.

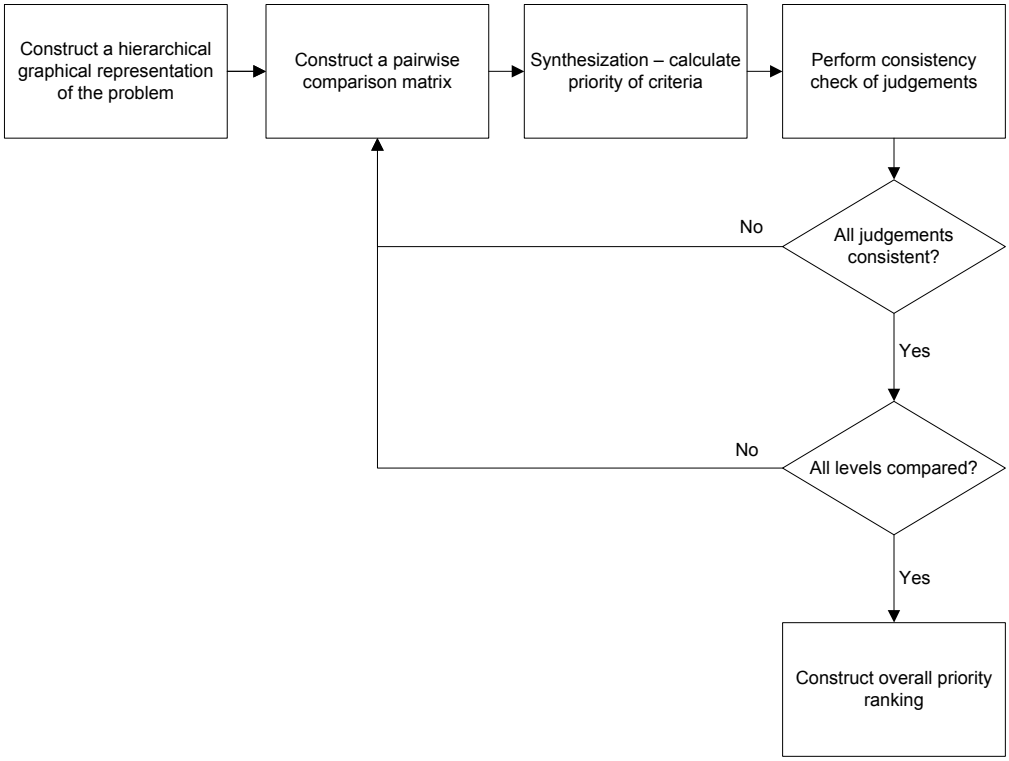


Figure 3: AHP process (Rosén, 2009)

The first step could be compared to the story told above about the company that whished to buy a new piece of equipment. It is when the user identify the decision problem and structure up its need and the alternatives. Then it is time to the core of the theory, the process that it iterated over bigger parts of the theory, when the user pairwise compare the identified factors (mentioned above, in the company story as aspects). (Coyle, 2004) The comparison between two factors are valuated by numbers from the following table (table 2) that is introduced by Saaty 1990.

Intensity of importance	Definition	Explanation
1	Equal importance	Two factors contribute equally to the objective
3	Somewhat more important	Experience and judgment slightly favor one over the other.
5	Much more important	Experience and judgment strongly favor one over the other.
7	Very much more important	Experience and judgment very strongly favor one over the other. Its importance is demonstrated in practice.

9	Absolutely more important.	The evidence favoring one over the other is of the highest possible validity.
2, 4, 6, 8	Intermediate values	When compromise is needed

Table 2:*AHP ranking values*

If factor E is very much more important than factor R, then that E is rated at 7, then R must be very much less important A and is therefore valued at 1/7. This is carried out for all factors and the result is booked in an N x N matrix. If taken the example with the company, the matrix could look like table 3 below. Bear in mind the meaning if the letters: expense, E; operability, O; reliability, R; and adaptability for other uses, or flexibility, F.

	E	**O**	**R**	**F**
E	1	1/3	7	1
O	3	1	5	1/5
R	1/7	1/5	1	1/5
F	1	1	5	1

Table 3:*AHP factor table example*

When all factors are weighted against each other and the matrix (let us call it A) is filled, the next stage is to calculate the consistency ratio (CR). The CR measures how consistent the judgment has been relative to large samples of random judgments. If the CR is much in excess of 0.1, Saaty (1980) has defined it so that the judgments are untrustworthy due to its proximity to randomness and the comparison must therefore be repeated until a valid CR is received. The CR is calculated with help from the consistency index (CI), which is calculated from:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (1)$$

Where n is number of factors and λ_{max} is scalar that fulfills the following equation:

$$A\omega = \lambda_{max}\omega \quad (2)$$

For matrix A, ω is said to be an eigenvector (of order n) and λ is an eigenvalue. For a consistent matrix, λ = n. Matrices that involves human judgment, the previous condition does not hold as human judgments are more or less inconsistent. That case, the ω vector satisfies the equation (2). The eigenvector for the matrix A could be calculated in several ways but though multiplying together all entries for each row of a the matrix and then taking the n^{th} root of that product then the n^{th} roots are summed and that sum is used to normalize the eigenvector elements to add to 1.00. That would give a good approximation to the correct eigenvector. The eigenvector for matrix A would then be according to table 4. This eigenvector is also the company's judgment of how much each factor is valued to (called the Relative Value Vector - RVV).

	E	O	R	F	4th root of product	Eigenvector
E	1	1/3	7	1	1.236	0.286
O	3	1	5	1/5	1.316	0.305
R	1/7	1/5	1	1/5	0.275	0.064
F	1	1	5	1	1.495	0.346
Total					4.322	1.000

Table 4:*AHP eigenvector example*

Next step is to calculate λ_{max} that would lead to CI. The matrix operations run according to (2) would result in the right side vector to (1.1817; 1.5522; 0.2351; 1.2570). λ_{max} is then received through simple expedient of dividing each component of the vector with the corresponding element in the eigenvector. This gives us λ_{max} to be (4.1317; 5.0892; 3.6728; 3.6329) which has the mean as 4.131 and that is the estimate for λ_{max}.

Equation (1) will give us a CI that is 0.044. Saaty argues that to calculate the CR, that would indicate the trustworthiness of the comparison, the CI is compared to a corresponding value from large sample of matrices of purely random judgments; the following table comes from his book:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

Table 5: *AHP random judgments*

This example when, n=4 gives us CR = 0.044/0.90 which is 0.049. The CR from this example is therefore trustworthy according to Saaty as it is below 0.1. AHP is have been reported to be misused on some occasions when the analyzer have stopped calculating after the eigenvector from the pairwise comparisons of relative importance, without checking the CR. But the strength in AHP lies in the whole process to get hierarchy; it is after all called to be a Hierarchy process.

So, next step in the process would be to analyze the alternatives that exist and for the company example there are three, which have different characteristics. The same pairwise comparison is performed but one factor is compared between two alternatives. For example is alternative X's reliability much more important than alternative Y's and so on for all alternatives and all factors. For example can the matrix for operability look like table 6 with the eigenvector to be (0.480; 0.406; 0.114) and CR to be 0.026.

	X	Y	Z
X	1	1	5
Y	1	1	3
X	1/5	1/3	1

Table 6:*AHP alternative comparison example*

The eigenvectors are then transferred to summarizing matrix and could at the end look like (Table 7).

	E	O	R	F
X	0.751	0.480	0.077	0.066
Y	0.178	0.406	0.231	0.615
X	0.071	0.114	0.692	0.319

Table 7:*AHP option performance matrix example*

The matrix is, by Saaty, called the Option Performance Matrix (OPM) and is supposed to be read that X is far better than Y and Z in terms of cost; it is a little better than Y in terms of operability, however, X is of limited value in terms of reliability and flexibility. Bare in mind that these values are not absolute, they are relatively compared with each other and can only be read out as relative.

In the absolute final step, to get to which alternative the company should go for, the company's judgments (the first calculated eigenvector, the RVV) and compare it with the matrix with each alternative's factors, the OPM. The result is received by performing a post-multiplication between OPM by the RVV (OPM*RVV=VFM) to obtain the vector for the respective abilities of these machines to meet the firm's needs. It comes out to the vector (0.392; 0.406; 0.204) and could be called the Value For Money vector (VFM). In some words it could be represented as:

$$performance * requirement = \ value\ for\ money$$

The AHP process is most often not done manually, through matrix operations, etc., but rather in graphically pretty designed software. This example is only one application area for AHP but as understood, the decision situation could look very different and still AHP is able to master it. That is taken into consideration when applying the theory to a licensing situation model.

4 Research methodology

The methodology used in this thesis has been developed around three sources of information, *literature studies, interviews* and *case studies*. The following chapter aims to provide a deeper description of how and why the research has been conducted throughout the specific methods and procedures. In general, however, the thesis is qualitative based, and thus a large part of the focus has been aimed towards finding qualitative sources. Adding to this approach, by using a more traditional research language, the thesis as such falls under the normative category of research, where the aim is to evaluate and analysis different approaches to licensing evaluation, and the different associated sub-factors of those approaches. Linking back to the problematic of finding references and sources of information to support the research question is the main motivation to the approach described below.

The starting point of the methodology used in this thesis lies in the problem formulation, which can be described by the illustration below, inspired by Booth et al (2003). The illustration highlights the nature of the research problem, and the associated identified steps in relation to reaching an answer to the research question(s),

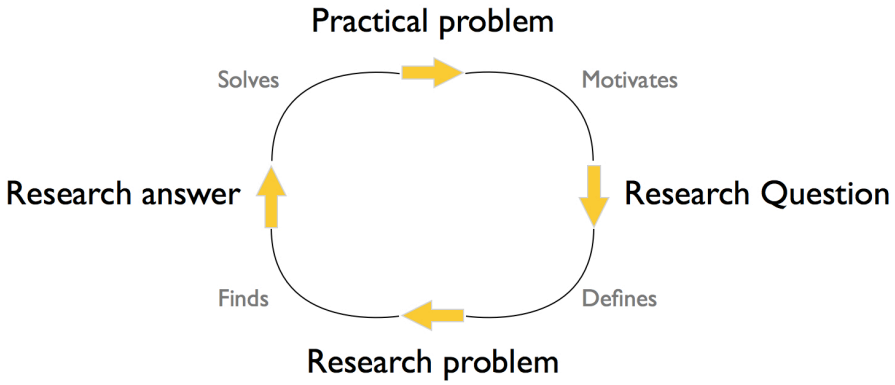


Figure 4: Research methodology

The nature of this thesis is fairly practical in the sense that the research takes a starting point in well defined problem correlating with the paradigm change in manufacturing and technology development for large multinational manufacturing corporations (MMC), where traditional business models are perhaps not always the ideal approach to maximize output from intangible assets. And in accordance with the illustration above, that context motivates the research question as such. This in turn leads us into the research problem, which dictates the methodology of how the question and the problem should be solved and/or addressed. The left side of the illustration leads into the methodology and how it has been used. Below is a description of the three sources of information used in this thesis, and how they correlate with the illustration above and the research question. The sources of information and intelligence of this thesis takes a starting point in the following three identified related areas,

1) Business factors
2) Technical aspects
3) Patent specific legislation

In the world of patents and intangibles these three fundamental areas are strongly correlating and overlapping, especially in relation to complexity of licensing.

4.1 Literature studies

The literature reviewed in this thesis is primarily focused upon the licensing from the academic perspective. The literature has been identified through public databases, databases of the Chalmers University of Technology and the University of Gothenburg, and in discussions with our tutors. We have also iterated the literature found to analyze their references, even though that particular approach is almost never ending, we have had some success in identifying critical literature for the purpose of this thesis using this method.

The selection of literature is built around the identified complexity of the thesis topic, *licensing evaluation*, and thus aims to cover the three areas of a licensing evaluation methodology, business, legal and technical aspects. We recognize the weakness of using primarily academic literature references, however finding and reviewing business-originated literature is complex, and perhaps even more time consuming in terms of critically assessing their methodology and approach. The combined literature and interview approach is constructed to bridge the potential gap between academia and the business-oriented approaches.

4.2 Interview methodology

The interviews conducted in relation to this thesis have been put together with the same starting point as the literature have been selected, taking a stand in the business field, the legal field and the technical field. We have done nine interviews (see chapter 4), with professionals in the previously mentioned fields.

4.2.1 Structure and data management

To structure the interviews three different templates were designed (see Appendix B), cover the questions and aspects to be answered in relation to each expert and their particular field. Interviewing experts in the field of patents evaluation and commercialization is a fairly complicated task, as the code of secrecy is always present, which forced us to be very dynamic and flexible in relation to the predetermined questions, and hence the potential answers and outcome.

The interviews have been either conducted through phone or meeting up with the interviewee in person. Both authors have been present during all interviews, assigned to ask certain questions and following specific leads that was predicted. Obviously this approach had to be very dynamic and adapted to the interviewees' answers. During the interviews, both authors have independently kept notes, according to the individual structure. Once the interviews ended, the notes where cross-matched and discussed and answers where received from the overall impression/notions of the interview. As a next step we summarized the notes, and structured them according to the interview template and finally summarized the joint impressions and answers into a text.

4.2.2 Formulating the general questions

The formulation of the general questions (displayed in Appendix B) is built around a 3-step process, particularly relevant from a structural perspective,

1) Within which field is this person an expert?
2) How does that relate to the research question and/or purpose?
3) What is this person's view of best practice in his/her particular field?

Given the fact that the interviewees has diverse backgrounds and experience, it have been the ambition to be as recipient as possible in relation to the information they provided us with. Thus, in relation to the formulation of the general questions, follow up with more specific sub questions.

To some extent there is a weakness in setting the frame of the interview in relation to a person's perceived expertise, as it is likely that their opinions and specific experience is more relevant than their current professional role. Hence the role of the sub questions/follow-up questions were to focus more upon the opinions and practical experience in relation to the actual discussed topic, that perhaps falls out side of the pre-set definition of how the interviewee "should" have answered.

4.3 Case studies

As a third component in the methodology of this thesis, we have chosen two case studies. The case studies aims to provide the reader with sense of how plausible and applicable the proposed model is in practice.

Two cases have been chosen, with significant characteristics, to evaluate under nondisclosure agreement. Case A, is a potential out-license scenario built around a single patent. The patent is interesting from the perspective of the current movement that particular technical field, and poses a challenging exercise in relation to IP and market specific factors. Case B on the other hand regards a in-license scenario, of a specific technology with promising in-house development opportunities with associated important factors to be implemented in the AHP evaluation approach. Thus one could consider these two alternatives a opposite of each other, where different contextual factors comes into play. Hence the outcome is intended to identified weaknesses, and potential pitfalls, or direct faults in relation to a decision theory as an instrument for licensing evaluation.

As patent valuation and evaluation is purely contextual, these two case studies cannot in anyway be considered illustrative for all in- or out-license scenarios. They can, however, serve an illustrative examples for the proposed AHP evaluation approach, from a both a business and academic perspective.

In relation to the case studies we have done additional interviews, however these are assessed to fall outside of the methodology of this thesis per se, and is therefore not included in the empirical findings. However these interviews will play a central role in the case studies, but more serving the purpose of source of case specific material and context.

4.4 The role of interpretation

Given the methodology used in this this thesis, i.e. the combination of established quantitative approaches, literature studies, case studies and interviews, the concept of interpretation, or *hermeneutics*, is a central component (Ödman, 2005). Understanding the reference, their context and how their conclusions and/or opinions have been formed is very much central in the building of methodology, but also the formulating the discussion and conclusion in relation the thesis purpose.

The interpretation of the references and case studies is built around the following 3 concepts,

1) Understanding the context of the references
2) Intersubjectively understand opinions/conclusions of the references
3) Analyze and understand the research in relation to the references

The role of interpretation is easy to conclude upon as essential from a methodology perspective, however harder to establish a solid discussion around, in line with Ödman's reasoning (2005). However one important

aspect is the communication between the subject of analysis and the analyst. As the above-introduced concepts are focusing upon understanding, the communication is solely the instrument for enabling a process of understanding. Hence the need for a structured way of communicating the questions so that the received answers are formulated on the basis of genuine understanding of the questions is important. And through this established understanding, in accordance with Alvesson's (et al 1994) notion of the need for a dialog between the interviewee and interviewer, is the preferred outcome.

