Best Practice for Valuation of a Subdivision Without Profit and Loss Statement

- A case study on Andebjo and the acquisition of a subdivision from Company X comprising intellectual property, employees and a service contract

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Best Practice for Valuation of a Subdivision Without Profit and Loss Statement

by

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Principer för värdering av en division utan resultaträkning

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Abstract

Acquiring companies for technology rather than investing in internal R&D is a common strategy for industrial companies. However, there are currently no standard valuation methods for the acquisition of small divisions without a P&L where most of the value lies in assets as intellectual property, technology and know-how. This thesis has through a literature review, interviews with experts and valuation modelling applied on a case found best practices for how to value such a division.

Interviews were held with a set of senior experts including management consultants, transaction advisors, investment bankers, corporate leaders and IP valuation experts. The findings from the interviews and the literature review were practically applied on a case through a valuation modelling where different valuation methods were tested. The case studied was the industrial company Andebjo who considered acquiring a subdivision of Company X comprising intellectual property, employees and a service contract. The findings and experiences from the valuation modelling are discussed in relation to the findings from expert interviews and literature. The most important conclusions drawn regarding best practices for valuation of a subdivision are;

- A division should preferably be valued as a whole company and not as the sum of its assets, this will provide a more accurate value as a sum-of-assets valuation risks missing value that cannot be assigned to a specific asset or origin from synergies.

- The best way to value intellectual property is in general to use an income based method. When specific prerequisites are prevalent, market based methods or real options will provide a more accurate value and should therefore be used.

- To value employees, the most useful approach which always works is to use a cost based method and look at the cost of replacement to someone with similar competence.

For more detailed conclusions including descriptions of contexts that make certain valuation approaches more appropriate, see Chapter 6 Conclusion.

Keywords: M&A, Company Valuation, Asset Valuation, Patent Valuation, Valuation of Employees.
Sammanfattning

Att förvärva företag för deras teknik istället för att investera i intern FoU är en vanlig strategi för industriföretag. Det saknas dock etablerade värderingsmetoder vid uppköp av små divisioner utan egen resultaträkning där en stor del av värden ligger i immateriella tillgångar, teknik och kunskap. Genom en litteraturstudie, intervjuer med experter och en värderingsmodellering tillämpad på en fallstudie har principer utformats för hur en sådan division bör värderas.


- En division bör värderas som ett företag och inte som summan av dess tillgångar, detta ger ett mer fullständigt värde eftersom värdering genom summan av tillgångar riskerar att missa värden som inte går att tillskriva specifika tillgångar eller kan hännföra till synergier.
- Det bästa tillvägagångssättet för värdering av immateriella tillgångar är generellt att använda en inkomstbaserad metod. Vid specifika förhållanden ger marknadsbaserade metoder eller realoptioner mer korrekta värden och bör därför användas.
- Vid värdering av anställda är det mest användbara en kostnadsbaserad metod som utgår från kostnaden för att ersätta en anställd med någon som besitter en likvärdig kompetens.

För detaljerade slutsatser med beskrivning av specifika förhållanden då vissa värderingsmetoder är mer passande, se Chapter 6 Conclusion.

Foreword

Writing this thesis has been a fun opportunity and a great learning experience for us in many ways. We have had the pleasure of working in the acquisition focused business development team of the expansive company Andebjo growing mainly through acquisitions. On top of gaining academic insights, this has offered us the possibility to make something more out of our semester writing the thesis.

We would like to thank our academic supervisor Associate Professor Dr. Thomas Westin for great feedback throughout the thesis work. Furthermore, we are grateful to all experts interviewed for the thesis for valuable input. Last but not least, we thank our company supervisors OP & OJ at Andebjo for providing this case, giving valuable feedback on the thesis and supplying us with exciting side tasks.

There are several other people we would also like to thank for contributing to our thesis writing experience. The crew at the Andebjo London office have all been showing great hospitality during our stay in London. We would also like to thank Jim and the guys at CC Taxi for their exquisite punctuality, interesting small talk and flawless morning driving.

We conclude that this thesis marks the end of a 14 year long journey that we have done together, not only in the same school or programme but in the same class. We have had a nice time and the thesis is a perfect ending before we move on to our professional careers. As a last note in our last academic text, we would like to recognize our high school physics teacher Per Wennerström who up until this point still is the most inspiring, enthusiastic and encouraging teacher we have had.

Felix Andersson & Fredrik Björelind

Stockholm, May 2017
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<tr>
<td>APV</td>
<td>Adjusted Present Value</td>
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<td>CAPM</td>
<td>Capital Asset Pricing Model</td>
</tr>
<tr>
<td>DCF</td>
<td>Discounted Cash Flow</td>
</tr>
<tr>
<td>EBIT</td>
<td>Earnings Before Interest and Taxes</td>
</tr>
<tr>
<td>EBITA</td>
<td>Earnings Before Interest, Taxes and Amortization</td>
</tr>
<tr>
<td>EBITDA</td>
<td>Earnings Before Interest, Taxes, Depreciation and Amortization</td>
</tr>
<tr>
<td>EV</td>
<td>Enterprise Value</td>
</tr>
<tr>
<td>IP</td>
<td>Intellectual Property</td>
</tr>
<tr>
<td>IPO</td>
<td>Initial Public Offering</td>
</tr>
<tr>
<td>M&amp;A</td>
<td>Mergers and Acquisitions</td>
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<tr>
<td>MRQ</td>
<td>Main Research Question</td>
</tr>
<tr>
<td>OEM</td>
<td>Original Equipment Manufacturer</td>
</tr>
<tr>
<td>P&amp;L</td>
<td>Profit and Loss Statement</td>
</tr>
<tr>
<td>ROIC</td>
<td>Return On Invested Capital</td>
</tr>
<tr>
<td>RQ</td>
<td>Research Question</td>
</tr>
<tr>
<td>SLA</td>
<td>Service Level Agreement</td>
</tr>
<tr>
<td>WACC</td>
<td>Weighted Average Cost of Capital</td>
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<tr>
<td>WARA</td>
<td>Weighted Average Return on Assets</td>
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Chapter 1

Introduction

This chapter covers the research topic of the thesis and the prevalent situation at Andebjo it is derived from. Elementary information about Andebjo, the potential acquisition target and the associated challenges are presented. Furthermore, the purpose and research questions are introduced and discussed.

1.1 Background

Andebjo is a global company offering products related to precision measurement. The technology of the different products varies from measuring with laser and optical systems to contact measuring, and the general value proposition is to give precise measurements in order to increase manufacturing and product quality. Their products are sold in a wide variety of industries ranging from industrial manufacturing to mining and agriculture.

Today, Andebjo is serving most markets in the world as a result of a very expansive acquisition focused growth strategy. They have over the years acquired several different software and hardware companies and are now offering products ranging over several business areas. Andebjo have over 25 different brands representing their different products in different markets [Andebjo AB 2016]. Andebjo operates in multiple business areas but this thesis will focus specifically on an acquisition of a carve-out division that would be integrated under their business unit Industrial Measurement.
Andebjo is facing an opportunity to acquire a subdivision from Company X. This division manufactures products related to precision measurements when producing injection valves and therefore fits well into the Andebjo product portfolio. The rationale behind the divestiture is that the top management of Company X wants to refocus their division away from specific measurement tasks. The division has also had difficulties to get any external sales, and has mainly been inwardly focused. Included in the deal would be the headcount of key employees, a set of associated patents and a maintenance contract for the installed base at Company X. The production of the carve-out would after a deal be moved to one of Andebjo’s facilities and the sales would go through Andebjo’s channels and distribution network.

Due to Andebjo’s products being closely associated to the carve-out of Company X and the desire for Company X to divest, Andebjo is solely being offered this acquisition opportunity. As this is a deal regarding a subdivision and not an existing company, it is a divestiture with carve-out characteristics. A carve-out includes the process of making a business unit a standalone company separating it from its parent company by getting its own board of directors and financial statement (Radcliffe, 2015).

The deal is attractive to Andebjo due to the acquisition of new technology with a new addressable market. Corporate transactions for acquiring technology is an increasing trend in the financial markets (Ernst & Young AB, 2014). During 2015, a record breaking number of technology M&A were carried out (Andriole, 2015). For many corporate executives, acquisitions are a vital strategy in order to remain competitive in a fast changing market environment (Axelsson, 2015)(Sur, 2016). Sometimes the target for such acquisitions are subdivisions or companies not having any sales or independent P&Ls at the time of the acquisition. In light of this, valuation methods for such situations are increasingly demanded and further development of existing theories to cover these specific situations is needed.

Conventional valuation methods include discounted cash flow models and different versions of multiple valuations (Koller, Goedhart, & Wessels, 2010). They cannot be directly applied on this case as they are all based on different cash flows and profit measures that are not easily attained when not having access to a P&L or the possibility to separate the division’s induced revenue streams from the parent company.

Andebjo has worked extensively with acquiring and integrating companies before. However, this opportunity of acquiring Company X is a somewhat new situation for them as it is a unit with no current P&L being acquired solely for technology. This presents a new set of challenges to Andebjo that they have not faced previously, in
terms of valuation. Therefore, this thesis will analyze this context and develop best practices for the valuation of a subdivision without a P&L. It will also function as a pre-study for the acquisition.

1.2 Identified Problem

There are several problems associated with a valuation of a subdivision. Issues related to the valuation are originated from conventional theories not being possible to apply due to the division not having a P&L on its own. Therefore, the entity must be valued either from a completely made up P&L or from other aspects than cash flow and the theory on this area is not very comprehensive. This is clearly illustrated by Andebjo themselves not being sure on how to go about with the valuation despite being a company essentially built through previous acquisitions. Key assets needed to be taken into consideration in the valuation of the subdivision in this case are IP-assets, key employees and a service contract for the installed base at Company X.

The IP-assets of the subdivision are very complex to value. The total number of patents are in total 52 with 18 being key patents used in the existing product line of machinery. What makes the valuation of the patents complex is that their related products are mainly used internally by the previous parent company. The products are generally in an early stage of their product life cycle and have not been tested commercially in the market. This complicates estimation of potential cash flow generated by the products and the underlying patents. There is also a general issue of valuing patents, as it is hard to evaluate the demand of the specific technology in the future, and hence the technology lifetime.

On the same topic, there are in this case issues valuing the experience and know-how of the current employees. As a large part of the value of the division in this case resides in a few key employees, researchers and sales personnel, these need to be assigned a value. It is also important to understand how to retain the employees and knowledge post transaction, what measures need to be taken for this to be achieved and also the cost this will induce.

The third big part of the value in this acquisition resides in a service contract that would state that Andebjo would have to serve the installed base used by Company X. The problem here is how to design this contract but also how it will affect the value of the subdivision and be included in the deal. Therefore, directions for the
entire process of designing and valuating the service contract for the installed base are needed.

The cost induced from the transaction is important to take into consideration when valuing the entity. This is partly derived from the shift of production facility, as the carved out entity will be moved from the previous company but also vital R&D measures and ramp-up of sales.

The set of issues and areas with need of analysis raised in this section serves as the base from where the research questions of this thesis originate. Of course there are other prevalent challenges in this process but these are considered to be most urgent for Andebjo to study and understand previous to the deal [Parschat 2017].

1.3 Purpose

With the current situation as a point of departure, the purpose of the thesis is to investigate and find best practices for valuing a subdivision when a P&L does not exist and large value lies in specific assets. The best practices should be able to serve as a foundation for carrying out the deal Andebjo is now considering. The thesis therefore aims to guide the valuation in this acquisition and other situations facing similar conditions.

The reported best practices will be applied on the acquisition opportunity of the carved-out unit of Company X as a case study. A discussion will be conducted intending to reach recommendations on how this valuation should be carried out.

1.4 Research Question

In order to serve the purpose of this thesis, the research question with associated sub-questions is:

MRQ: How to value a subdivision, including technology, patents and employees but no P&L, for a carve-out acquisition?

- RQ1: Should a division be valued as a company or as the sum of its parts?
• RQ2: How to value intellectual property?
• RQ3: How to value key employees?
• RQ4: How to design, value and include service contracts in a transaction?

1.5 Academic Contribution

This thesis is based on a case study on Andebjo and the valuation for the acquisition of Company X. The outcome is a valuation recommendation to use for valuation of a subdivision without its own P&L.

This approach fills a gap in the research field as previous research has mainly focused on valuation of whole companies under the prevalence of cash flow or profit measurements. Valuation methods not being based on such methods are heavily associated with specific assets while this thesis intends to guide a full valuation through the summation of assets or complete projections. Hence, it also explores the possibility of using existing valuation theory onto a subdivision valuation.

1.6 Delimitations

The thesis will use Andebjo and the acquisition of Company X as a case study being the base for the research. This means that the thesis will not to any larger extent base the analysis on other companies and other situations. However, the obtained results will be generalized as much as possible.

1.7 Disposition

After the introduction the thesis is organized in chapters as follows: Method, Literature Review, Results and Analysis, Discussion and Conclusion. Below follows a short description of the chapters of the thesis.

1. Introduction - The introduction introduces the topic of the research and presents the research questions that the thesis aims to answer.
2. Method - The method chapter describes how the data of the research is collected and how the data is analyzed. The main data collection of the thesis is through interviews with experts and that in later chapter are related to existing literature and tested in a valuation model.

3. Literature Review - In the literature review, relevant literature on the subject of the thesis is presented and discussed. The literature is mainly from the categories; traditional valuation methods, valuation methods for IP, valuation of human capital and valuation of service contracts.

4. Results and Analysis - In the results and analysis chapter, the results from the interviews are presented and the opinions from the interviewees are grouped by their views. The results are presented under each research question to get a feeling of how the experts would go forth to answer the research questions.

5. Discussion - In the discussion chapter the results from the interviews are discussed and related to the previous literature on the subject. The valuation modelling based on the Andebjo case is also discussed and related to the opinions of the interviewees.

6. Conclusion - The conclusion chapter presents the conclusions of the thesis. Based on the results from the interviews, the literature and the valuation modelling conclusions are drawn to answer the research questions of the thesis.
Chapter 2

Method

In this chapter the method of the research is presented along with the research approach and research process of the thesis. Furthermore, the method for data collection and analysis is introduced. The quality of the research is also addressed through a discussion regarding reliability, validity and generalizability.

2.1 Research Approach

The research approach has been formed in order to fulfill the purpose of the thesis. The purpose of the thesis is to investigate and find best practices for valuation of a subdivision under the conditions of the Andebjo case.