In this thesis and the associated research the role of interpretation have been substantial, both in terms interpreting sources of references as in literature, but also in the role as interviewer and assessing the proposed framework through case studies.

4.5 Identified Weaknesses and criticism

In relation to the research methodology a couple areas of concern have been identified that could be labeled as weaknesses and/or self-criticism.

As the methodology primarily is centered on interviews, it is appropriate to discuss the potential weakness in relation to this approach. One identified point of interest in relation to weakness is the role of the person being interviewed and his/her capacity of making a distinction between opinions and facts, and the capacity of the interviewer to understanding this situation and thus ask appropriate questions. There is a risk that the interview does not provide the right information or becomes biased. This is a particularly crucial aspect of the methodology as it is confined to a small set of qualitative interviews. Another aspect of the conducted interviews is the secrecy aspects usually linked to the patent business; hence people tend to be less prone to share and discuss their approach/solution to related problems. So potentially the crucial information asked for has been left out of the interviews. These problems are in greater detailed discussed in the interview chapter of this thesis.

Besides the interviews conducted during this thesis work a fairly large amount of literature have been carefully reviewed. However sources of information on the topic of licensing evaluations are fairly scarce, hence the approach of combining sources of literature and conclude upon their results in relation to the purpose of this study. This particular method requires a delicate balance in terms of interpretation of the sources. Additionally, the ability to find and read the most important literature in relation the thesis topic is very hard to relate to and conclude upon.

5 Interviews

The following chapter aims to provide an overview of the qualitative study conducted in relation to development of the licensing evaluation model. As discussed in the methodology section (Chapter 4), the mixture of interviews of this thesis designed by inspiration of the three sets of arenas, *business*, *legal* and *administrative* (Petrusson, 2005). The idea behind this approach is to highlight and approach the fundamental complexity of IP transaction and business models and concludes upon important components in a licensing evaluation model. The full interview forms are to be found in Appendix B.

The following table (8) illustrates an overview of the interview respondents, their position and field of business. There all are, respectively, well established and specialized in the field of IP, commercialization of IP and/or Corporate IP settings.

Respondent	Title	Field of business	Location
A	Director	IP Commercialization (consultant)	SE/Europe
B	Global Director	Corporate IP	SE/Global
C	Director Value extraction	IP Commercialization (consultant)	SE/Europe
D	Director of Business development	Research and Commercialization	USA
E	Valuation expert/Director of Innovation	Research and Innovation	Middle east
F	IP Counsel	Intellectual Property lawyer	UK/Global
G	Managing director	Non-practicing entity	UK/Global
H	IP Portfolio Manager	Corporate IP	SE/Global
I	Patent quality manager	Corporate IP	SE/Global
J	CEO	IP Consultant	SE

Table 8:*Interviewees*

As the concept of the business, legal and administrative arenas is a fairly theoretical categorization the structure of the interviews, in relation to the following categories which are more directly related to the concept of the proposed model, in this thesis.

Business interviews - In this context refers to the pure business/market information that is linked to an IPR transaction. Defining market opportunities and how to value IP (in terms of money) is the essential factors of this component. Different valuation approaches (see chapter 2), and how these approaches are applied have been the main focus during the interviews categorized as business interviews.

Legal interviews - Given the complexity of a patent and the associated legal dimensions it is crucial, from the perspective of a transaction, to map and evaluate patents from their strength and potential. The legal dimensions is thus essential both from a valuation perspective but also from the perspective of choosing commercialization paths or alternatives. The main focus in the interviews has been establishing a reasonable understanding of patent strength, patent quality and how to evaluate validity.

Technical interviews - The technical dimension to licensing is, from a fundamental perspective, central in an analysis. The ambition has been to form an understanding from the perspective of what factors in relation the technology controlled by the licensor are important to include, but also how to potential technology is to be evaluated when being licensed in.

The findings from the interviews are presented according to the following structure, which aims to highlight and discuss the different important dimensions to licensing,

- Intellectual Property Valuation methods and approaches
- Contextual aspects and IP specific factors
- Technology and IP relevance
- Carrot vs. Stick
- Stages of technology and licensing opportunities

5.1 Intellectual Property Valuation methods and approaches

As described in chapter 2, there are numerous ways of valuing assets from a general perspective. However, when applying valuation models on IP only a few actually fits the aggregated context of intangible assets as such. The main ambition with the interviews in the context of IP valuation methods and approaches have been to establish a best practice, or to the least be able to establish how the valuation modeling is being conducted by various firms and practitioners. One quote from one of the interviews is stating an interesting aspect of valuation,[1]

"All decisions are made on valuation"

Obviously a rather general comment, however telling in the setting of valuation in general, and perhaps even more so in the context of IP transaction. The understanding is that valuation is the main component in the licensing transaction process for any of the persons we have interviewed. Some has been keener on sharing their approach and methodology, where other has been less prone in doing so[2]. And from this we wish to concluded, regardless of secrecy aspects or not, that valuation is perhaps the most important factor in building a licensing evaluation tool/framework.

As for the general models used, two models stands out,

- Cost based model
- Income based model

With some variances and different sets of assumptions. These variances are likely to have arisen from internal capacity, resources and opinions. The statement made by one of the interviewees,

[1] Interviewee E
[2] Interviewee D, H, I

"I do not trust any of the models"[3]

highlights the rather complex reality of IP valuation methods, and also the associated risks in a valuation model of patents.

A cost based model is not the ideal choice for transactions of IP, however is applicable when valuing aggregated patent portfolios in relation to balance sheets, and overall estimations of IP value[4]. However the model does not reflect the potential of a market or how a patent could be leveraged in terms of financial value on a market. As it only takes into account the costs of generating the patents it is only fit for a static internal valuation system[5].

The income-based approaches are, concluded from its dynamics and possibilities to adapt, today the best starting point for patent valuation. As mentioned in chapter 2, there are several different income based approaches, such as DCF analysis, real options and scenario analysis, etc. Our understanding is however that DCF analysis[6] is the most common approach. Even so, from the interviews we can conclude that there are variances in terms of DCF analysis, and some are fairly complicated in terms of assumptions and probabilities.

In addition to the models and frameworks used in practice, a conclusion is that 75 - 80% of licensing income (including down payment) is contribution profit. Thus the financial incentives for licensing are deemed to be fairly high. However, the trick is to make someone pay the royalties and the relationship between value and the one who might value the technology accordingly.

5.2 Contextual aspects and IP specific factors

One major concern for licensing and the relationship between licensing and valuation is the contextual aspects. From the perspective of a MMC the balance between manufacturing and potential revenues provided through licensing is a fairly complicated matter. Finding aspects and contexts that could potentially leverage assets in a better setting is obviously the dream scenario, but perhaps is unachievable for a MMC, since their own production is their main revenue stream and overall objective.[7]

Another aspect of patent valuation in relation to licensing is how you actually valuate the patents, and this is set by the context as such. A patent can be valued from a strictly financial perspective, but also in terms of "Good" and "Bad" or by using a rating system[8]. Obviously the different approaches are good for different settings, however in the context of licensing all these aspects, or methods of valuation is seemingly relevant, fitting the different aspects of licensing, financial value, technology value and IP value.

As patents, by definition are contextual, intellectual assets, their value are strictly confined to the setting it could be leveraged in, is defined by this fact, especially if applying the income based method. To the understanding there are general factors, of which a patent can be assessed, in the context of potential transaction (both licensing and acquiring). These factors, however not undebated, are not always the most reliable set of information sources[9]. Though arguable[10] they can for the most of cases be motivated through

[3] Interviewee A
[4] Interviewee C
[5] Interviewee C
[6] Interviewee C
[7] Interviewee E
[8] Interviewee E
[9] Interviewee B
[10] Interviewee C

statistics, and hence, to some extent hold value. Factors that we have encountered during the interviews as most critical are,

- Citations
- Number of claims
- Claim structure
- Patent family

From the input received through interviews, these factors are not deemed to be essential from a licensing perspective, but rather an aggregated valuation perspective, which even so is a matter of debate. However factors in relation to patents that are important in the context of licensing have been found to be within the categories of, *strength, validity* and *scope*[11]. Strength is referring to the actual strength of the patent in terms of a litigation process. Validity refers to how well the patent answers to the patent laws in correlating countries in which the patent is filed, i.e. if the requirements of the patent law is fulfilled, and if so to what extent. A conclusion from the interviews is that patent quality is not to be taken for granted. And the scope is the actual coverage of the patent right i.e. what is written in the patent claims and how are the patent claims structured, which is essential from any transaction perspective.

5.3 Technology, IP relevance and manufacturing

There seems to be a consensus among the interviewees that the foundation of licensing correlates with market evaluation and a technical evaluation[12]. The market evaluation is the aspects of the market dynamics and how a technology/product would fair on a given market. Factors of interest could be level of competition, elasticity but also market growth and current size. If the market evaluation is mostly an external evaluation the technology evaluation tends to be both internal and external in its characteristics. The technical evaluation is focusing upon the internal technical solution and the overall contribution of that specific technology. And this evaluation is to be compared to external technical solutions that might compete or offer an alternative procedure of conduct. A conclusion from the interviews is that market- and technology evaluation are crucial aspects and analysis in relation to a licensing strategy, regardless if one chooses stick or carrot as a general licensing approach.

In this complexity of market analysis in combination with a technology analysis the value chain has been mentioned as a valid tool for licensing analysis, especially in the case of a MMC setting[13]. To our understanding, even profound and well-established MMCs in licensing still have to bear in mind that the main revenue stream comes from the product line as such, and not intangible assets such as patents. The political dimensions in relation to this context i.e., manufacturing vs. technology is a delicate balance. Examples of successful technology spin offs from large corporations, such as Autoliv AB and Adobe Systems, highlights the dilemma of technology value truly is contextual. The relevance of a patent(s), if analyzed from the perspective of basic game theory[14], often shows that the value of a patent portfolio is not, per say unrealized, but rather confined by the setting it is found in. Which in practice means that the value sometimes cannot be realized in the setting of the parent company, but in the hands of others when the rules and capabilities have changed. The value of for example Autoliv AB is likely not to have been realized if the company never was formed and instead stayed within the Volvo Group[15]. This reasoning correlates with the aspects of standards and standardization, which have been discussed with a couple of the interviewees, where the developed technology needs to be incorporated into a standard setting to be widely used. If the technology were to stay

[11] Interviewee D
[12] Interviewee E, J, D
[13] Interviewee E, I
[14] Interviewee E
[15] Interviewee E

inside the developing corporation, the potential and value, both in terms of market presence and financial number, would have been significantly less promising.

Another approach that we have come by during the interviews is the usage of a claim chart in relation to the technology[16]. It can be used both as internal instrument for mapping technology in relation to other actors, aiming to provide a guidance for development, but also, perhaps even more so effective, in a licensing scenario where technologies is compared against each other to map out infringements and/or possible usage areas. The main advantage with a claim chart is mapping the relevance of the patents in relation to a given technology or product. This is however deemed to be one of the more advanced tasks with regards to a licensing evaluation setting.

5.4 Carrot vs. Stick

As described in chapter 2, there are two fundamental ways of licensing, either through *Carrot* (negotiation/technology licensing) or *Stick* (assertion licensing)[17].

From the interviews conducted we can conclude that technology license is fairly complicated, which can be attributed to several factors, such as not invented here syndrome, competing technology solutions and valuation of the technology as such. Valuation of technology, in some cases, tends to be far from what the market/actors are willing to pay[18], which perhaps, to some extent, could explain the system of standardized royalties. As the valuation component in a technology licensing is crucial, this approach is very complicated to perform which in combination with the other above-mentioned factors makes assertion a more straightforward approach to licensing. There are companies, such as IBM, Xerox, PARC, (etc.) who are exceptional in technology license, however their business models are adapted accordingly. To simplify the business model of for example IBM, their concept is to license out their core technology in combination with surrounding services and joint development arrangements, and thus make the licensees dependent upon IBM technology[19]. Incorporating this model into a traditional MMC is deemed to be fairly complicated, and perhaps not even feasible based upon market dynamics. Technology licensing should not be regarded impossible, but it can be complicated in relation to the delicate balance between production and alternative revenue streams (as discussed above).

The assertion licensing refers to the process of detecting infringement and force the infringing party to pay licensing fees and potential damages for the intrusion, as described earlier. This process is linked to what stage the technology is in, i.e. the maturity. The complexity here lies in the legal procedure of investigating the relevance of the patent right in relation to the technology, and to what extent the infringement have been done[20]. This is a very time consuming process, and the outcome is somewhat uncertain. We can conclude from the interviews that a case of assertion seldom leads to a blocking of an actor, but rather a financial settlement[21]. The suing party does not have an interest in blocking the other party, unless it directly hurts their revenue stream and market position[22]. However, in the context of licensing as a source of revenue, it is important to be ready to go the distance with a lawsuit, otherwise none will, overtime, be inclined to pay licensing fees[23].

[16] H, I, F
[17] F
[18] J
[19] D
[20] F
[21] F
[22] F
[23] H

5.5 Stages of technology and licensing opportunities

The opinions regarding technology and the interpretation of technology has varied during the conducted interviews[24], however the conclusions is that technology can be both obvious and non-obvious at the same time, subjected to the viewers perspective. Thus, understanding the different stages of a technology is essential, as it highly affects the valuation of a technology but also the licensing opportunities, in terms of decisions and paths[25]. The picture below is an illustration of the three identified steps of a technology, in relation to licensing,

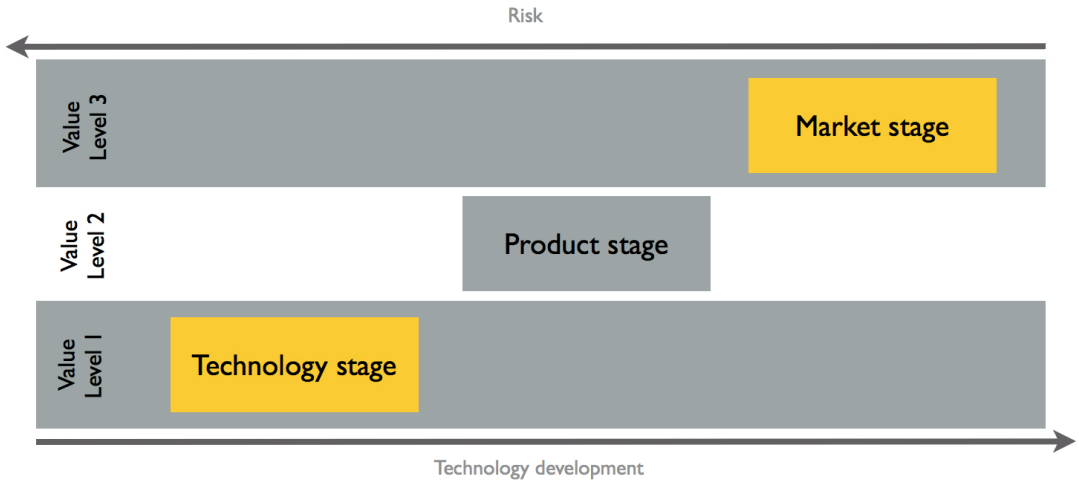


Figure 5: Development stages of a technology

The three stages are *Technology stage, Product stage* and *Market stage* and has different, but related characteristics.

Technology stage - Has the character of a novel technology, or unproven in relation to a product. The technology can be either a component or solution for an existing and/or predicted problem[26]. The valuation in this stage is primarily scenario based, and the risk premium is deemed to be high[27]. In this stage technology licensing might be an option, but also potentially joint development arrangements with other actors. Standards organizations and procedures spring out of the technology stage thinking[28].

Product stage - This stage refers to a technology transferred into a product. Which transfer the risk from a technology risk to product risk, where factors of market dynamics and evolution are more central. The valuation is still scenario based, however with lower risk premium[29]. At this stage both technology licensing and assertion are possible ways of leveraging the technology. The likeness of infringement has increased.

[24] Interviewee J, H
[25] Interviewee J
[26] Interviewee E
[27] Interviewee E
[28] Interviewee I
[29] Interviewee J

Market stage - This is the stage where assertion is mostly applicable but also where the technology as such has highest value, with lowest assessment risk. If the technology is out on the market, through a product, it is also likely that the technology could be leveraged on a parallel market[30].

The above-described stages are fairly general, however highlights the different stages of a technology and its maturing process. Obviously it is not easy to commercialize a technology none understands, or if there is no currently existing market[31]. Our understanding is that the standardization process (in telecom etc.) is a structural approach to deal with uncertainties and risks in relation to early stage technology, even though that process also comes with high stakes[32]. In general terms risk associated to a technology commercialization process is related to the context and the capacity of the developing organization[33].

5.6 Conclusions of interviews

This section aims to conclude the interviews, but also add impressions and comments to the topics discussed that have not been suited to place under any of the sections above.

Conducting these interviews have not been as straightforward as one would have hoped for. Given the different topics discussed, and the background of the interviewees, it has been hard to nail down to the core of the topics and actually discuss those core issues. In terms of knowledge sharing, it varies from interviewee to interviewee; some have been keener on sharing information and thoughts, while others have been more restricted in their answer. There might be multiple explanations for this, such as their current professional engagements, non-disclosure agreements and a general carefulness in relation to patents, and the correlating internal processes. What would counter argue this would be that all the interviewees would potentially be under the same leech in relation to secrecy, and yet some manage to convey a more insightful view of patent valuation and licensing than others?

As for the thesis topic as such, all interviewees seems to agree to the importance and how interesting this topic is. However, the approach i.e. building a standardized evaluation tool has met some criticism. More or less the same argumentation has been used, "You cannot standardize a licensing evaluation, as it is contextual". To some extent we have failed to communicate the concept in comprehensive way, as the approach very much would be context licensing evaluation tool rather than a patent evaluation tool as some of the interviewees might have interpreted the scope. However, in relation to the outset purpose of this thesis, most of the interviews have supplied us with factors and input that would enable us setting up a draft evaluation tool for licensing, that could act as starting point for a analysis of a general character.

We can summarize licensing and the different components related to licensing, *Valuation*, *Technical* and *Legal*, is a fairly complicated reality, where there seems to be some core approaches and on top of that different methods and tweaks, that, from the perspective, seems to spring out of opinions. The main key outtakes from the empirical findings are the following,

Context - The context is the starting point for any licensing scenario and it dictates the possibilities and restrictions of the patent. It is deemed to be a starting point for a licensing evaluation analysis.

Stages of technology - The stage of technology is linked to the context i.e. what you can do with the technology and what context it could be leveraged in.

[30] E
[31] J
[32] I, H
[33] J

Carrot and stick - The two fundamental approaches behind licensing. The understanding is that assertion is easier (if one can prove infringement), as it is a more straightforward approach. Technology licensing on the other hand is financially interesting (compare with successful companies such as PARC, Ericsson and IBM), however deemed to be trickier as the licensor must supply more than just the patents such as knowledge and time. Technology licensing from the MMC perspective is deemed to be more complicated, especially in relation to manufacturing.

Valuation - There are various forms of valuation, but the most common one in relation to licensing is income based valuation, and more precisely the application of DCF models. The DCF calculations weaknesses are deemed to be problematic, however the more complicated models requires more input and time and are thus less widely used.

Technology development and manufacturing - Manufacturing and technology development is not necessarily the same thing, and the approach to revenues streams is considerably different between the two. A licensing evaluation approach should be adapted accordingly, especially in context where manufacturing is the main revenue stream.

6 Proposed model

This chapter will in detail describe the process of the proposed model for patent licensing evaluation. The model as such is built around the literature studies and the empirical findings, in an attempt to settle upon a based practice approach given the MMC context. The main inspirational literature references to the proposed model apart form the conducted interviews would be Parr (2011), Grönberg et al (2009) and Sullivan (1996). However as this literature is focusing upon the financial value, as the driving force behind licensing evaluation, the proposed model applies a different approach given its starting point in decisions theory. In relation to the mentioned references, Chiu and Chen (2003) have tested the AHP theory in relation to patent valuation, which also inspired to the potential usage of AHP in a licensing evaluation context.

As discussed in chapter 1, an organization's approach to interact with its surroundings is very much essential for a technology development setting. In relation to this, as we have seen during our interviews and literature studies, the context and understanding the context is key for a successful license evaluation process. Hence the approach is primarily a context evaluation tool, which combines the theory of the AHP methodology in an attempt to mitigate evaluation bias and structure the evaluation in accordance to a given context.

The model is structured in relation to potential licensees, markets and opportunities. And thus from a aggregated point of view is a fairly general approach, trying to include all, though the empirical study, identified components in relation to a licensing opportunity. With this in mind the model is structured accordingly,

1) Contextual definition
2) Contextual analysis and evaluation
3) Alternative Analysis

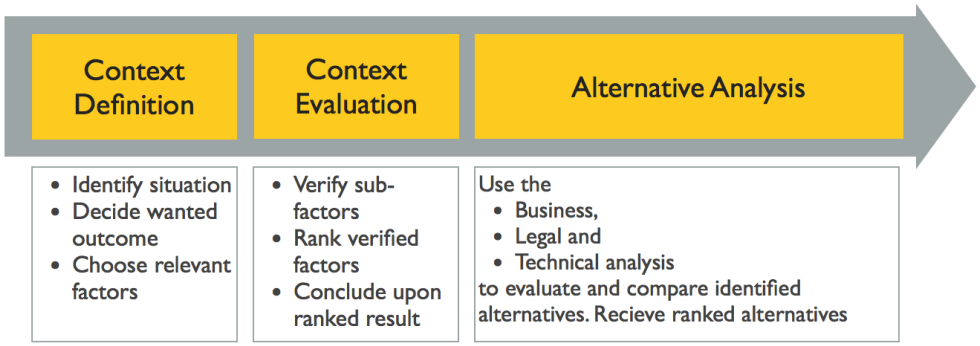


Figure 6: Proposed model process

6.1 Context definition

The context definition stage is the initial stage built around the situation in which the MCC currently is. As a starting point there are two scenarios, out-licensing (1) and in-licensing (2). Both scenarios are equally important in relation how patents could be leveraged in a technology development setting. Obviously there is a difference between licensing-out technology versus licensing-in technology (Granstrand 1999), however it is arguable that there are synergies in how the two scenarios can be evaluated. Especially if we consider

Grandstands framework (see chapter 1), where acquiring technology mainly should lead to commercialization. The same notion applies to in-house development, i.e. generating transactable patents should lead to commercialization in one or several contexts. The following steps are to be included in the context definition stage, confirmed through interviews[34],

- Define the organizational ambition level and goals
- Interviews with key technology development personnel
- Screen the IP scenario
- Identify potential alternatives

Define the organizational ambition level and goals

To define the context, the key is to interact and understand the ambitions and wishes of the organization, either from an in-license perspective or from a out-license perspective. To map out initial ideas and concept stages in relation to an in-license idea is crucial, as that will set the bar for the evaluation as such.

Interviews with key technology development personnel

Thus, interview researchers, business developers and key personnel in technology development is essential from technology perspective, as it is important to understand the relationship between the internal assets and/or capacity with the external assets and/or capacities. It is also crucial to understand the technology in relation to the external patent landscape.

Screen the IP landscape

Screening the IP scenario or landscape is essential from both an in-license point of view and a out-license point of view, even though this stage serves different purposes subjected to what the fundamental context is. From an in-licensing perspective, knowing what is out there is necessary and understands the relationship between the internal capacity and how the goals and ambitions can be reached. From an out-license perspective identifying actors that are close in terms of technology or have alternative technology is essential to create an understanding for the uniqueness the in-house technology and how strong the patent position actually is.

6.1.1 Identify potential alternatives

This stage of the context definition component is essentially finding synergies in the previous three stages, and map out alternatives in relation to context that have been defined. For the purpose of clarity, in this stage, it s useful to use the concept of a decision tree (see figure 7 below), where the top level is the context and the subsidiary stages are alternatives which correlates with the context definition stage of the framework.

6.2 Contextual Analysis and evaluation

This second stage of the framework aims to analyze the context and identify factors of importance, and weight them against each other in accordance with the AHP framework, and thus settle upon a path in which to work regarding the identified potential licensing alternatives. This stage takes a starting point in the following identified steps,

[34] Interviewee D and E

- Identify factors in relation to context
- Rank identified factors
- Apply AHP mathematical framework

This stage is perhaps the most interesting step, however a lot the "hard" work is conducted by the mathematics of AHP, which is built upon the ranking. Thus the crucial part of this stage is the ranking and how it should be conducted. As we see it, depending upon the ambition and context, it could it be performed by the licensing analyst (also subjected to skill level) or by a panel of people with expertise in financial evaluation, technical expertise and patent specific legal competencies (Sullivan 1996). Ideally the persons involved in the ranking should be the persons setting the context, as the ranking should be performed on a situational basis, and not general. The tree structure is similar to the one presented by Parr (2011) or by Grönberg et al (2009), however focusing upon the path to take in combination with the financial gain and alternative important factors.

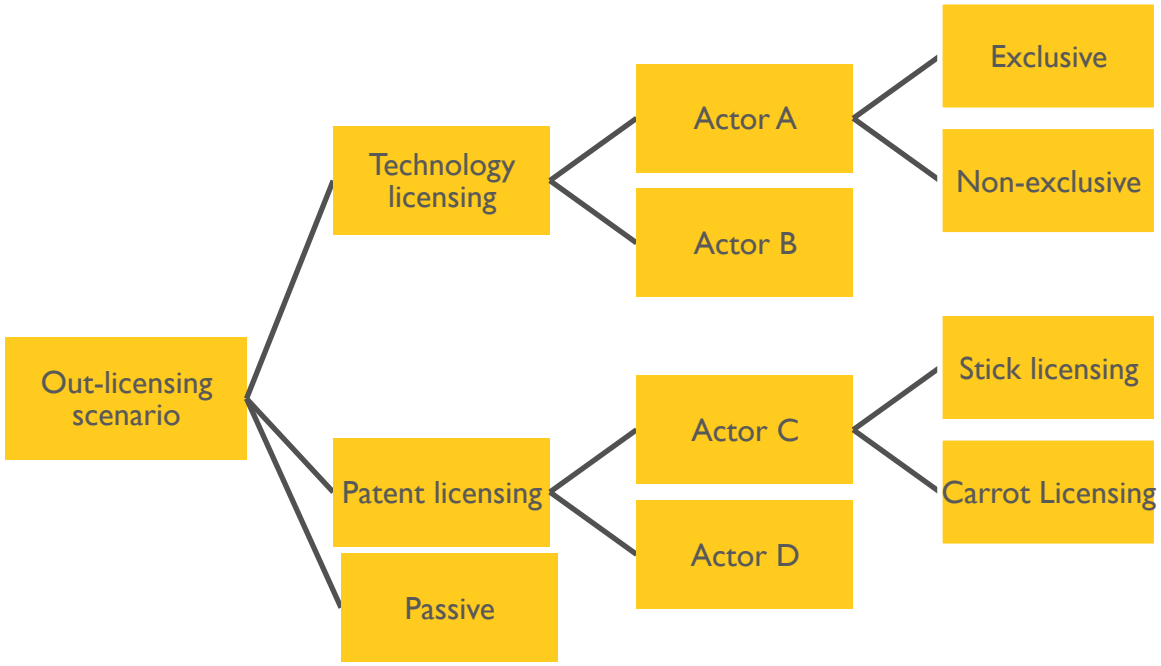


Figure 7: Potential additional outcomes

6.2.1 Two levels of factors to be considered

As mentioned above, there are synergies in evaluating patent licensing scenarios, regardless of it is in-license or out-license. However, the synergies are not present on all levels, and given the importance of context factors, we wish to conclude that there are 2 levels of factors, a *general level* and a *specific level.*

Highlight the differences between the two, examples of general level factors and specific level factors are illustrated in the following table (table 9)

General factor	Specific factor
Income	Down payment

	Royalty
Cost	Down payment
	Royalty
	Personnel resources
	Litigation cost
IP position	Exclusivity
	Ownership
	Cross-license
	Geographical area
Time	
Technology	Grant-back
	Contribution
	Requirements
Publicity	Good will
	Bad will

Table 9:*Examples of model factors*

The general factors refers are, as we have labeled them, are directly connected to the ambitions and goals dictated by the context, such as technology development, access to technology and financial gain, etc. The specific factors strongly correlate with the technology and the specific setting of the technology, such as technical contribution, prerequisites (requirements) and grant-backs, etc.

6.3 Alternative analysis

By using the AHP ranking system, provided through the contextual definition but also context evaluation, the concept is to evaluate the chosen alternatives for licensing given the score and outcome of the ranking. Thus this alternative analysis is very much centered on the previous two stages of this framework, and their conclusion. The *alternative analysis packages* that should be conducted in this third stage, is built upon the identified and analyzed alternatives, in line with Sullivan's presented framework (1996). These analyses should be conducted to support the ranking and, to a large extent, support the general conclusions of the analysis.

Each alternative should be analyzed from three sub analysis perspectives or alternative analysis packages, and how that analysis relates back to the context identified in stage 1 is the intended outcome. The following path analysis packages, concluded from Sullivan but also interviews[35],

- Business analysis

[35] Interviewee C, D and E

- Technology analysis
- Legal analysis

These analysis can be conducted either independently or clustered together. They could also be taken out of this framework and be conducted on autonomous basis. The alternative analysis is, as indicated in the figure 6, the larger part of the framework as it consists of potentially several different analysis, cover different disciplines such as valuation and infringement analysis.

6.3.1 Business analysis

The business analysis takes a starting point in a traditional market identification setting, where intelligence regarding actors, value network/chain and market dynamics are corner stones. However the most important, and perhaps most demanding, pieces of information to obtain is the information regarding estimated market size, growth and plausible segmentation. Around this specific information is will be possible to build a market estimation case and map that in relation to specific technology to be licensed. As discussed earlier there are several financial models for evaluation this specific part of the analysis, the conducted interviews indicates that a traditional discounted cash flow analysis (DCF) should be considered as a starting point for this analysis.

One key assessment to conduct is the estimated market penetration, of a specific reference product (from an infringing party) or an in-house product, so that the financial estimation is being built around reliable assumptions, thus as accurate as possible. To mitigate potential assessment risks caused by the need for assumptions, a sensitivity analysis is recommended, that provide the analyst with an understanding of the potential delicate nature of the licensing scenario.

6.3.2 Technology analysis

Subjected to the level of technology status (see figure 5), whether it is in a technology stage or product stage, (etc.) understanding the technology and the definition of the technology is crucial. Both in relation to the technology evaluation setting, but also in relation to the above introduced business analysis, according to Sullivan (1996). The technology analysis should consist of four steps: *Technology definition*, *identifying technology actors, current use of technology,* and *technology potential assessments*.

The goal with this analysis should be to provide a technology control estimation of either out- or in-license technology and how that relates to competing technology and actors. One of the major challenges with licensing is the issue of proving the strength of the patent(s) conveying the technology, as argued by Sullivan (1996). Identifying technology matches and designing a technology-licensing offering is performed throughout this analysis and the steps introduced above. The concept of invent around likeliness, (etc.) is very much the core of this analysis. With the concept of invent around we are referring to how quickly a specific technology covered by a patent (or several patents) could be invented around and thus a new competing technology performing similar could be put to the market. There is no silver bullets in relation to this analysis, when it comes down to it, experience, ability to analyze and understanding the technology is core competencies.

6.3.3 Legal analysis

The terminology legal analysis refers to the patent specific legal analysis. This analysis is focused upon understanding the patent(s) from the perspective of their strength and usability in relation to either an in-license alternative or an out-license scenario.