The research was performed as a qualitative case study using an explanatory method where existing literature and theory was used to form an understanding of the situation and answer the research question (Collis & Hussey 2013). The research paradigm used was an interpretivist approach as a specific situation was studied in a natural setting and specific context. The reason for using an interpretivist paradigm is the assumed notation that social reality is highly subjective when doing a qualitative study (Collis & Hussey 2013). To complement the empirical findings, a literature review was conducted to enhance the analysis.

The case study could also be described as an opportunist case study as the research did have access to internal Andebjo information and personnel (Otley & Berry 1994).
This provided a very extensive empirical foundation and hence contributing to create clear characteristics of the case. In general, deals having the same characteristics are private and hence the details are strictly confidential. Therefore, this was a rare opportunity to gain insight to such a deal.

2.2 Research Process

The research process of the thesis was designed in a natural way given its purpose and intended output. Covering an array of subjects important for the valuation of a subdivision in a carve-out acquisition, it was essential to collect knowledge, expertise and recent research from many different sources in a quick manner. To provide a solid background to the case, interviews with Andebjo employees were carried out early on in the process. From the literature and the case background, a few perspectives on every subtopic of the thesis were found. These were then used as the foundation for the external interviews, collecting the views and opinions of the experts on every subject.

During the research process an iterative method was used, as illustrated in Figure 2.1 where the findings from the empirical study influenced the aim of the literature review, similarly the analysis influenced the content of the interviews.

When having analyzed prevalent research and the subtopics in the literature, interviews with industry experts of different kinds were held. The intention of these interviews was to align the research with real life experience as well as fill gaps and discuss their views on previous findings in order to answer the research question. Experts were attained from management consultancy firms, financial advisory firms, investment banks, corporate leaders and experts on IP valuation.

After conducting interviews, the findings were summarized and a few best practices were found for the issues prevalent in the case of Andebjo and Company X. Having done that, the best practices were applied on the case through a valuation modelling. The final best practices of the thesis were then derived from the collected findings from the interviews and the modelling. This ended up in tangible recommendations to Andebjo regarding the case. Lastly, conclusions were drawn after the findings were scientifically analyzed, also elaborating on drawbacks and possible future research on the topic.
2.2.1 Literature Review

A literature review was conducted as a preparatory study for the design of the research as well as guiding and complementing the empirical findings of the case study. As Yin (1994) proposes, the initial literature review was conducted to improve the research rather than to work as a prerequisite theoretical framework of answers.

The literature review was conducted to create an understanding of the concepts related to the research area. The theory was found by searching specific key words. Some of the used key words were the following: Acquisition, M&A, Carve-out, Divestiture, Partial divestiture, Valuation of IP property, IP property, Patent Licensing and Royalty, Patent Law, Valuation of Human Capital, Company Valuation.

2.2.2 Case Study

The research methodology chosen for this thesis was a case study. This choice was, as discussed by Otley and Berry (1994), partly made from opportunistic reasons as an extraordinary occasion to study a small carve-out acquisition was offered, something that most commonly is strictly confidential. However, one can think of different research designs for utilizing this opportunity. Yin (1994) argues that this decision should be based on characteristics from three parameters; form of research question, requirement of control over behavioural aspects and if the research focuses on contemporary events. As the research question, including sub-questions, have specified a few areas of analysis and the thesis aims to understand their impact, the answer is on how or why form. This gave the research more of an explanatory approach and hence it was appropriate for an experiment, history or case study approach ac-
According to Yin (1994). Furthermore, it required no control over behavioural events which ruled out experiment. Lastly, it focused on contemporary events which made a history approach inappropriate. Therefore a case study was chosen as the research method.

Yin (1994) proposes that the scope of the case study should be defined so that the boundaries of the phenomenon and context of the case are not clearly evident. The case of the carve-out acquisition of Company X is considered a good representative of a small company carve-out with no current standalone P&L.

A case study is also an ideal research methodology when current research on the area is sparse and there are gaps to fill (Otley & Berry, 1994). Currently, there is no research taking a comprehensive grip on valuation of a carve-out acquisition of a small unit with no standalone P&L. However, there is plenty of research on parts of this field which can form a rather extensive base that needs to be complemented and merged together. This yet again indicates that a case study is a sound choice as it is well suited for holistic approaches (Otley & Berry, 1994).

2.2.3 Interviews

The case study was performed using a qualitative research approach. In the qualitative data gathering, the main data was collected from interviews with external industry experts but also from interviews with key stakeholders in the Andebjo business.

The use of interviews as the main data gathering method is because of the need of simple means to get a good picture from individuals with knowledge of the research area, which furthermore makes it a good choice in this thesis as time was limited (Blomkvist & Hallin, 2015). To mitigate the risk of biased interview data, a diverse group of experts from different fields related to company valuation and acquisitions was interviewed (Eisenhardt & Graebner, 2007). The different fields chosen that relate to the topic were; management consultants, transaction advisers, investment bankers, corporate leaders and IP valuation experts. All interviews were conducted in a semi-structured way to be as flexible as possible in order get comprehensive information, both on the questions we had decided ahead of the interviews but also experiences from the interviewees not being considered beforehand (Blomkvist & Hallin, 2015). The qualitative interview questions were complemented by a few simple quantitative questions. For the interview script and the list of interviewees, please see Appendix I and Appendix II.
As the main data source in the study was interviews, the results are presented as a relatively complete story from the interviews in text, including quotations from the interviewees (Eisenhardt & Graebner, 2007).

2.2.4 Analysis

To increase the quality of the research the data analysis was partly conducted simultaneously as the data collection. This would in a higher sense allow for capturing the reality that the data brought (Barratt, Choi, & Li, 2011). The data collection method was also adjusted during the data analysis to be able to create the best possible perception of reality (Barratt et al., 2011). This was done mainly through adjusting interview protocols and questions during the interview process and in between interviews.

The analysis was mainly done as a summary of the general opinions and takeaways from the interviews comparing different views to each other. From this, best practices for valuation from the interviewed corporate valuation professionals were derived. Following these insights, the found best practices were tested through hands on valuations of Company X using different methods based on the opinions of the experts. This yielded further insights and enabled an analysis and a discussion contributing to the final conclusions of the thesis.

2.3 Research Quality

It is important to point out that the research methodology has flaws that are relevant to be aware of, in order to actively mitigate the impact of them. Yin (1994) points out, that when conducting a case study, there are four main areas to focus on in order to ensure high scientific quality. These four areas are construct validity, internal validity, external validity and reliability. Blomkvist and Hallin (2015) also point out that testing the validity and reliability is of importance in order to secure a high scientific quality of a thesis. As the research method to a great extent consisted of meetings and interviews there is a limitation to the quality of the empirical findings because of the possibility of bias or misinterpretation. To ensure a high reliability of the research the interviews were complemented with an extensive literature review to support the empirical findings. Furthermore, interviews were anonymized in order to secure unbiased interpretations of interview answers.
To ensure a high validity of the research, every source explored in the literature review was critically analyzed in order to assure its relevance to the problem formulation, the purpose and the research question. High validity is achieved through a literature review closely connected to these components (Blomkvist & Hallin, 2015). As the research is formed from the interpretivist paradigm the research aims to provide a detailed explanation of the phenomenon studied. According to Collis and Hussey (2013) an interpretivist approach contributes to a higher degree of validity in general.