Tools such as claims charts, freedom to operate analysis (FTO) and external patent landscapes estimations are combined with litigation specific analysis focusing on claim strengths, validity and claim coverage form the basis of a legal assessment. This assessment should be used in either in combination with the above introduced alternative analysis packages or separately. This analysis package is fairly complicated and should not be underestimated in relation to the more "practical" business and technical analysis. A difference between the patent legal analysis and the other are the problem in formulating a general model in relation to how the analysis should be conducted. The key outtakes from the research[36] on where such analysis should start,

1) **Assessing patent(s) validity.** If the patent(s) respond to the patent legislations
2) **Assessing 1st independent claim.** Assessing technology coverage and scope of claim
3) **Identify potential infringers.** In relation to patent claim coverage identify a potential infringing party

6.3.4 Concluding remarks on introduction of proposed framework

The above-introduced model is very much a theoretical, and perhaps, technical introduction of the proposed approach. The frameworks uniqueness lies in the combination of more traditional patent commercialization analysis, in the model referred to as *alternative analysis packages,* with a detailed contextual analysis, enabled through the AHP mathematical theory. To illustrate the model better two case studies have been conducted (see chapter 7).

[36] Interviews with internal experts at collaborating MMC, and interviewee F

7 Case study

This chapter describes the testing of the proposed framework in relation to two licensing scenarios, one in-license and one out-license situation. These two cases are real live cases, and potentially interesting for the collaborating MMC's competitors, and are thus stripped of specific details and sensitive information. The complete ranking process can be found in Appendix A.

7.1 Case A. Communication patent: Out-license possibilities

The ambition with this case study is to test the proposed framework in relation to a possible out-license situation, where a large component is to identify alternatives in relation to what the MMC whishes to accomplish.

7.1.1 Background

This case is single patent, deemed to be potential on several related markets as well as parallel markets. At the time of filing for the patent the technology where most likely not considered core technology, however currently the interest in this specific communication technology has increased rapidly and most likely will follow the same path over the next few years.

Basic technology and patent characteristics,

- Internet based communication technology between nodes
- Communication is possible in two directions
- Patent covers actuating functionalities
- 12 years of age
- 9 claims, 1 independent

The task is to evaluate different commercialization alternatives in relation to the context of the MMC, taking into account ambitions and goals with a potential out-license scenario. In relation to what have, through interviews[37], been identified as factors correlating with the MMC's ambitions, we have conducted the analysis. As assessed, this case it would be categories as a stick licensing.

7.1.2 Identified factors of importance

The following factors have through interviews with internal exports of the MMC been identified as general factors of importance,

1) Income
2) IPR Control position

In relation to these two factors a breakdown have been conducted of the factors that have been ranked in standard AHP software,

- Income

[37] Interview with Internal IP Experts on electronics and patent prosecution

- Cross-license
- Level of Exclusivity

These specific factors, derived from the general factors, have been weighted towards each other, as illustrated by figure 7. As the ranking is conducted in relation to the output gathered from internal experts on this specific technology. The conclusion is that potential income in relation to the patent is considered essential in relation to other factors.

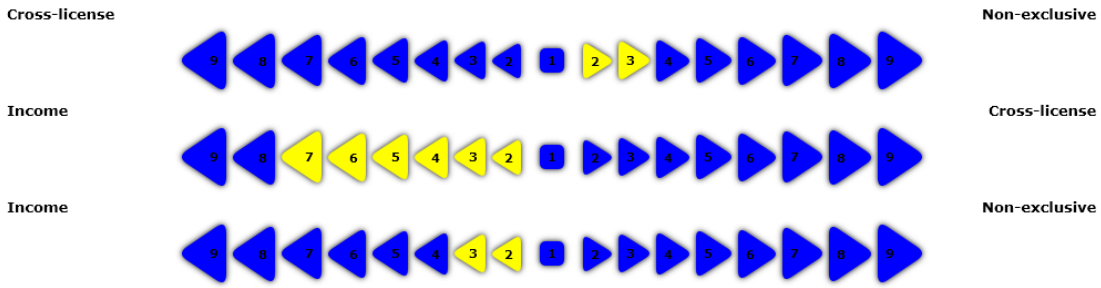


Figure 8: Ranking of factors in Case A

7.1.3 Identified alternatives

Through meetings with experts[38] at the MMC conclusions have been made that the following alternatives as plausible paths forward in relation to identified context of the MMC. Subjected to the strength of this patent there are numerous alternative paths, however 3 alternatives have been selected;

Alternative 1: After market actor. This alternative correlates with the high likeliness of infringement on the aftermarket, as products are offered with a high technical correlation to the main claim of this particular patent. The identified infringing actors main business is not infringing but rather an add-on product offered to customers. The assessed infringing part has an annual revenue of 2,3 billion euros.

Alternative 2: Similar industry actor. This alternative strongly correlate with the collaborating MMC and its industry, however supplies a different market. As we have assessed the situation, a stick license seems to be the most plausible approach. Similar to alternative 1, this actor is not infringing in terms of a core product, but rather as an expensive add-on product. The infringing actor has an annual revenue of €60 B.

Alternative 3: Do nothing. In relation to the two above alternatives this one might seem a bit strange, however as the character of this licensing opportunity is stick, choosing not to initiate contact with the infringing parties should be considered an alternative given the associated risks. This alternative is also interesting from a testing point of view of the framework.

7.1.4 Alternative analysis

Subjected to the above-introduced alternatives a financial, legal and technical analysis has been conducted on the two potential scenarios. These analyses, to some extents, do not apply to all of the above-mentioned alternatives. Regardless, they are important in relation to the outcome of the analysis,

[38] Ibid

Financial Analysis

The following financial analysis has been conducted in relation to the above-mentioned three alternatives. For obvious reasons, alternative 3 is not included in this financial assessments of this out-license scenario.

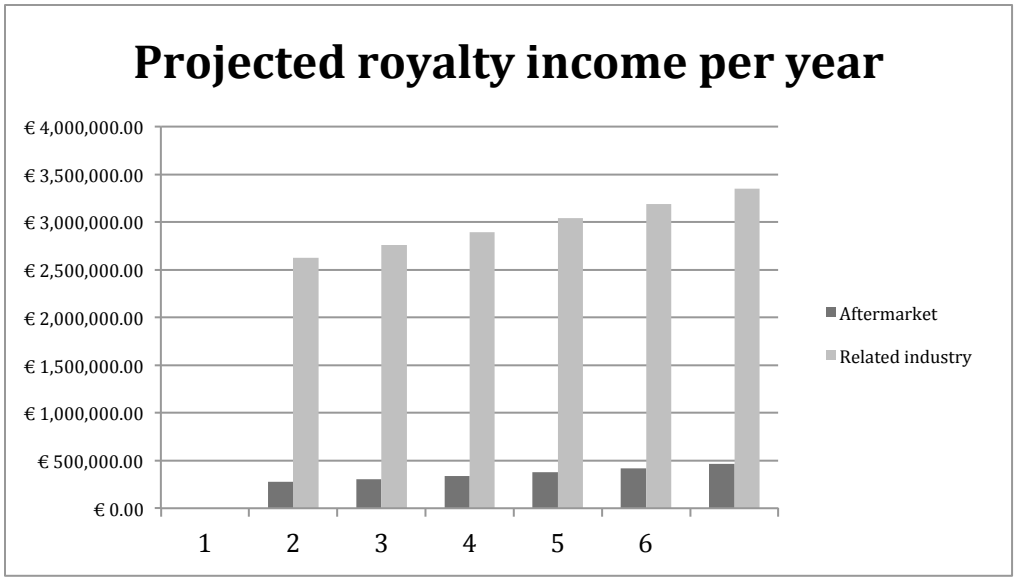


Figure 9: Financial calculation Case A

The graph above is generated from financial calculated based upon the assessments and assumptions illustrated in the tables below. The two alternatives are fairly different from a financial perspective, given the market assessment and the associated market development. From a strict financial perspective it is fairly clear which alternative that is most promising.

Alternative 1

Aftermarket	
Cost/Unit	550
Units Sold	10000
Royalty	5%
CAPM	5%
CARG	11%

Alternative 2

Related industry	
Cost/Unit	350
Units Sold	150000
Royalty	5%
CAPM	5%
CARG	5%

Technical/legal Analysis

The patent covers a basic technology system in the communication field. According to experts[39], the patent is very wide which can indicate a weakness in the protection. A wider patent could imply that it is easier to kill with prior art. There is also a technical expression in the independent claim that needs to be confirmed by an expert, but if the expression means what this analysis is based on, the possible infringements are many which would pinpoint the advantages of a wide written patent. The wideness of the patent could sometimes make it harder to enforce, as it harder to split up the patent and specify smaller parts of the system to a licensee.

7.1.5 Conclusions and summary on Case A

From the analysis we can conclude that alternative 2 is the alternative to pursue in relation to the context evaluation done with AHP. However in this particular case, it is possible diversify and also contact other infringing parties, as this is a stick license setting. In addition, the factors of evaluation could also be stretched cover other angles of this potential out-licensing opportunity.

7.2 Case B. Display technology: In-license possibilities

In relation to case A, this case is an in-license scenario, which arguable is the complete opposite of the previous case. One main difference between case A is that in this case the alternatives are set, and the main focus is to evaluate which of the alternative would suit the MMC's context and ambitions.

7.2.1 Background

The starting point for this case is the identified need of a display solution. Initial contacts have been made with actors supplying potential technology alternatives. One technology approach (1) would be to choose a more established technology supplied by an established actor within this given technology field. The other technology approach (2) is to license/acquire a novel technology from a research facility with promising technical and economical solutions. The task is to evaluate which of the alternatives are best suited in relation to the context of the MMC, and the identified factors.

Technology approach 1, characteristics

- Productified technology
- Existing prototype
- Established technology

Technology approach 2, characteristics

- Research stage
- No protype
- Novel technology, with technical advantages

7.2.2 Identified factors of importance

[39] Interview with Internal IP Experts on electronics and patent prosecution

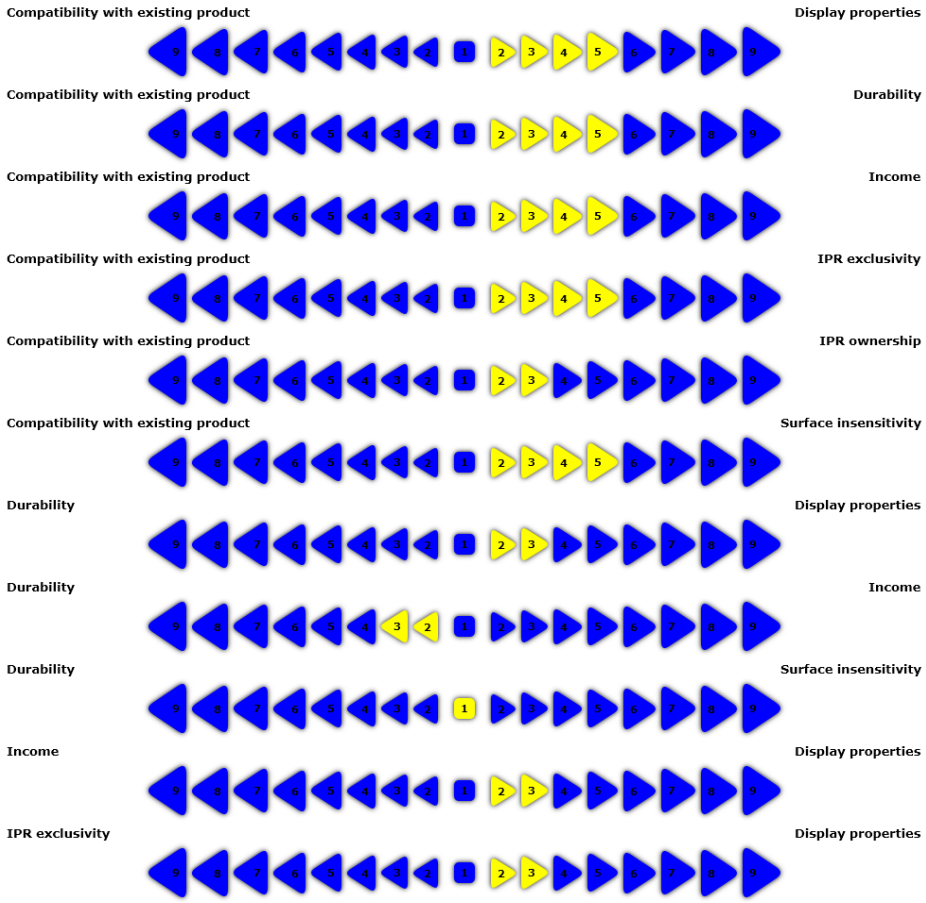
The following factors have through interviews with internal experts of the MMC been identified as general factors of importance,

1) Income
2) IPR Position
3) Technical prerequisites

In relation to these three factors a breakdown has been conducted of the factors that have been ranked in standardized AHP software,

- Display properties
- Durability
- Surface insensitivity
- Income
- IPR Exclusive
- IPR ownership
- Compatibility to products

All these specific factors, derived from the general factors, have been weighted towards each other, as illustrated by figure 10. As we can see, no specific factor stands out in relation to the others.



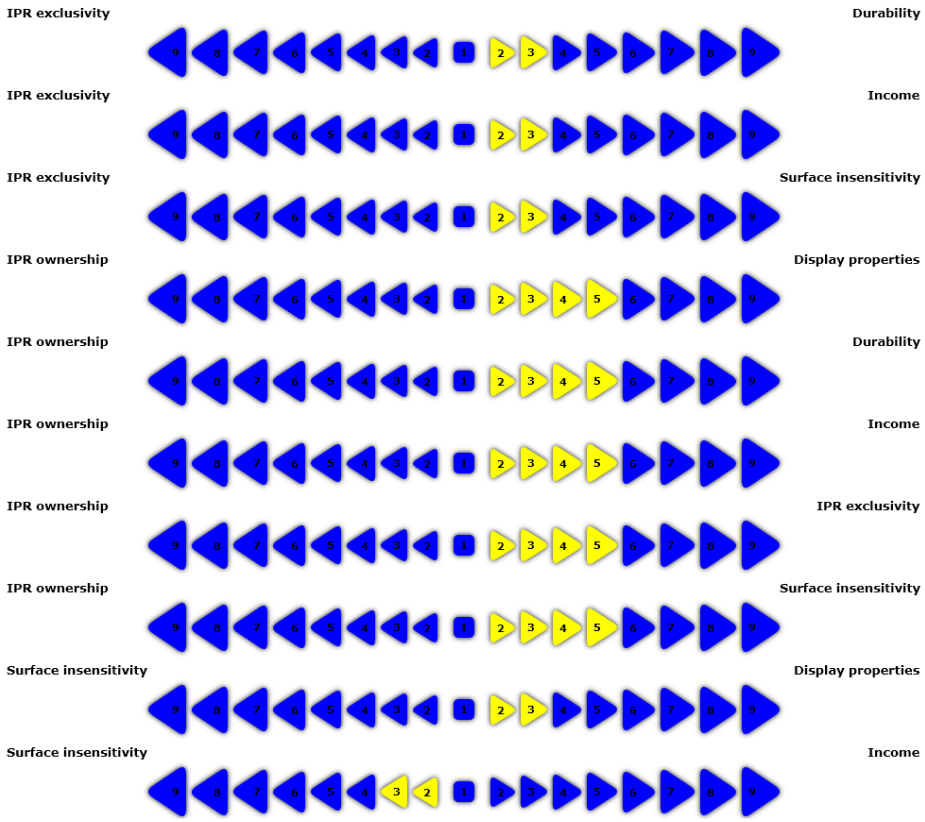


Figure 10: Ranking factors for Case B

7.2.3 Identified alternatives

Through meetings with experts at the MMC we have concluded the following alternatives as plausible paths forward in relation to identified context of the MMC. Alternative 1 and 2 is derived from the same source of established technology, and alternative 3 and 4 is derived from the alternative novel technology. Thus, there are two sources of technology however they have been divided into four categories, as there are different approaches to the two technology sources.

Alternative 1: Basic Supplier

This alternative is given through the fact that a supplier is offering a similar technology, however not as adequate in terms of technical prerequisites and also deemed to be a fairly expensive technology.

Alternative 2: Extensive supplier

In relation to alternative 1, a more advanced alternative exists. This product has a more advanced graphical interface, and a different technology. This alternative, given its characteristics is expensive, and thus suited for premium products.