The construct validity regards the usage of appropriate measures for the field being studied. To mitigate risks associated with the construct validity multiple sources of evidence can be used (Yin, 1994). This thesis used multiple sources in the sense of having experts on different areas presenting their views on the same topics. Furthermore, construct validity was improved by letting some of the interviewees review both the report and the valuation model.

To secure internal validity it is important to ensure that the findings actually have causal relationships with no intermediary factor determining the effect of the cause (Yin, 1994). For this thesis, internal validity risks are believed to be minor as most interview data is rather straightforward and was possible to evaluate.

A common critique of case studies is that they often look at a very specific situation in a specific organization. Hence, they tend to lack generalizability (Otley & Berry, 1994). Yin (1994) elaborates on the concept of external validity and discusses how the findings of the research can be generalized. Yin (1994) introduces a way to mitigate low external validity by introducing replication. As this case will not be able to replicate, the literature review and previous research on similar areas serve as a benchmark from replicates or similar cases to improve the external validity. To further improve external validity, the research takes a general view of the situation analyzed. To achieve this, it was vital to describe the market conditions and Andebjo characteristics in a general wording aiming to broaden the otherwise narrow usage of the results of the thesis.

### 2.4 Ethics of Method

As the Andebjo case was of a sensitive character, a confidentiality agreement was signed with them prior to the commencement of the research. All figures used in the thesis have been manipulated and prior to publishing the report was approved by Andebjo executives.
Ryen (2011) raises three main concerns of qualitative research when it comes to ethics; codes and consent, confidentiality and trust. As the main data gathering in this research has been interviews it has been very important to get complete consent to use the answers and reflections provided from the interviewees. On the topic of confidentiality all interviewees have been asked whether they want to remain anonymous in the thesis and whether their company should be anonymous as well. This has also been important to increase the willingness from the interviewees to participate in the study. As consent and confidentiality has been central elements in the contact with interviewees this has helped to build trust which has helped gain further contacts and answers to follow up questions. The company names of the interviewees were disclosed as it was considered to increase credibility of the thesis without harming the ethics and was accepted by all it concerns.

Miller and Bell (2002) put forth the notion that even though full consent has been given at the beginning of a study it is important to always keep the ethics of the research in mind. To improve the ethics of the method used in this study, the interviewees have always been asked on beforehand and at the completion of the interview about their view on being anonymized. All interviewees were also invited to take part of the research before it was finalized and published to check that they have been understood and correctly cited.
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Chapter 3

Literature Review

This chapter presents the literature covering theory on the topic of the thesis with intention to create an understanding of the different subtopics of the research. The subtopics include literature on divestitures, conventional valuation methods, intellectual capital, patent and personnel valuation theory, patent valuation standards, patent law, patent licensing and contract theory.

3.1 Divestitures

Divestiture is a broad concept and there are many different types of divestitures, Koller et al. (2010) divide the different types into private and public transactions. The different types of private transactions are defined as trade sale and joint venture while public transactions are defined as initial public offering (IPO), carve-out, spin-off, split-off and tracking stock (Koller et al., 2010). Eckbo and Thorburn (2008) describe the different types of separation of company assets under the expression breakup transaction which includes the concepts of divestiture (which Koller et al. (2010) defines as a trade sale), spin-off, split-off, equity carve-out and tracking stock. Regardless of type of breakup transaction the aim of the action taken is always to improve operating efficiency, increase the cash flow and increase firm profitability (Eckbo & Thorburn, 2008). Linn and Rozell (1984) present different reasons for a divestiture and conclude that ultimately the most usual reason for a divestiture is that the divested unit is worth more as a part of the buying company then as a part of its previous parent company.
3.1.1 Different Types of Divestitures

Trade Sale

A trade sale is a private transaction where the parent company sells all or a part of the company to a financial or strategic investor (Koller et al., 2010). Eckbo and Thorburn (2008) define this as a divestiture where a company is selling a portion of its assets to a third party buyer through a private transaction. The assets are typically a division, a subsidiary, a segment or a specific product line.

Joint Venture

A joint venture is a separate business entity that is created by a company, or a part of it, together with other stakeholders (Koller et al., 2010). It is an arrangement that usually includes shared ownership, shared risk and return, and shared governance.

Initial Public Offering

Taking a subdivision public through an IPO means divesting by offering all shares of the subdivision to new shareholders in the public stock market (Koller et al., 2010). This is a public transaction which separates the subsidiary from the parent company.

Spin-Off

A spin-off is when a subdivision of a company is completely separated from its parent company as a new corporate entity (Eckbo & Thorburn, 2008). If the parent company is listed, the new separated company will also become a publicly traded company with an independent board of directors. In a spin-off the stock owners of the parent company will get the same stake in the spin-off company (Koller et al., 2010).

Split-Off

In a split-off, which is a similar concept to a spin-off, the stock owners will be offered to trade their stocks in the parent company for stocks in the subsidiary. Hence, it is a way for the parent company to buy back stocks (Eckbo & Thorburn, 2008).

Carve-Out

A carve-out is often the short for equity carve-out, defined as a company making a subsidiary of a business unit followed by a partial IPO of no more than two thirds (Thompson, 2011). An equity carve-out is defined as a partial IPO of the stock of the subdivision of the parent company (Koller et al., 2010). Similarly to a spin-off, the
subsidiary will have its own management and board of directors but the parent company often retains a controlling interest in the subsidiary (Eckbo & Thorburn 2008). The equity carve-out is used as a way of unlocking capital from the subsidiary while keeping control and is common in fast growing high technology industries (Perotti & Rossetto 2007).

Tracking stock

The concept tracking stocks is slightly different from the other breakup transaction concepts as the company remains one entity but issue stocks following the performance of a specific subdivision of the parent company (Koller et al. 2010). The owners of these stocks will hence retain the performance connected to the cash flow and financial performance from this division (Eckbo & Thorburn 2008).

3.2 Conventional Valuation Methods

Traditional valuation of companies are normally done through a rather limited set of methods. One of the most commonly used methods today, multiples, was developed in the 1920s and is based on frameworks that link income statement and balance sheet to different measures on profitability (Thomas & Gup 2010). In the late 1950s, models were created based on the assumptions on continuous growth in cash dividends as the widely consulted Gordon model. In the 1960s well managed and reliable stock price databases were established enabling research that led to the development of the capital asset pricing model (CAPM).

In the 1980s, new insight into how business strategy affected profitability led to development of valuation techniques closely related to business strategy. With this as a point of departure, two major branches were developed. One was based on the understanding of discounted cash flows (DCF) and one based on economic value added (EVA) (Thomas & Gup 2010).

Damodaran (2007) classifies the different methods for valuation used today into four fundamental categories. The first one is the income based approach of discounted cash flow valuation where future cash flow is the base of the valuation. The second is liquidation and accounting valuation where the present assets of the company are the foundation of the valuation, often using accounting estimates. The third valuation method is the relative valuation which is market based and a value is obtained by comparing the target assets to other comparable assets of other companies. The final
method is contingent claim valuation where option valuation methods are used to value assets that have option characteristics (Damodaran, 2007).

On the same topic, Luehrman (1997) presents a guide for the most common valuation techniques. He groups the different methods into three categories depending on what is to be valued: operations, opportunities or equity claims.

When valuing operations, the objective is to value assets and operations in place and therefore the main rationale is to value the revenue streams these can induce. In general terms, methods here are different forms of DCFs that include forecasting of cash flow, elimination of financing cost and discounting in order to arrive at the present value. Weighted average cost of capital (WACC) is most commonly used for the discounting. What Luehrman (1997) suggests over a DCF is an adjusted present value valuation (APV). APV is based on DCF rationales but splits revenue streams into real cash flow associated with revenues and side effects associated with financing. The main advantage with APV is that different parts are valued separately which makes it easy to analyse where value is created and where easy improvements can be made.

The second category according to Luehrman (1997), valuation of opportunities, is based on option pricing and can be seen as the valuation of possible future operations such as R&D. The basics of option pricing for opportunities is that the potential investment in R&D can be seen as the options exercise price, the last time the company can decide to invest is the expiration time and the uncertainty in future value is captured by the variance of returns. The very option is then valued using any valuation method for options, for example the Black-Scholes formula (Luehrman, 1997).

The third category of valuation methods is for equity claims. This is needed in for example joint ventures and strategic partnerships when it is vital to know not just the value of a venture but also a specific stake in it (Luehrman, 1997). One method to value the equity is to forecast the future cash flow and discount them at a rate that compensates for the risk. This is called the equity cash flow approach. It is different from a WACC discounted DCF as cash flow must be adjusted for financial claims and another discount rate is used to compensate for the leverage. Other options are using the WACC based DCF with subtracted value of debt claims or the price per earnings multiple. However, both have shortcomings as the true value of a debt claim for subtraction is difficult to determine and the same holds true for finding an appropriate multiple.
For a complete guide of the Luehrman (1997) classification of different valuation methods, please see Figure 3.1.

<table>
<thead>
<tr>
<th>Problem types</th>
<th>Recommended valuation method</th>
<th>A sampling of alternative valuation methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Operations (assets in place)</td>
<td>Adjusted present value</td>
<td>Sales multiples EBIT multiples Book-value multiples</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cash-flow multiples WACC-based DCF Monte Carlo Simulation</td>
</tr>
<tr>
<td>2. Opportunities (real options)</td>
<td>Simple option pricing</td>
<td>Installed-base multiples Simple option pricing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Customer, subscriber multiples Decision trees</td>
</tr>
<tr>
<td>3. Equity Claims</td>
<td>Equity cash flow</td>
<td>Net income multiples WACC-based DCF, minus debt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P/E ratios Simulation; scenario analysis</td>
</tr>
</tbody>
</table>

Figure 3.1: Framework for classification of valuation methods according to Luehrman (1997), for descriptions of the methods see the original article.

### 3.2.1 DCF

A DCF model discounts the free cash flow, the cash available for all investors, at the WACC. Following that, debt claims and other non-equity claims are subtracted in order to arrive at the equity value (Koller et al., 2010). Koller et al. (2010) recommend to value the entire enterprise first and afterwards subtract non-equity claims. A DCF is especially advantageous when applied on multi business companies as the computations can be done as the sum of the value of different business units, as seen in Figure 3.2.
Figure 3.2: Example of an enterprise DCF-valuation of a multi business company showing how the equity value is derived from the contributions of different units (Koller et al., 2010).

The same authors present the following four step model for doing the DCF (Koller et al., 2010):

1. "Value the company’s operations by discounting free cash flow at the weighted average cost of capital.

2. Identify and value non-operating assets, such as excess marketable securities, non-consolidated subsidiaries, and other equity investments. Summing the value of operations and non-operating assets gives enterprise value.

3. Identify and value all debt and other non-equity claims against the enterprise value. Debt and other non-equity claims include (among others) fixed-rate and floating-rate debt, unfunded pension liabilities, employee options, and preferred stock.

4. Subtract the value of non-equity financial claims from enterprise value to determine the value of common equity. To estimate price per share, divide equity value by the number of current shares outstanding." (Koller et al., 2010)
3.2.2 CAPM

Important input in most valuation models is the computation of the cost of capital. Often cost of capital is estimated by the WACC in which the primary determinant is the expected return of the specific company stock, the cost of equity is often estimated through CAPM. (Fama & French, 2004).

CAPM relates the specific company stock to the risk free return and the expected return of the market. The model was found by Sharpe, Treynor, Lintner and Mossin in the early 1960s. Eventually, Sharpe was awarded the Nobel price for it in 1990 (Fama & French, 2004). At time of its creation, there was no model more than assertions specifying the relationship between expected return and risk more than the prevalence of the capital market line (Sharpe, 1964). Based on this, CAPM was developed and the model is specified from the following formula (Perold, 2004):

$$ E_S = r_f + \beta (E_M - r_f) $$

In this formula $E_S$ and $E_M$ are the expected returns of the stock and the market respectively. The beta, $\beta$, is the sensitivity of the specific stock return related to the market return and $r_f$ is the risk free rate.

If the CAPM formula would not hold, investors would be able to outperform the market until a sufficient number of investors have adjusted their positions and the stock price is shifted to where CAPM holds (Perold, 2004).

The restrictions of CAPM have long been recognized but it is still popular to use due to its linear relationship between return and risk. The most common critique regards the assumptions of normality in returns and the quadratic preferences in the mean variance efficiency (Ross, 1976).

3.2.3 Multiples

To value companies using multiples is a rather fast way of assessing the value of a company compared to for example a DCF. Multiple valuation can also assist in testing the plausibility of other valuation techniques as well as explain differences compared to competitors (Koller et al., 2010). Different multiples can be used depending on the purpose of the valuation. Koller et al. (2010) suggest three multiples; net enterprise value (EV) divided by revenues, EBITDA and EBITA. The authors also point out
that despite the price-to-earnings (P/E) often being used, it is not a sound choice as the capital structure and non-operating gains and losses affect it. Furthermore, forward-looking multiples are promoted as they are consistent with the principles of valuation; that a company is worth the value of its future cash flows. To do the very analysis, the following procedure is recommended:

1. "Use the right multiple. For most analyses, enterprise value to EBITA is the best multiple for comparing valuations across companies.

2. Calculate the multiple in a consistent manner. Base the numerator (value) and denominator (earnings) on the same underlying assets. For instance, if you exclude excess cash from value, exclude interest income from the earnings.

3. Use the right peer group. A set of industry peers is a good place to start. Refine the sample to peers that have similar outlooks for long-term growth and return on invested capital (ROIC)." (Koller et al., 2010)

**EV/EBITA**

This multiple is the first pick of Koller et al. (2010). The reason EBITA is preferred over EBIT is that amortizations is an accounting post resulting from past acquisitions and hence not a reflection of the business of the company and its ability to generate future cash flow. The reason for EBITA being preferred over EBITDA is that depreciation is a non cash expense reflecting sunk cost. In many cases, depreciactions are equivalent of setting capital aside for future replacement of assets and therefore it is associated with the operations (Koller et al., 2010).

**EV/EBITDA**

This multiple is more accurate than the EBITA multiple in cases where depreciactions do not reflect future capital expenditures. If for example peers have significantly higher depreciactions despite same equipment, possibly due to a poor buying history, then EBITDA is better as the companies have the same possibility of generating future cash flow.

**EV/Revenues**

The EV/Revenue multiple is useful when companies have similar operating margins. This as the companies ability to generate future cash flow from its revenues is strictly dependent on the operating margin (Koller et al., 2010).
Choice of Peer Group

As mentioned in the three item list by Koller et al. (2010), it is important to use the right peer group when using multiple valuation. First, most practitioners pick a set of companies in the same industry. A common mistake is to use industry average or median for the comparison with the specific valuation target. This as, the firms can have different levels of performance that heavily affect their multiples. Koller et al. (2010) point out that EBITA is driven by growth rate and ROIC level of the company. Therefore they recommend to pick companies from the industry peer group having similar levels of growth and ROIC as the basis for the valuation.