Alternative 3: Acquire novel technology

This technology springs out from a technology research setting, with similar technical characteristics as alternative 1. This technology is deemed to be a cost efficient alternative, however can only handle simple graphic visualizations. The approach is to acquire the technology through a purchase.

Alternative 4: Licensing novel technology

This alternative is the same as alternative 3, however is not acquired through a purchase of the technology as such, but licensed in under a licensing agreement.

7.2.4 Alternative analysis

In relation to the above briefly described alternatives, alternative analysis have been conducted based upon financial estimations, technical and IP legal assessments of the situations. These analyses, to some extents, do not apply to all of the above-mentioned alternatives. Regardless, they are important in relation to the out come of the analysis.

Financial Analysis

The following financial analysis have been conducted in relation to the above mentioned 4 alternatives,

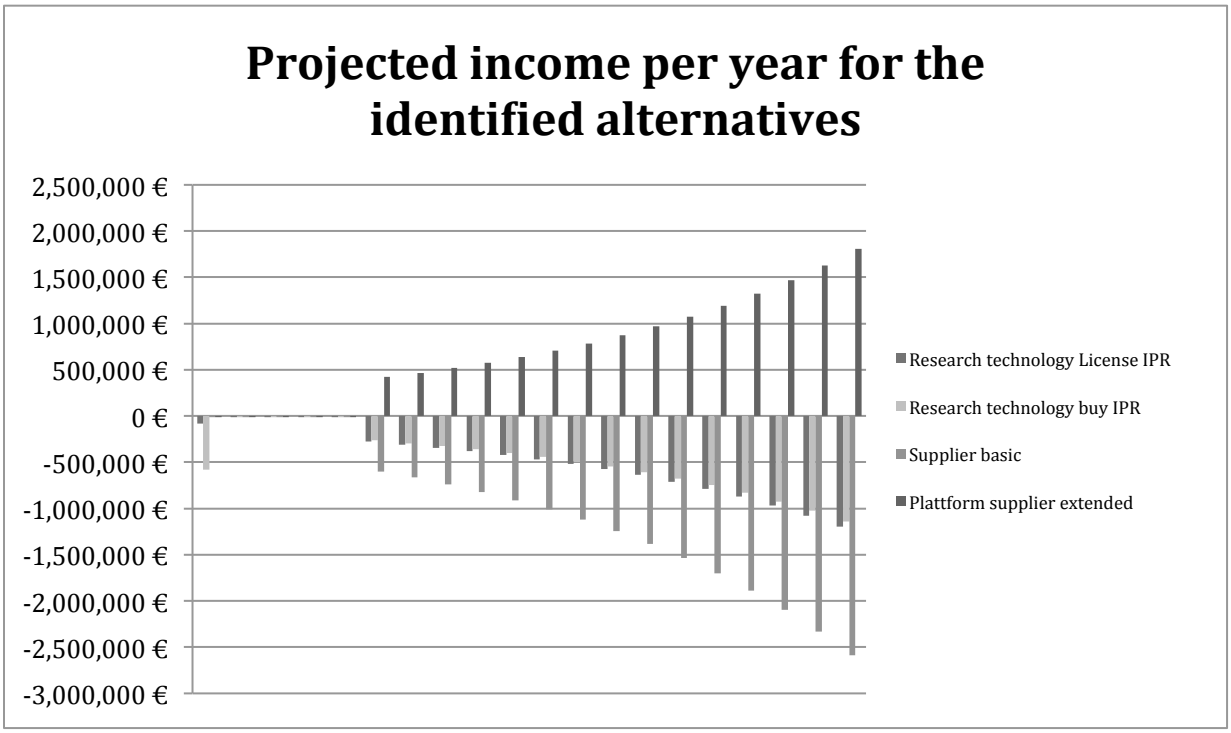


Figure 11: Financial analysis Case B

The above graph is generated from the following financial assumptions and estimations. As for the figures as such, they are derived from market reports when applicable and fictional in some cases due to secrecy.

Alternative 1:

Supplier Basic	
Sold Units	100000
Price/unit	-50
Royalty	0%
CAPM	5%
CARG	11%
Product penetration (an)	N/A

Alternative 1 will be offered for no additional cost for the customer, and are thus financially considered to be a negative in this model. However the value for the MCC's market position and brand by introducing this functionality as a standard could potentially increase. These calculations have not taken that value into consideration, given the complexity of such calculations.

Alternative 2:

Supplier extended	
Sold Units	100000
Price/unit	350
Royalty	0%
CAPM	5%
CARG	11%
Product penetration (an)	1,2%

Alternative 2 will be offered as add on to customer, and hence will generate revenue, which is indicated in the graph above.

Alternative 3:

Research technology	Acquire IPR
Sold Units	100000
Price/unit	-22
Royalty	0%
CAPM	5%
CARG	11%
Product penetration	N/A
Patent's price	500 000,00

Similar to alternative 1, the technology will be not pose any additional cost to the customer in relation to the product, hence the negative development of financial revenue in the calculations above. The value of for the MMC in this market offering is not included in the calculations. The price is set to 500 000 SEK according to estimations by experts at the MMC.

Alternative 4:

Research technology	License IPR
Sold Units	100000
Price/unit	-22
Royalty	5%
CAPM	5%
CARG	11%
Product penetration (an)	12%

This alternative has the same characteristics as alternative 3, however instead of a one-time purchasing fee ongoing royalties for the lifespan of the IPRs.

Technical/IP Legal analysis

This particular area of technology is very dense, and there are, in the numbers of 10 000 patent families with related technology, hence there might be issues from a strictly IP related perspective entering this field, as it is very complicated. As of now, a deeper analysis is needed in relation to a system patents covering this particular technology, and the intention of the MMC. A more comprehensive FTO analysis is need, as well as a detailed definition of technology and a productification of the same.

Given alternative 1 and 2, this is likely to be less of a problem as the technology is acquired through an established supplier. The risk with such approach is assessed as not IP specific. However acquiring the technology through alternative 3 and 4, the above-described IP Thicket is more important to take into account.

In relation to alternative 3 and 4, the following conclusions have been made in the technical/IP legal analysis.

1) The patent situation is not ideal, as only one patent controlled by the research institute has been granted (in the US).
2) It is unclear how well the patents are covering the technology as such, a further investigation is needed
3) It is hard to conclude upon easy of invent around given the patent landscape and the technology as such.

Entering this field as a developing actor, the above-mentioned issues needs to be addressed. The risk profile of alternative 3 and 4 is deemed to be high. This situation also affects the value of the technology, though favorable in relation to an acquiring scenario for a MMC.

7.2.5 Conclusions and summary on Case B

The conclusion is dependent upon the context and how we have defined the context into factors of importance. As the calculations and ranking is conducted to today Alternative 2 is best suited for the MMC. This could of course be changed with added factors of evaluation and a different ranking.

7.3 Concluding remarks on Case studies

On the general level we can conclude that the approach has some weaknesses, such as is that it is hard to see the underlying analysis, which reduces the confidence of the overall analysis. Also note that ranking does only take into account the above introduced factors. And we can see a clear need for the alternative analysis covering finance and IP/technical aspects, in accordance with Sullivan's framework (1996)

On the usage of the framework we wish to conclude the following, which should be noted is subjected to the two case studies conducted within the scope of this thesis,

1) We deem the ranking to be circumstantial, i.e. the need of thoughtfulness from the analyst is advised
2) One can not see the underlying analysis in relation the result of the framework
3) As for the contextual evaluation the approach is deemed to be suitable
4) Seemingly both in and out-licensing are scenarios that the framework could be used in. However the analysis needs to be adopted accordingly

These conclusions will be discussed in greater detail in the discussion chapter (chapter 8), and also be contrasted in relation to the references.

8 Discussion

This following chapter has to purpose to synthesis the outset questions from the introduction chapter with the empirical study, concluded framework and case studies. For organizational purposes the discussion is structured as the questions were introduced earlier,

1) Describe and analysis established ways valuate licensing from a financial perspective, built upon the specific factors of Multinational manufacturing corporation
2) Describe and analyze patent specific factors that are important from a licensing evaluation point of view, such as claim construction, ease of infringement detection, validity and ease of invent around
3) Describe and analyze a reasonable approach combining a decision theory with the above-mentioned factors, for context specific patent evaluation.
4) Analyze and conclude upon the proposed model as we test it on a confined set of patents. This fourth sub-question acts as a synthesis step in relation to the above-described approach.

To discussion below is drawn from the empirical findings and the cases studies we have completed testing the approach to licensing evaluation.

1) Describe and analysis established ways valuate licensing from a financial perspective, built upon the specific factors of Multinational Manufacturing Corporation

Concept of financial valuation does not seem to overly well fit the bill of intellectual asset valuation, as financial valuation to a large extent takes a starting point in a more tangible world. Several of the interviewees indicated the problem with the traditional approaches and their need for special adoption in relation to patent valuation, as mentioned by the reviewed literature (Razgaitis 2009 etc). Regardless of the identified weakness we can conclude both from literature and interviews, the high importance of financial models estimating a price of patents. This setting have shaped the patent valuation map into a rather straightforward, streamlined and overall accepted approach taking a starting point in income based valuation, either through more advanced methods such as real option valuation or more easily grasped DCF analysis. Regardless of approach we can conclude that its subjected to the capacity of the analyst, the organizational need and to whom the valuation is going to be presented. The wide adoption of the DCF analysis is concluded to be the function of the communication advantages this approach has, and the synergies in relation to its wide usage in other valuation context, such as real estate valuation. Hence, as we see it, DCF analyses is probably a suitable approach for a MMC, as they most likely use valuation models with similar characteristics for other situations, and thus have the internal experience and capacity of conducting these kinds of analysis properly.

Even Though the DCF analysis is the mostly used model for valuation of patents in the transaction context, the cost based approach has an important function in relation to patents value on the accounting side of things. Hence, from the perspective of how much are the book value of the patents worth, income-based methodology is not suitable or applicable according to Razgaitis (2009). From the perspective of a MCC book value is important, and more actively manage patents in the books are recommended even for transactional purposes as it gives a indicative starting point for an analysis, we would argue.

In-licensing poses a challenging analysis, from a valuation perspective, as the conclusions leans towards the need for a combination of a income based valuation and cost based valuation, inline with Razgaitis reasoning on the need of both approaches (2009), meaning that the potential incomes of a in-license scenario does not always correspond with the costs as the technology needs to be further developed and tailored to fit the MMC context. Perhaps a slightly confusing statement, as if not the income valuation is correct then the

technology is not worth acquiring. Though we wish to conclude that the in-license of a technology, not to seldom is a risk taking business, and thus purely using the income approach might not be ideal, but rather combining the methodology with a cost based approach, especially if the technology not is to be sold as a product but an incremental add-on the existing product line. Obviously this reasoning applies to technology in-license, and not all in-license scenarios. Another aspect is of course the time frame, it could take 5 years or more to incorporate a technology into a product, during this time the cost associated to the acquired technology could/should for accounting purposes be indicate in the books, and not only be purely speculative.[40]

Another important notion discovered during the research[41] of this thesis is the concept of value versus financial value. The value of patents as *business instruments* is perhaps not always suitable to transform into a financial number, as the intended functionality of specific patent was not to be used in a transaction context, but rather in the more "traditional" blocking setting or the some other contextual way intended to be leveraged by the assignee. The economic literature, such as Razgaitis (2009), Reilly (2004) and Allison (2004) etc, discussing financial value versus the vague term of *just* value is vast, and quite likely there are as many definitions of values as there are economic scholars, which of course diminish the discussion on patent intangible value to more of a opinion then a fact based discussion. Nevertheless reflecting over the value of patent does not seldom end up in the conclusions, *what do you want to do with the patent?* and *what can you do with the patent?* (Granstrand 1999) Given these questions, the approach of defining and contextualizing patents, we would argue, where much aims to answers the more philosophical approach regarding financial patent value versus patent value, even though it does not provide a straightforward path.

2) Describe and analyze patent specific factors that are important from a licensing evaluation point of view, such as claim construction, ease of infringement detection, validity and ease of invent around

Patent specific factors in relation evaluation of a patent seem to be a hot topic, where opinions and approaches differ widely. From the interviews, which have been the main source of information in relation to this specific question (as the literature, with some exceptions, is confined[42]), we can conclude that no real consensus exists. However, it seems that there are two approaches to it,

- The aggregated approach (quantitative)
- The specific level approach (qualitative)

The aggregated approach refers to less detailed factors of the patent itself, i.e. quantitative analysis. Factors of importance here is citations, number of claims, length of claims and size of families, etc. Needless to say, this approach do stand in sharp contrast to the specific level approach, where the actual content of the claims and their construction is essential. How these should and could be used is, once again it seems, contextual concluded from the interviews. Valuation a patent portfolio of several hundreds of patents (or more) the aggregated analysis could be an applicable starting point, however according to the findings, does not really correspond to the real value of the portfolio according to several of the interviewees. But yet, if we consider the statistics and presumably the most advanced statistical model[43] these aggregated factors seem to be relevant. From the licensing perspective however, (in or out-licensing) the specific level approach seems to be mostly relevant, as in often involves few patents, in the number of tens, and it is outmost important that the technology being claimed is covered if someone is to be convinced (or prosecuted in a court of law) to take up a license or if one offers a technology licensing package. We have during the interviews recognized some

[40] Interviewee C and J
[41] Interviewee E
[42] Interviewee B
[43] According to the reference C, OceanThomo has currently the most sophisticated statistical model for patent valuation.

tension between these to approaches to patent valuation, as some of the interviewees seem to be more in favor of the aggregated approach, whereas others favors the qualitative approach. As well as there are scholars supporting this (Albert 1991) aggregated analysis, and also scholars not in favor of this approach (Olsson, 1996). There are likely a number of explanations to this, however the main reason as we see it is probably the business context off the interview person or the methodology used by the researcher. Their professional role is likely to influence their approach and opinion about these two general valuation approaches we have concluded upon.

To some extent, the above discussion that we have been confronted with during this thesis work could partly be described as the myths of patent specific characteristics. These myths have originated from typical United States patents[44], where the number of claims with long and complicated claim structures is the reference patent used in as a benchmark. From the persons (experts in drafting and analyzing/due diligence of patents) we have interacted with during the research argues that claims and claim construction is foremost a qualitative assessment, and should carefully be assessed on contextual basis.

3) Describe and analyze a reasonable approach combining AHP theory, with the above-mentioned factors, for context specific patent evaluation.

The purpose of this thesis has, in various forms, met some friction during the interviews and interactions with knowledgeable people[45]. To some extent we have suffered from the lack capacity of explaining the concept in a structural way, but also we feel that quite a few of the interviewees have been reluctant towards a structural approach for licensing evaluation. The argument of a licensing and patent valuation as purely contextual has been ever present as an argument for the low necessity of an evaluation approach. This external input has to a large extent shaped the approach, and we have had the opportunity of adapting the proposed model and the underlying theory. The main contribution lies in the capacity of the model for defining and highlighting aspects and factors for out- and in-licensing in the MMC setting.

With the situation described above in mind, it is justified to ask the question if a structural licensing evaluation model at all is possible to construct? The main argumentation against a structural approach is the importance of context and that all potential scenarios are different, so no real synergy is can be identified. The ambition in relation to this has been to focus upon developing a model that is merely an approach with a specific set of guidelines for evaluating licensing opportunities/alternatives. The problem with this approach is the pressure it exposes on the analysis as such, and the information that constitute the fundamentals of the analysis. Without exaggerating understanding a specific context can potentially complicated, and perhaps even more so to assign specific factors of importance in relation to this context. Using the AHP theory in general, could be described as a complicated task, as it a very broad and to some extent subjected only to the analyst conducting the evaluation of the alternatives. Given this starting point of the proposed model, the ambition have been to build a model where the contextual factors are key to the evaluation. We can however not disregard the fact that the sharpness of the analysis is subjected to what kind of background information and sources of discussion one can add to the information gathering section in relation to the given context, as that is stipulating the quality of the factors.

Another important factor of interest in relation to the proposed model is the lack of a confidence interval. This is something we see as potential weakness, as one cannot conclude upon the level of the analysis in relation to confidence. Obviously this can affect interpretation of the reliability of the analysis, and also pose an obstacle for the analysis once the user is to present the conclusions and result of the analysis for senior staff and not being able to give rating of confidence.

[44] Interviewee B
[45] Interviewee I, H

Regardless of the above-discussed downside of the proposed approach, the model is deemed to have positive influence on the contextual understanding and what can be potentially being done with patents in different commercial context. Also the framework potentially takes into account factors not directly linked to financial gain, which in the setting of MCC is deemed to be useful.

4) Analyze and conclude upon the proposed model as we test it on a confined set of patents. This fourth sub-question acts as a synthesis step in relation to the above-described approach.

This section mostly refers to the case studies conducted, however has a strong correlation with the discussion above. What we can conclude from the case studies are,

- It is hard to conclude upon AHP theory in relation to the evaluating the case studies
- Implementation of the framework is possible to evaluate, but it is hard to evaluate results
- We cannot see if the background research is well performed or not

The difficulty in evaluating the proposed model in relation the two cases we have reviewed is merely due to the fact that the cases have primarily been done in theory. Obviously that is a plausible starting point, however it biases the analysis to some extent. A more realistic testing would have been conducted in collaboration with more of the involved professionals in each case. We have also stumble upon the need for external professional technical validation in relation to one of the cases, which is has not been possible during the timeframe of this thesis.

In relation to the model as such, the implementation of approach is very much subjected to the analyst and how the user aims to structure its evaluation process. The ranking process is essential, and thus needs to be done with some caution, and as discussed above, the background sources of information and assumptions are essential in relation to how the analyst is ranking the identified factors. And once the ranking is done one cannot see whether the background work is well performed or not. As we see it, a potential way forward mitigating a single person's ranking is setting up several rankings by the involved professionals.

9 Conclusion

To conclude, with regards to the above discussed questions, we which to highlight the following three main conclusions,

1) A decision theory is useful to evaluate context and non-traditional licensing factors

The proposed AHP theory supplies an interesting alternative analysis to more established ways of reviewing patent in/out-licensing. The main advantages as we see it, is that the contextual component of a licensing analysis are highlighted. We deem this to be especially interesting in settings where licensing is not the main business, but rather a potential alternative way of leveraging intellectual assets, such as within a multinational manufacturing corporation. As discussed earlier the results are from an AHP evaluation process is fairly complicated to analyze since one cannot tell whether the background analysis is properly performed or not. However, as a complement to the traditional technical/legal and business analysis it represents a useful analysis, especially as non-traditional factors of importance can be highlighted.

2) The proposed model should/could be used to analyze alternatives and potential scenarios

Given the weakness of the AHP theory, not being able to see the fundamentals behind each undertaken ranking, the model should be considered to be guiding in relation to the identified alternatives. The *result* per see is not necessarily the most important outcome when using the theory but rather the outcome of the contextual analysis, breaking down opportunities and factors of importance.

3) To increase the sharpness of the context evaluation, and thus increase its confidence, the fundamental analysis and sources of information needs to be addressed

The potential in using AHP when reviewing patent licensing alternatives is subjected to the analyst and to what extent reliable sources of information have been identified, and that the proper professional personnel have been interviewed, thus it is essential in relation to the context evaluation, to spend time on understanding the context and from that derive factors of importance.

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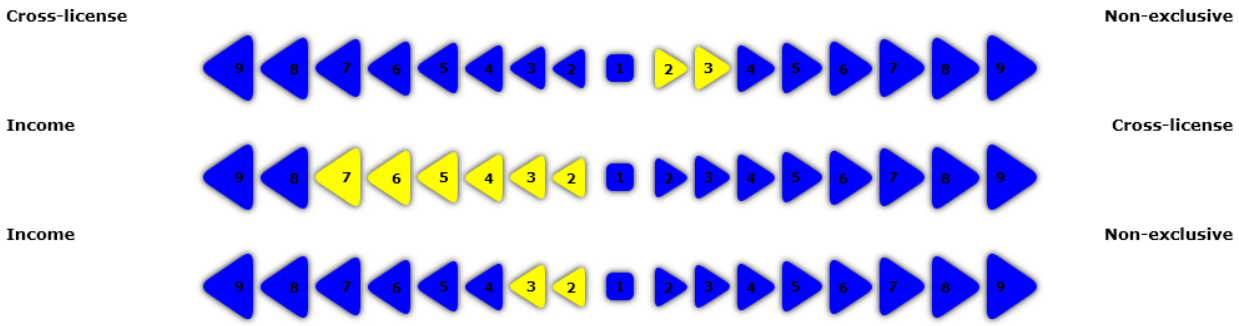
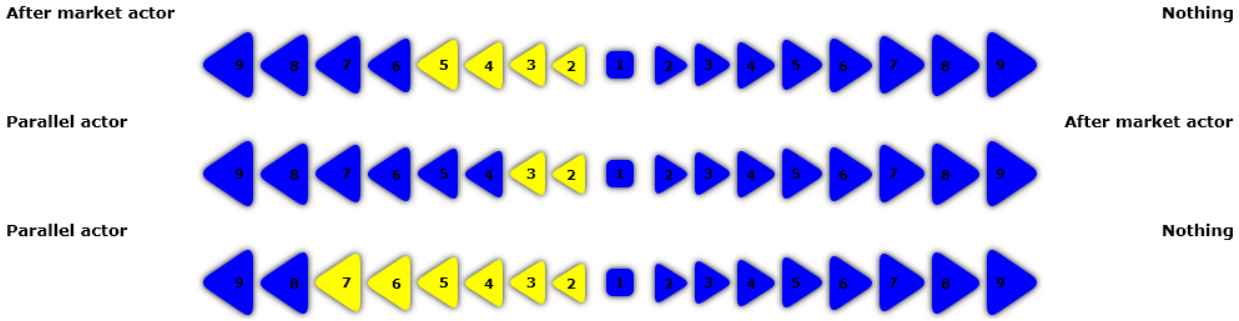
11 Appendix A