Transaction vs Market Multiples

It is important to be cautious about the choice of multiple as the value can differ between multiples based on public companies and transactions. If the value is derived from a transaction there are often premiums or discounts included that are not present in the equivalent market value in the stock market (Bernström, 2014). Premiums or discounts may occur from specific synergies that are not relevant for financial investors in the market place.

A common method for valuation of non-listed firms is to look at precedent transactions. The method is based on looking at previous transactions of similar firms under similar circumstances to get an estimation of the value of the target firm. Precedent transaction analysis relies on public information about listed companies, which is used to estimate the value of the target firm from using estimations of multiples (Bernström, 2014).

3.2.4 The Gordon Growth Model

The Gordon Growth Model is a model for valuation of a company based on its dividend in perpetuity developed and presented in (Gordon & Shapiro, 1956). The formula is based on an expectation on perpetual growth in dividends and a fixed discount rate. The formula is on the following form:

\[ P_0 = \frac{D_0}{k - g} \]

where \( P_0 \) is the present value, \( k \) the rate of profit used as discount rate, \( g \) the expected growth in dividends and \( D_0 \) the dividends at time zero.
The formula is also widely consulted to value the continuing value when doing DCF-valuations. Then, the parameters are typically changed from dividends to free cash flow, rate of profit to WACC and growth in dividends to growth in free cash flow, often the inflation rate (Koller et al., 2010).

3.3 Intellectual Capital

Intellectual capital is defined as "simply, knowledge that can be converted into profits" by Sullivan (1998). Moon and Kym (2006) present a framework shown in Figure 3.3 defining intellectual capital, which they divide into three subcategories: human capital, structural capital and relational capital. Human capital is defined as the performance and quality of the employees and is described as the heart of intellectual capital contributing greatly to intellectual capital as a whole (Moon & Kym, 2006). The definition of structural capital is not as well established but Moon and Kym (2006) describe it as culture, organizational processes, information systems and the collection of IP. Relational capital is described as the relations to other companies such as customers and suppliers.

![Figure 3.3: Intellectual capital classification scheme](Moon & Kym 2006).
Molaeinezhad (2016) presents a summary of value drivers for intellectual property from previous studies and concludes that the following parameters are the ones recognized in the literature: prospects of success at commercialization, legal considerations in respect of protection of intellectual capital, market success factors, innovation and innovation management, competition considerations, financial factors including profitability and cash flow, risk management, economic factors, government support and policies, and productivity. Furthermore, Molaeinezhad (2016) concludes that the existing methods for valuation of intellectual property, i.e. conventional valuation methods, do not take into account the value drivers for intellectual property and hence there are no existing methods that can give a fair valuation of intellectual capital.

Fulmer and Ployhart (2014) discuss how the lack of valuation methods available for valuation of intellectual capital affects the possibility to compare the value of intellectual capital of different firms. As there are no well established methods, every manager designs their own method for valuations and that is why it is impossible to compare and evaluate the intellectual capital value of different firms. However, Fulmer and Ployhart (2014) argue that the lack of a general method may result in every company developing their own method suited for their internal need more accurately than any general method could ever do.

3.4 Valuation of IP-Assets

Intellectual property has become a larger share of firms’ market values in recent times and is hence an important part of business performance and economic growth (Kamiyama, Sheehan, & Martinez, 2006). Kamiyama et al. (2006) study this phenomenon and the growing interest in intellectual asset management. Furthermore, they present a set of tangible techniques for assessing the value of IP-assets. These techniques can be grouped into qualitative and quantitative valuation methods. See Figure 3.4 for an overview on different techniques.
3.4.1 Quantitative Methods

Quantitative valuation methods intend to put a monetary value on patents and can be grouped into three families; cost approaches, market approaches and income approaches. On top of these, an emerging technique is to use option pricing theory (Kamiyama et al., 2006).

Cost Approaches

Cost approaches are based on the link between the cost incurred by an intellectual property and its value (Lagrost et al., 2010). Cost approaches find their valuation from the potential cost of developing similar inventions internally or acquiring them in the market. Hence, the value is derived from an assessment of the replacement cost or the reproduction cost. These approaches are however not commonly used due to not being able to evaluate the future economic value (Kamiyama et al., 2006).

Cost approaches consist of a few methods. Firstly, the replacement cost method that is based on the rationale that a buyer would not be willing to pay more for IP than the cost of a similar investment. Different materials and components can be used for the replacement according to this method as long as the performance is the same.
The historical cost trending method is in contrast based on the total cost incurred during the development of the asset. The cost is then transformed to the date of the valuation using an appropriate inflation factor (Lagrost et al., 2010).

The reproduction cost method is somewhat different compared to the replacement cost method as it bases its value on the production of an identical version of the considered assets. The value derived is hence achieved by the cost for developing a similar product using the same materials as the IP asset valued (Lagrost et al., 2010).

Market Approaches

Market approaches are based on previous public patent and company transactions. However, Kamiyama et al. (2006) point out that market approaches might be difficult to use due to a low number of trades available for comparison partly due to confidentiality and the issues regarding characterization of similar patents in order to find multiples. If public databases become easier to access the authors consider these methods to have great potential to be used more widely. Lagrost et al. (2010) also discuss the limitations of the market approach and the difficulties of defining what is a similar transaction. This can be hard for conventional corporate transactions but even more challenging valuing IP-assets, as many such assets can be considered unique. Therefore, Lagrost et al. (2010) recommend doing the comparison in terms of utility, technical specificity, property, and market perception of the asset.

A specific market approach method is the comparative income differential method. This method compares the income produced with and without the asset and is often used for valuing brand, for example looking at a branded product and its non-branded competitor. The market multiple method is using transaction prices, for example sales, to find a multiple that is used for valuing an IP asset (Lagrost et al., 2010).

Income Approaches

Income approaches are based on the computed present value of projected future income from the patent. Using regular discounted cash flow models transforms future revenue streams to a present value. Among the largest challenges with this method is setting the discount rate including inflation, liquidity, real interest and risk premium but also to isolate the value of the patent from aggregated income from a product or a project (Kamiyama et al., 2006).
Another income approach method is the excess profit method. It starts with the value of net tangible assets for computing the rate of return and followingly determining value of IP-assets. The value of the IP-assets is the difference between the net tangible assets with and without the IP-assets (Lagrost et al., 2010).

Lastly, Lagrost et al. (2010) present the Relief from Royalty method which is based on the idea of computing the value from the alternative cost of licensing the IP-asset from a third party rather than owning the rights in-house. It originates from the assumption that this is a good estimate of the value of the IP-asset.

Real Options

Thomas and Gup (2010) discuss real options and how some practitioners believe that it will be the main method for valuation of sequential investment opportunities in the future. It is a method where future business decisions are taken into consideration in the valuation by handling them similar to financial options (Trigeorgis, 1993).