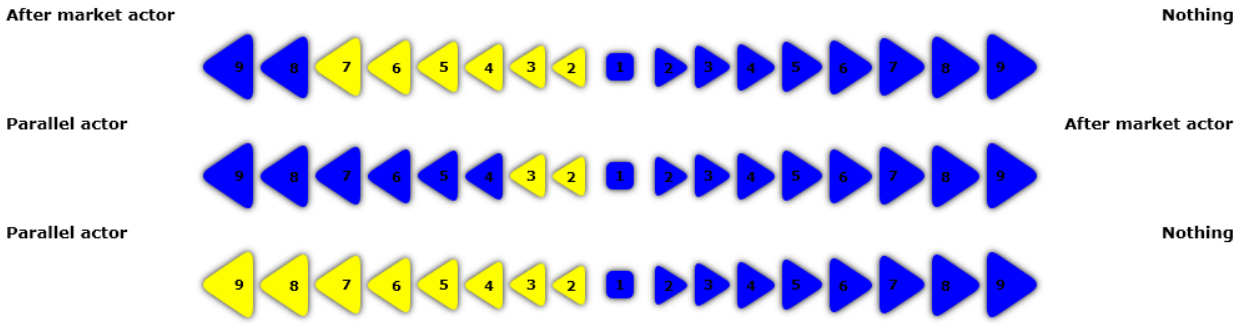
11.1 Ranking process – Case A



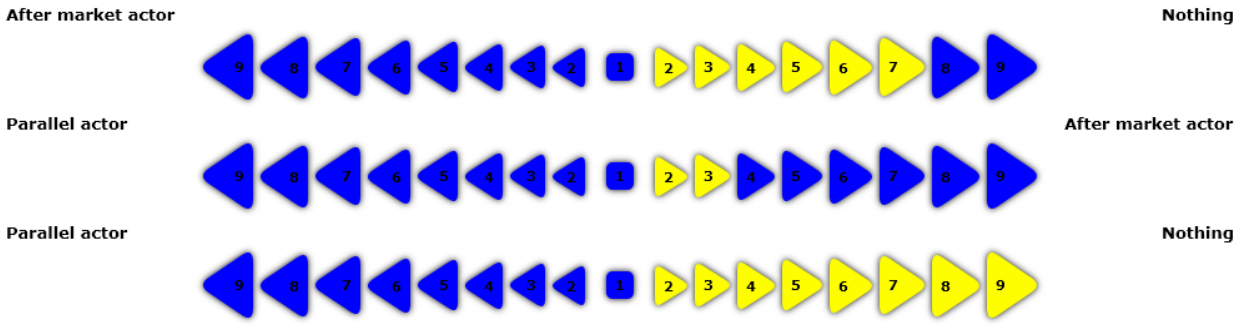
Initial context definition



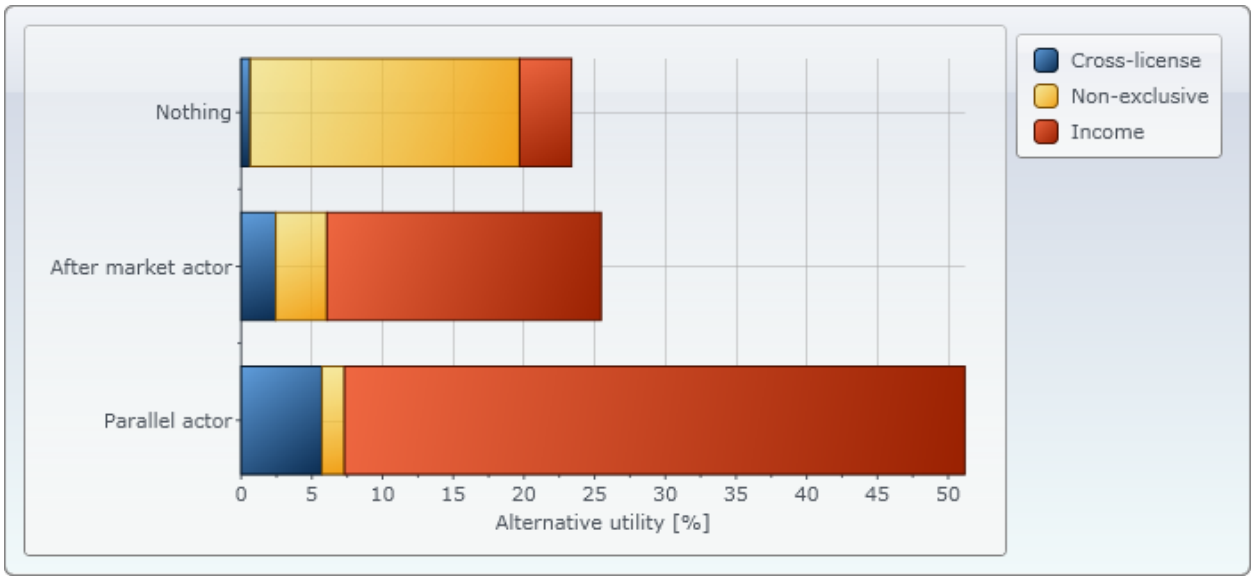
Cross-license factor



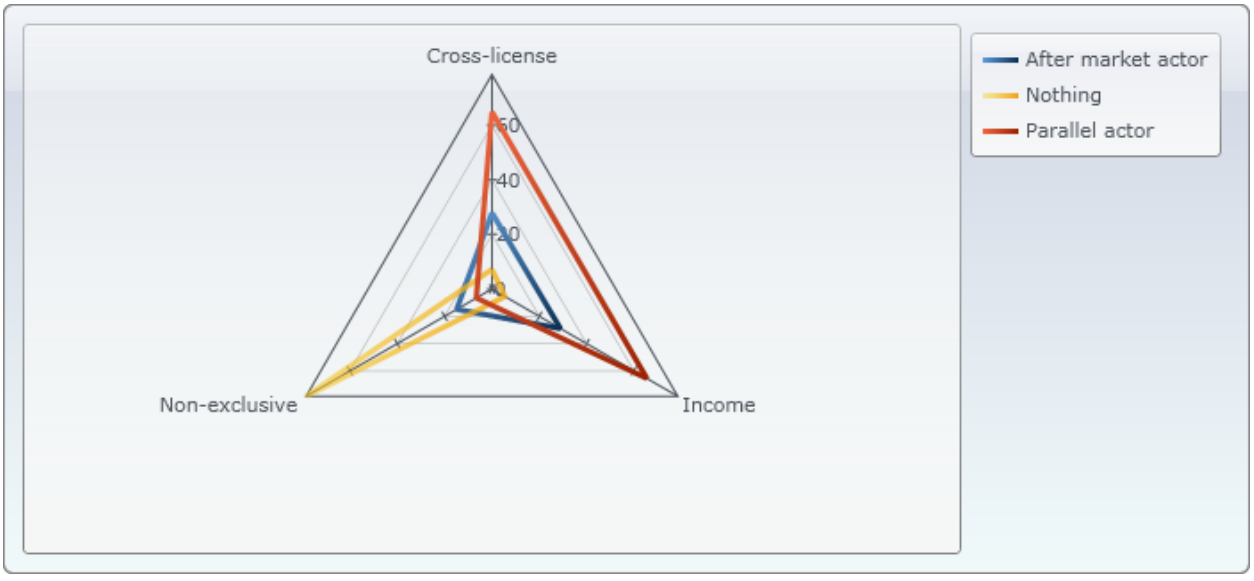
Income factor



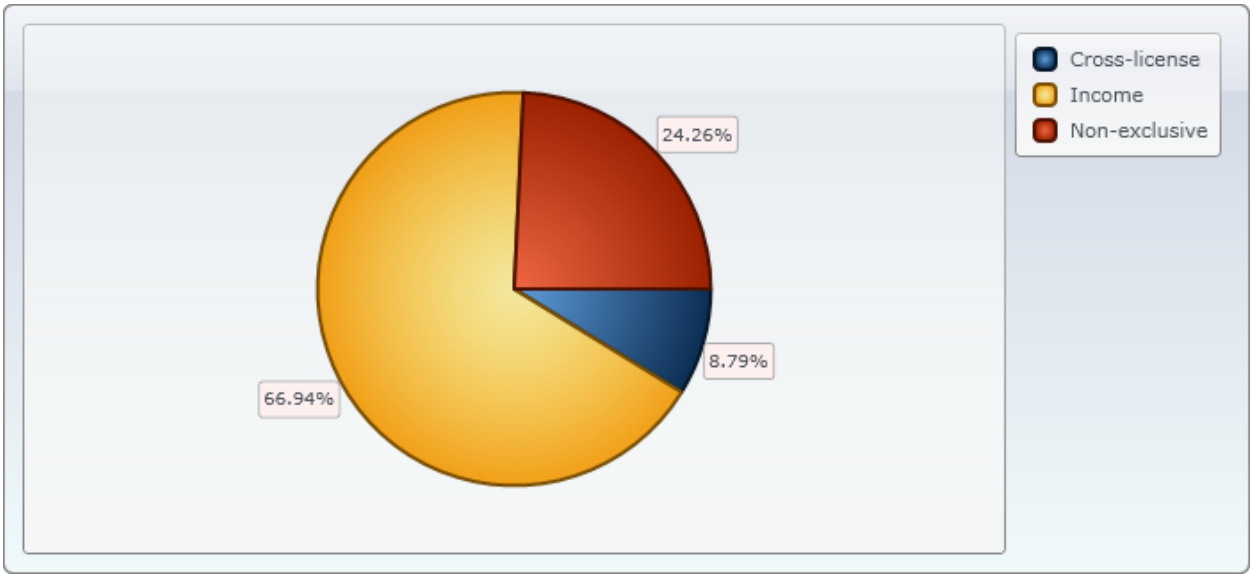
Non-exclusivity factor



Result graph 1

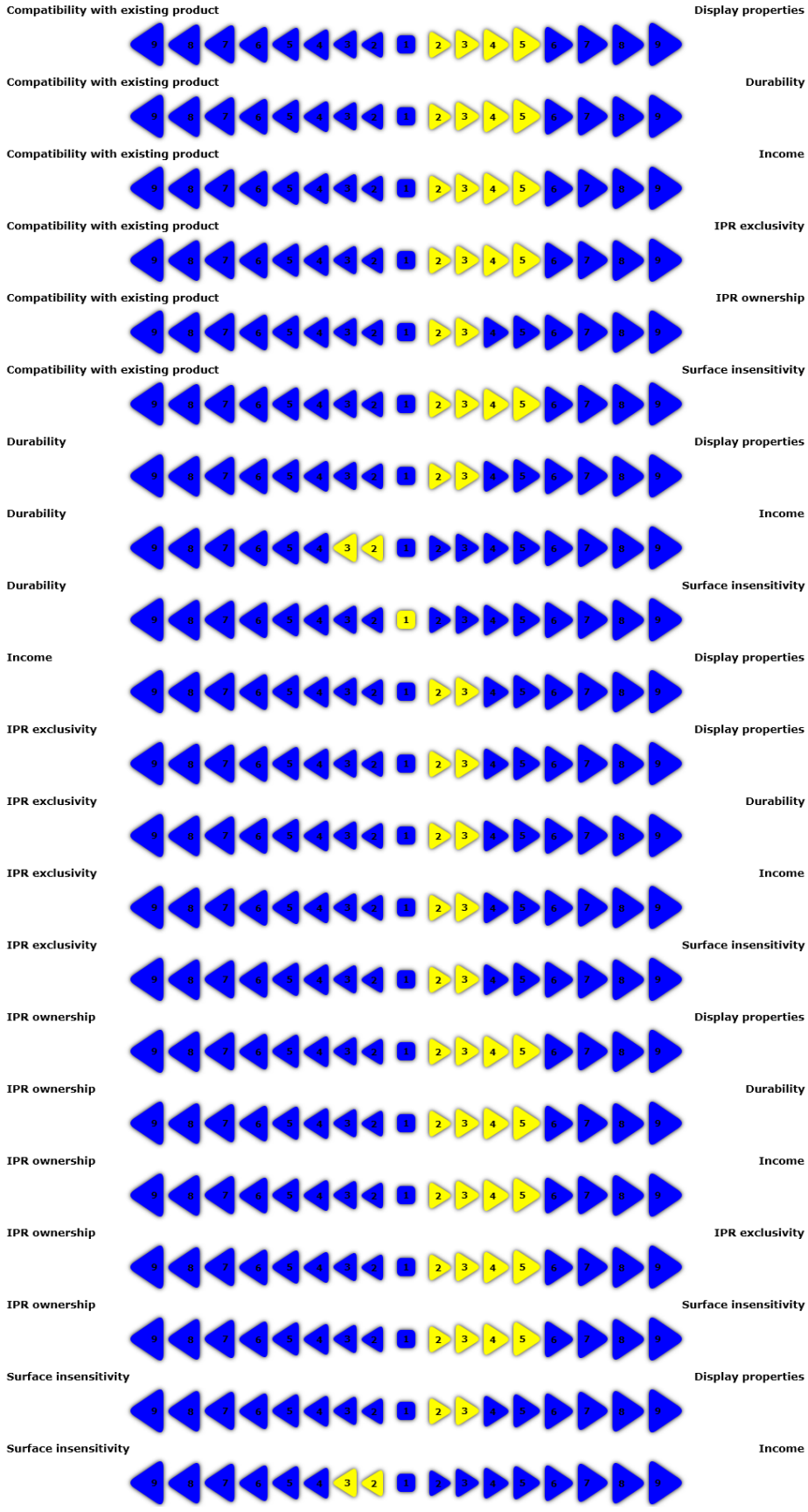


Result graph 2

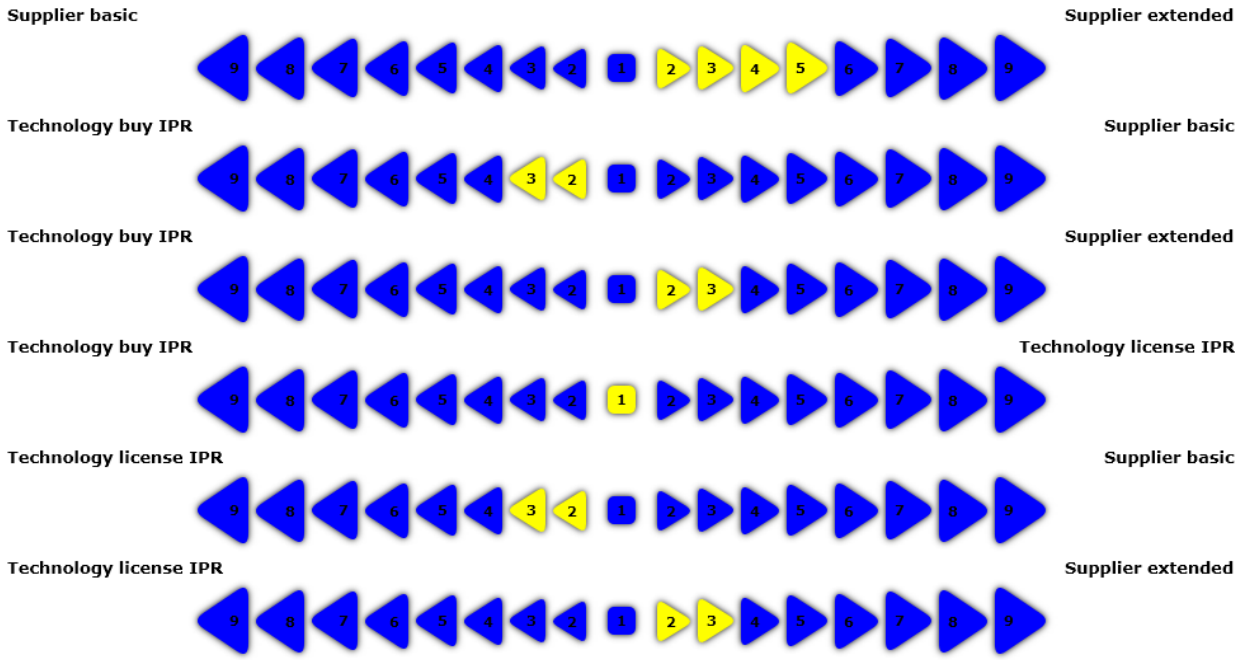


Result graph 3

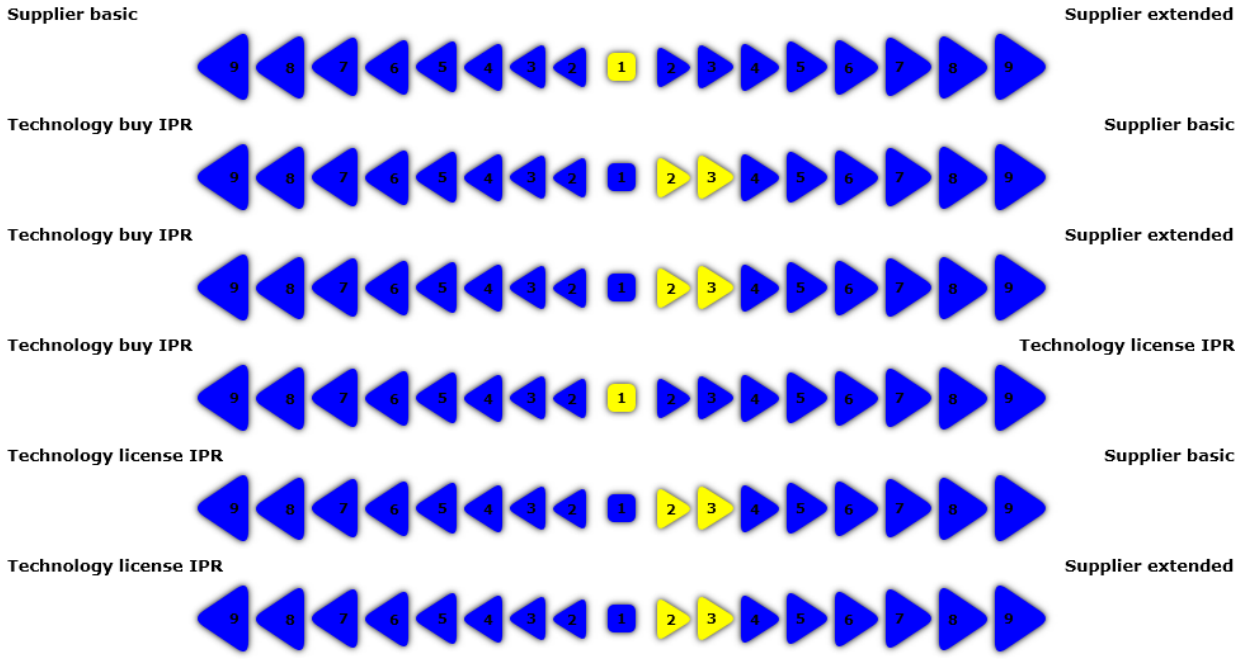
11.2 Ranking process – Case B



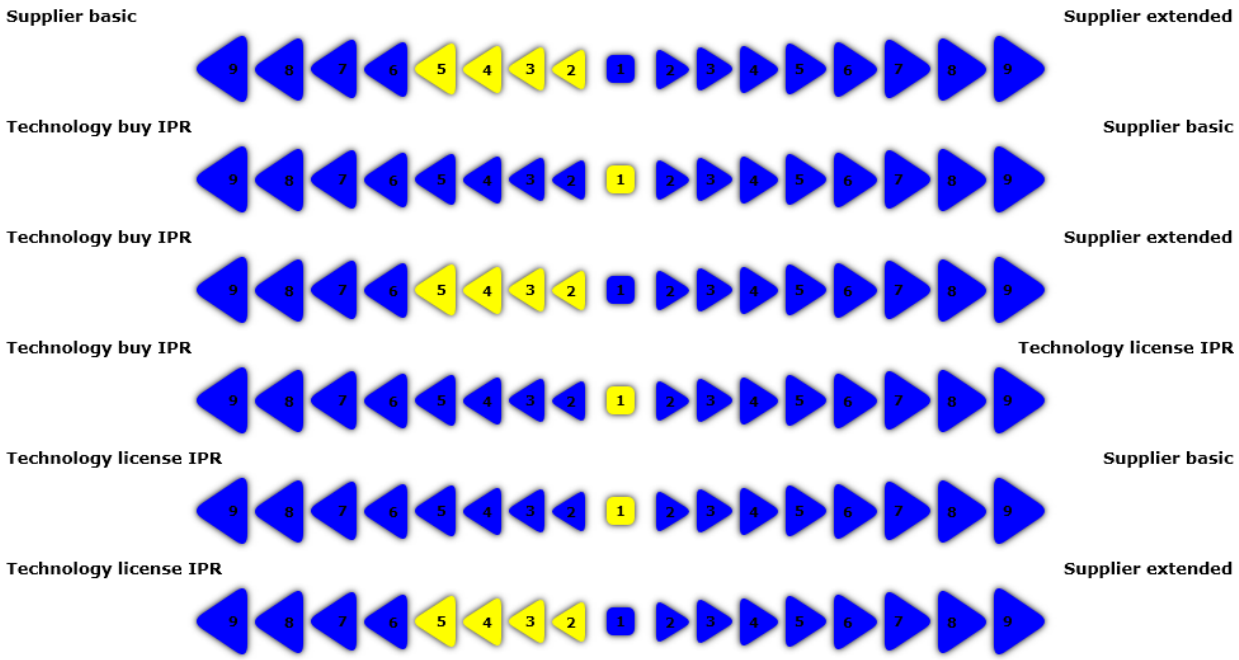
Initial context definition



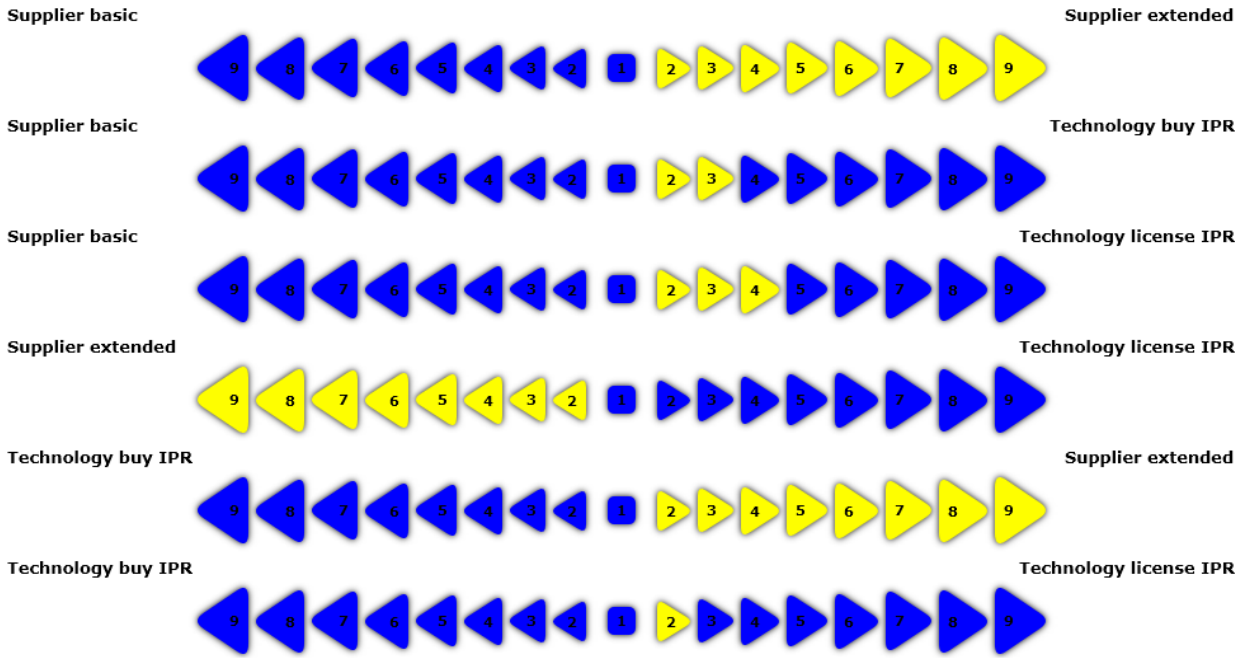
Display property factor



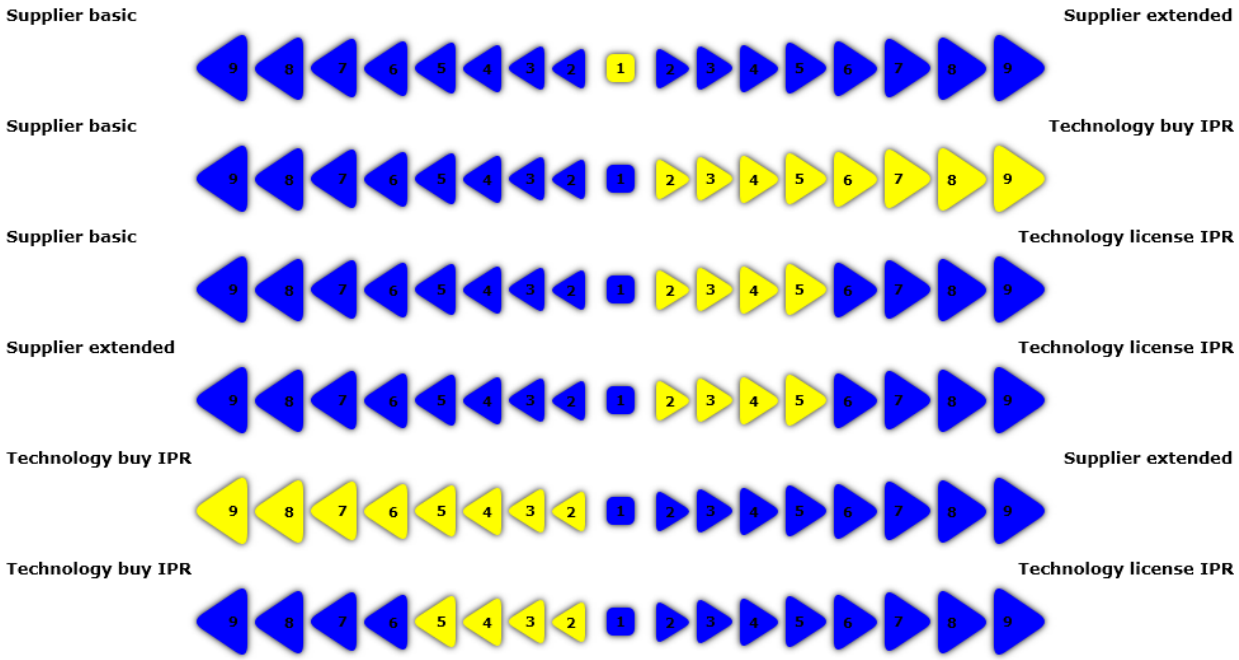
Product compatibility factor



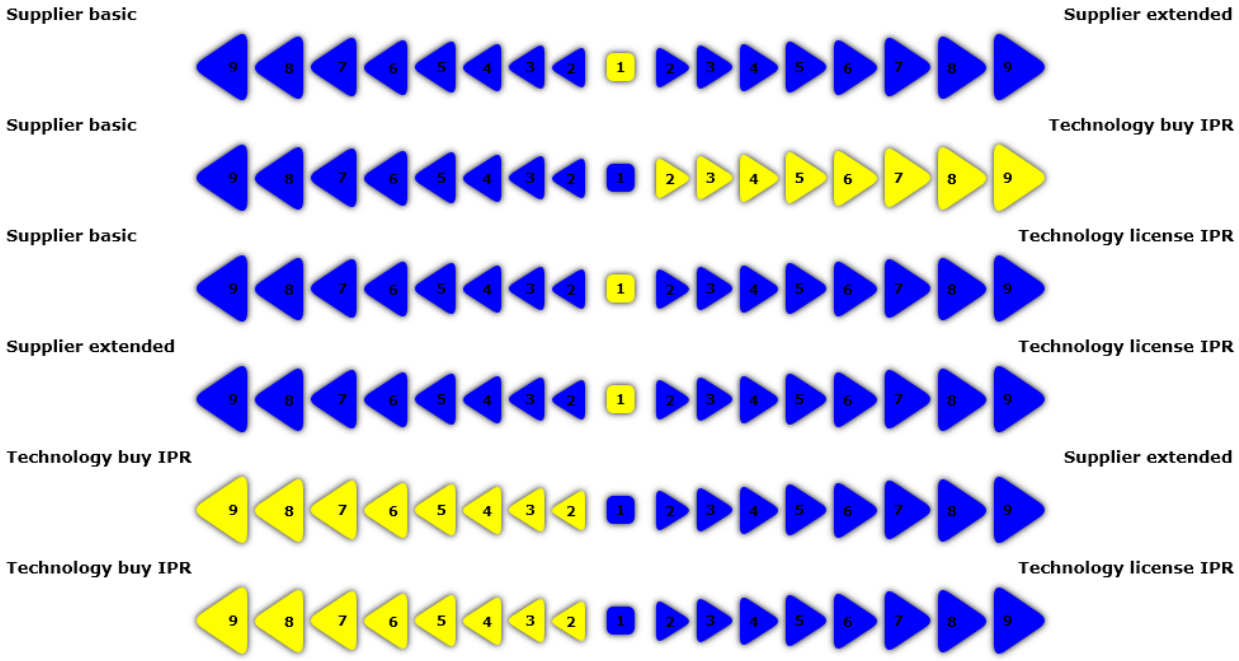
Durability factor



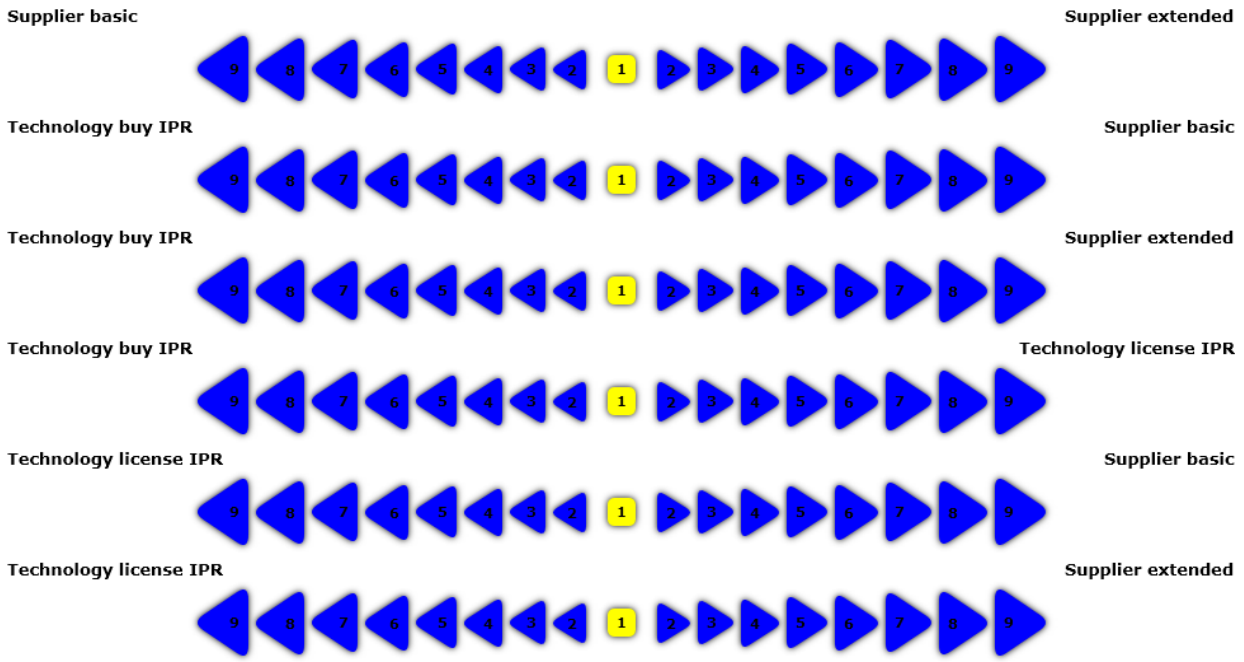
Income factor



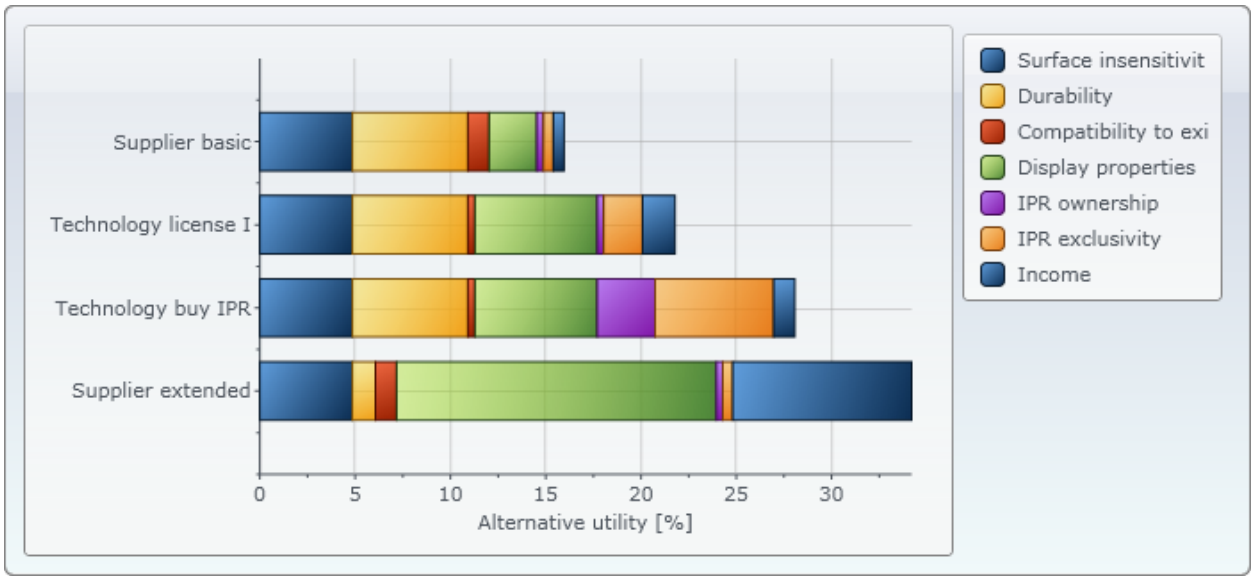
IPR exclusivity factor



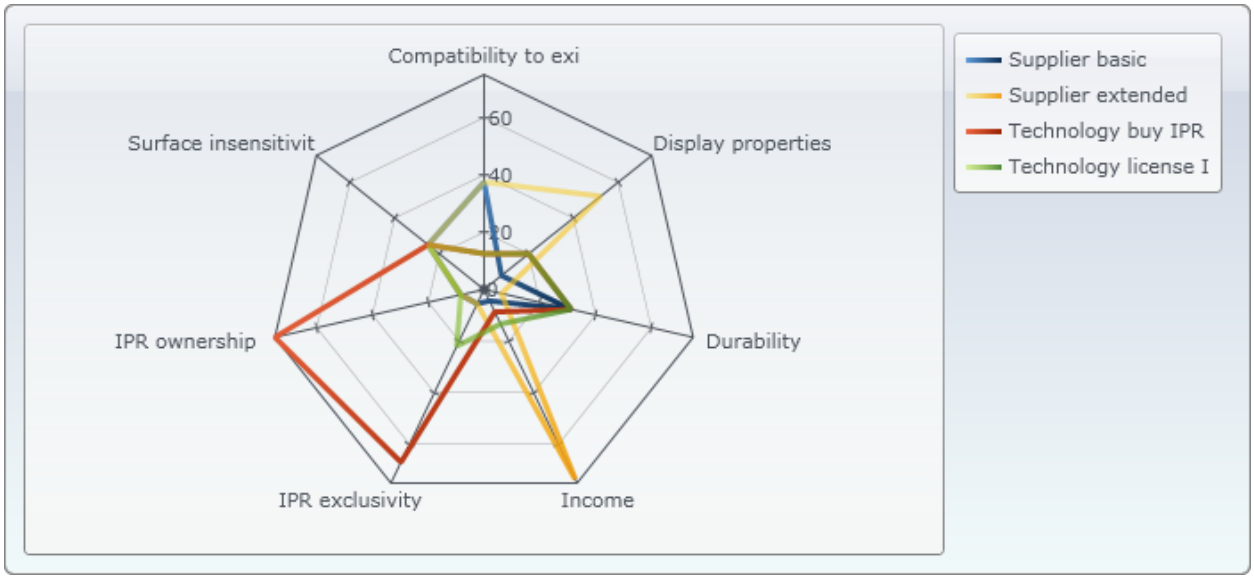
IPR ownership factor



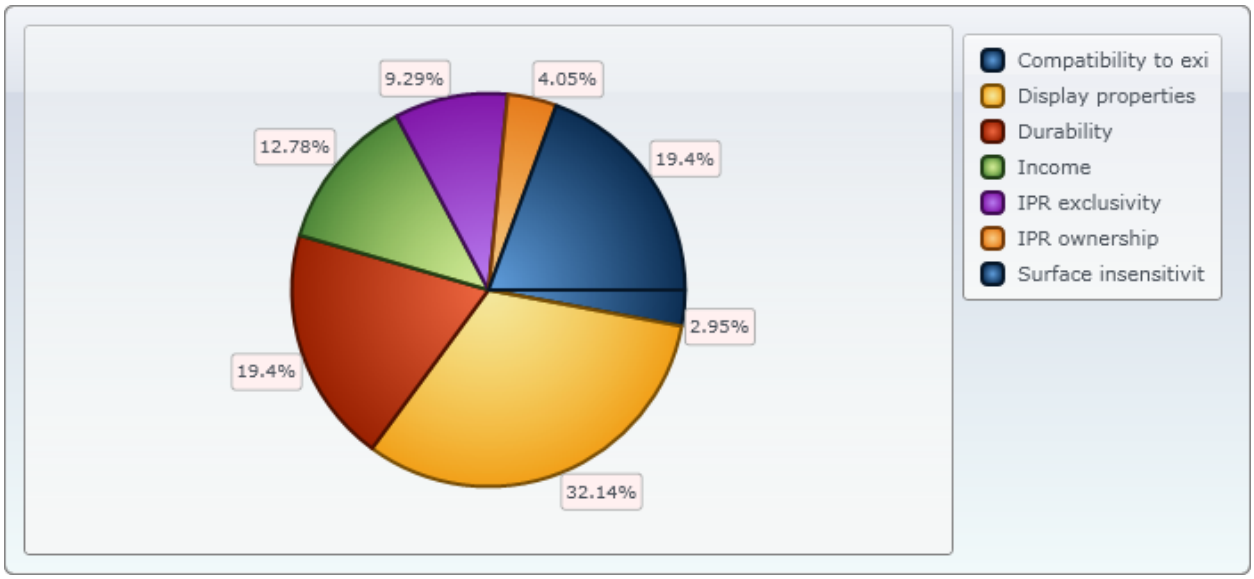
Surface insensitivity factor



Result graph 1



Result graph 2



Result graph 3

12 Appendix B

12.1 Questionnaire – Legal

Interview - Template

Date and Place:
Interviewer:
Interviewee:

1	**Company Profile**	**Notes**
1.1	Background of the person being interviewed	
1.2	Year of formation of company	
1.3	Company size (number of people employed)	
1.4	Background employees	
2	**General Operations**	**Notes**
2.1	Could you please describe your general IP operations	
2.2	Of your business, witch activity is Core vs. Non-core	
2.3	In which countries do you carry out our operations?	
3	**Patent specific factors for valuation**	**Notes**
3.1	What are the most important factors to Patent valuation (patent specific)?	
3.2	Are there some factors that are more essential then others?	
3.3	Are their any factors that are general vs. Not general (more contextual)?	
3.4	How would you divide (for valuation purposes), Patent age, Citations, Family size, No of Assignees, no claims etc.? (ranges)	
3.5	How do you motivate an indicator of patent value?	
3.6	What do you find to be most difficult when valuing patents?	
4	**Additional information/References**	**Notes**
4.1	Do you have any literature recommendations for us, on the topic of valuation?	
4.2	Are there any people you suggest us to contact based upon our thesis purpose?	

12.2 Questionnaire – Business

Interview - Template

Date and Place:
Interviewer:
Interviewee:

1	**Company Profile**	**Notes**
1.1	Background of the person being interviewed	
1.2	Year of formation of company	
1.3	Company size (number of people employed)	
1.4	Background employees	
2	**General Operations**	**Notes**
2.1	Could you please describe your general IP operations	
2.2	Of your business, witch activity is Core vs. Non-core	
2.3	In which countries do you carry out your operations?	
3	**Patent Valuation approaches**	**Notes**
3.1	Which are the most common approaches of patent valuation of the established Income, cost and market approaches?	
3.2	Are their any pros and cons to these different approaches?	
3.3	Which one(s) do You prefer?	
3.4	Why is this (these) a preferred model?	
4	**Additional information/References**	**Notes**
4.1	Do you have any literature recommendations for us, on the topic of valuation?	
4.2	Are there any people you suggest us to contact based upon our thesis purpose?	

12.3 Questionnaire – Technical

Interview - Template

Date and Place:
Interviewer:
Interviewee:

1	**Company Profile**	**Notes**
1.1	Background of the person being interviewed	
1.2	Year of formation of company	
1.3	Company size (number of people employed)	
1.4	Background employees	
2	**General Operations**	**Notes**
2.1	Could you please describe your general IP operations	
2.2	Of your business, witch activity is Core vs. Non-core	
2.3	In which countries do you carry out your operations?	
3	**Technical aspects approaches**	**Notes**
3.1	How do you approach the technical properties of a patent? What factors do you consider?	
3.2	Are their any pros and cons to these different factors?	
3.3	Which one(s) do you prefer? Why?	
3.4	How do you valuate the different factors?	
4	**Additional information/References**	**Notes**
4.1	Do you have any literature recommendations for us, on the topic of valuation?	
4.2	Are there any people you suggest us to contact based upon our thesis purpose?	