Trigeorgis (1993) points out that DCF valuation often results in undervaluing of projects when they have real operating options or other strategic decision making included. Furthermore, the valuation model of real options is presented as an alternative that in a better sense includes sequential managerial flexibility by valuing the project with techniques used for valuing financial options. The concept managerial flexibility includes a set of real options that affect the future cash flow of the project and hence the value in the valuation. Included in real options are actions like contract, defer, expand, abandon investment or switch investment to alternative use (Trigeorgis, 1993). These potential real options are considered as financial options as the company has the option but not the obligation to a specific business action (Thomas & Gup, 2010).

Schwartz (2004) presents a framework for using real options valuation on patents and R&D. The framework takes into account uncertainty in the cost associated with completing the project, possible catastrophic events that could kill the project and uncertainty in generated cash flow from the project. Furthermore, the model also includes the possibilities of abandoning the project if cost increase or if future cash flow estimations are lowered (Schwartz, 2004).

Real options can be used in three different ways; using the decision tree method, using the real options method or using the Monte Carlo method. The decision tree method is widely used in the pharmaceutical industry and illustrates the different possible outcomes in a decision tree. The decision tree can thereafter serve as a tangible tool for identifying the best strategy and value staged investments. The real options method
is a method taking the uncertainty of the forecast cash flows into account. These methods compute the value primarily through the binomial model or the Black-Scholes formula techniques used in valuation for financial applications. Here, the binomial model is more simplified as it takes only two outcomes per stage into account. The Black-Scholes formula is more advanced and for real option applications it includes factors such as remaining development cost for the IP-asset, mean market value of products comprised of similar IP-assets, time until commercialization, product value volatility, risk free rate of return and expiration of IP-assets (Lagrost et al., 2010). It is more detailed than the binomial model but is often regarded as too complex to use. Lastly, the Monte Carlo method is a statistical valuation method that includes risk into the financial valuation. The method is not straight forward and returns no single value of the asset. Rather, it results in a set of values with associated probabilities that can then be entered into the calculations of the net present value.

As a final thought on real options, Lagrost et al. (2010) refer to Flignor and Orozco (2006) that call for using the methods with care as they are technically advanced and sensitive on a set of assumptions in the underlying parameters.

### 3.4.2 Qualitative Methods

**Rating Based Methods**

Among the qualitative methods listed by Kamiyama et al. (2006) is a tool called PRISM developed by QED Intellectual property. According to PRISM, patents are classified into four management models depending on their rating in a number of categories. The four models are monopoly, defensive, license and joint venture. Another tool mentioned is "Patent Evaluation Indexes for Technology Transfer" developed by the Japan Patent Office. It is a method for doing an initial evaluation for technology transfer of patents. This model examines and weighs three categories: rights, transferability and business potential.

**Indicators and the Econometric Approach**

Kamiyama et al. (2006) present the econometric approach. One take on the econometric approach is to estimate the value by looking at the number of citations in the patent documentation, either backward or forward. Instead of citations, the value can also be estimated by renewal data as patent holders only renew patents when they are economically valuable. A drawback with the later version is that it often can only be done backward looking.
Other research regarding an econometric approach is conducted by Reitzig (2004) who studies patent valuation through the use of indicators. An indicator for patent value can be defined as a variable with correlation to either of the following; the observable prices, costs or sold quantities of a product or operationalize latent determinants of patent value such as novelty.

Reitzig (2004) presents the 13 most commonly used and researched indicators and discusses their advantages and disadvantages. The three with the highest degree of theoretical and empirical validation is forward citation, family size and the ownership variables. Market value of the company also shows on being a good indicator, however, distinct from other indicators due to measuring the aggregate IP-asset value. Furthermore, Reitzig (2004) presents so called third generation indicators that are obtained from the full text of patent applications. One example of such an indicator is ‘breadth’ that is the number of claims in the patent documentation. The advantage with using such indicators is that they are available earlier than for example citation indicators. The idea of including full text indicators is derived from interviews with experienced patent attorneys. The computations done in the paper show that full text indicators with explanatory power on patent value are the technical problem, the number of technical preferences, independent and dependent product claims and application claims.

Hall, Jaffe, and Trajtenberg (2005) use the same approach solely focusing on patents and citations. They compute indicators for R&D spend, number of patents and number of citations based on a large data set comprising all patents granted by the United States Patent and Trademark Office between 1965 and 1995 together with firm data from Compustat. The results say that a one percent increase in R&D/Total assets increase market value by 0.8 %. An extra patent for each million of dollars in R&D increases the value with 2 % and an extra citation per patent increases firm value by 3 %. Furthermore, Hall et al. (2005) do the same computations grouping the patents in five groups depending on the number of citations. This results in the indicators increasing market value by 10 % for patents having 7-10 citations and for patents having more than 20 citations an increase of market value by 54 % given same amount of R&D and number of patents.

### 3.4.3 Choosing Valuation Method for IP

The choice of valuation method for IP is far from straight forward and very dependent on what the value is used for. Lagrost et al. (2010) focus on this complex decision and present a discussion on when specific techniques are preferable. As seen in Figure 3.5.
they recommend a decision process in four steps that guides the choice of method: why, to whom, for what, and what you value.

Figure 3.5: Framework for choosing valuation method for IP (Lagrost et al., 2010).

WHY the valuation is done is the fundamental part of the decision. Lagrost et al. (2010) name four distinctly different purposes of which the branch in Figure 3.5 is called transaction purposes. The other three are legal, administrative and financial purposes, however, not elaborated further upon due to no applicability for this thesis.

TO WHOM you do the valuation is not a very important determinant in the transaction purposes case. It is rather obvious, that the parties interested in the value obtained are shareholders or managers wanting to make economic sound decisions. FOR WHAT is more of a clear separator. Depending on if the valuation is for pure economic reasons or decision making, the output needed is either quantitative or qualitative. If for example, it is for an acquisition as in this case, a quantitative output is required. If it on the other hand is for capital allocation or similar, a qualitative value might be sufficient.

The WHAT category defines if a trademark or patent is valued. Based on this reasoning, the framework by Lagrost et al. (2010) suggests an income based method for the valuation similar to the Andebjo case in this study. However, their rationale for recommending this method over others in this context is not clearly presented.
Watanabe (2002) does other research on the usage of different valuation methods for IP and rates how common different techniques are for different applications, shown in Table 3.1. Looking at the findings for IP sale, both income and market based methods are commonly used but also cost based approaches are used to some extent.

<table>
<thead>
<tr>
<th>Purposes</th>
<th>Expected Results</th>
<th>Cost Based</th>
<th>Income Based</th>
<th>Market Based</th>
<th>Qualitative Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company valuation</td>
<td>A range or a unique monetary value</td>
<td>-</td>
<td>++</td>
<td>++</td>
<td>-</td>
</tr>
<tr>
<td>IP sale</td>
<td>A range or a unique monetary value/a range of monetary values</td>
<td>(+)</td>
<td>++</td>
<td>++</td>
<td>-</td>
</tr>
<tr>
<td>IP license</td>
<td>A range or a unique monetary value</td>
<td>(+)</td>
<td>++</td>
<td>++</td>
<td>-</td>
</tr>
<tr>
<td>Raising finance/Securitization</td>
<td>A monetary value</td>
<td>-</td>
<td>++</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Taxation planning</td>
<td>A monetary value</td>
<td>++</td>
<td>++</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Accounting</td>
<td>A monetary value</td>
<td>++</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Infringement/Litigation</td>
<td>A monetary value</td>
<td>(+)</td>
<td>++</td>
<td>(+)</td>
<td>-</td>
</tr>
<tr>
<td>External reporting</td>
<td>A monetary value</td>
<td>(+)</td>
<td>(+)</td>
<td>-</td>
<td>(+)</td>
</tr>
<tr>
<td>IP exploitation and management</td>
<td>A monetary value or not</td>
<td>-</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Internal management and strategy</td>
<td>A monetary value or not</td>
<td>-</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
</tbody>
</table>

Notes: ++ Used; (+) Used to some extent; - Not applicable

Table 3.1: Application areas for different valuation methods (Watanabe, 2002).

3.4.4 Patent Valuation Standards

There are several standards for patent valuation issued by different types of associations. They have somewhat different purposes and therefore bridge different gaps. In general terms, one can say that they all are based on different methods previously presented in this section. Three common standards are DIN77100, IVS210 and IAS38.
DIN77100 is a German standard for valuation of patents used for putting a monetary value on patents based on the cost of developing and maintaining them (Ignat, 2016). The standard is based on three parameters taken into account for assessing the value: legal, technical and economic (Casley, Menninger, & Stuffer, 2011). The technical parameters comprise of the life expectancy of the technology, if easy to design around and commercial use of the technology. The legal aspect relates more to the actual patent application. For example, the chain of title which is the name change chain that appears when patents are transferred between parties and is vital to deal with properly in order for the patent to be valid. Other aspects are the prosecution history of the patent and its enforceability over the geographic cover (Arvidsson, Lindell, & Ydreskog, 2014).

Another valuation standard for intellectual property is IVS210 (Arvidsson et al., 2014). This standard is somewhat like a guide to possible valuation approaches on IP and comments on the usefulness of different methods in different situations. Most methods previously raised in this thesis are presented in IVS210 and classified into income based, market based, and cost based approaches (International Valuation Standards Council, 2011).

IAS stands for international accounting standards and IAS38 is the standard for intangible assets. The standard is simply about how to value intellectual property, patents included, for accounting reasons. Without going further into details, acquired intangible assets should be valued at cost, including price of the purchase and preparation for the intended use (IFRS Foundation, 2014).

3.4.5 Patent Law

The rationale behind a patent is that it protects the holder of the patent from someone else using the specific invention that is being patented (WIPO, 2008). An invention is defined as a solution to a specific problem in the field of technology and may refer to either a product or a process. Patents are generally valid for 20 years but local variance occur. It is important to point out that a patent does not give the patent holder the right to manufacture, use or sell anything but merely excludes everyone else from using that specific invention (WIPO, 2008).

There are several general criteria that must be met by the invention to be eligible for patent protection. First of all the invention must be considered to consist of subject matter that is patentable (OECD, 2004). It must also be a new invention, be applicable for industrial use and show a significant step forward technology-wise,
meaning it cannot be obvious. Lastly it must also meet the specific standards used in the application by every patent office (WIPO 2008).

The patents are issued either by a government office or a regional office that covers several countries, e.g. the EU. It is also important to emphasize that it is usually up to the patent holder to see to that the patent is not used by anyone else and if that would be the case the patent holder himself will have to bring up the case under civil law, as is his statutory right (WIPO 2008).

### 3.4.6 Patent Licensing and Royalty

Patent licensing is when the owner of a patent transfers the rights residing in the patent to another party in return for a licensing fee. In a broad sense, licensing can be split into exclusive, sole and non-exclusive licenses (General Patent Corporation 2009). Exclusive licensing is when the patent holder transfers all rights related to the patent to the licensee and formally only is the owner of the name of the patent (General Patent Corporation 2009). Hence, the patent owner signs off all possibilities to sue other parties for infringement of the patent but rather transfers this right to the licensee. The exclusivity can also be limited to a specific field of usage. In non-exclusive licensing, on the other hand, the patent owner only commits to not suing the licensee in the area of the patent. However, it does not guarantee freedom to operate in the area as there may still be infringement of other patents (General Patent Corporation 2009). Sole licensing is rather unusual and is very similar to an exclusive licensing agreement, the only difference being that the licensor also retains the full right to exploit the patent (Shkopiak 2017).

In a licensing agreement, the licensee pays the licensor for the rights of the patent. This can be in the form of either a royalty or a fixed fee. A fixed fee is in general a fixed sum that is payed as a one time cost for the patent license. A royalty is usually either calculated as a percentage of the net sales value for the licensed products or as a fixed sum per licensed product sold (Bristows 2011). If the royalty is payed as a fixed sum it is important for the licensor to relate the sum to an inflation measure so that prices are adjusted over time. Saracho (2002) discusses how previous literature show that the most usual agreements when licensing is using a royalty model and she also presents data on the royalty model being more profitable for the licensor in general. Poddar and Sinha (2002) support this claim and present the royalty model as being superior to a fixed fee licensing agreement from the side of the licensor.
Hill (1992) presents a framework to help firms cope with the conundrum of choosing to license a technology to competitors or not and to decide the best strategy to pursue in order to maximize profits from the technology. The dilemma lies in the possible outcome of the different scenarios. If a firm chooses to license the patent they will have a secure revenue from royalties and the technology has the potential of becoming a dominant design in the market, increasing the demand. If instead deciding to not license the patent the market is potentially their own but this will make competitors invest in imitating the technology which possibly could out-rival the firm (Hill, 1992). Based on that the inventor has the ability to financially execute the invention and take it to market the decision of licensing or not depends on the speed of imitation, possible first mover advantages or disadvantages and the prevalent cost of licensing. Depending on the prevalent conditions of a specific situation Hill (1992) developed a decision framework, shown in Figure 3.6 to use when deciding whether to license a patented technology or not.

The 25 % Rule of Thumb

The 25 % rule of thumb was first presented in 1971 and has become a widely used estimation of license costs for patents (Goldscheider, Jarosz, & Mulhern, 2002). The method is used to find a reasonable royalty rate and in its general form the rule states that the licensee pays 25 % of the profits from the products where the patent is used to the licensor. To put this in perspective this would result in a 5 % royalty rate if
the licensee has a 20% profit margin on the product where the patent is included. The operational profit margin is always to be used in order to not include debt and interest expenses (Goldscheider et al., 2002).

3.5 Valuation of Human Capital

Cascio (1991) presents four main methods for valuation of human capital and employees based on; historical cost, replacement cost, present value of future earnings and value to the organization internally.

Estimating the value of human capital by looking at historical cost means looking at the cost of acquiring, training, hiring and placing the employee and then amortizing these costs over the expected useful life of the human asset. Use of this method is very limited as it is hard to estimate the value from historical cost. The fact that all employees induce different recruiting costs also makes it hard to use internally when comparing value of employees (Riahi-Belkaoui, 2004).

Looking at replacement cost for valuation of employees is a method where the cost of replacing a certain employee with someone else on the market is evaluated. This method includes the cost for attaining the new employee, the cost for formal and informal training and the potential cost for losses in productivity during the replacement period. Cascio (1991) points out that this method is rather limited as the employee turnover is often limited making the estimated replacement cost nothing more than an educated guess.

Calculating the present value of future earnings is based on a projection of the future cost for the company to keep a certain employee, e.g. the salary the employee will earn. This is a rather limited method as it does not take into account the possible contribution to profit and revenue from the employee but simply looks at the costs (Cascio, 1991).

The method of looking at value to the organization means determining the value from what managers are willing to pay for a specific individual and service provided at an internal market. Cascio (1991) points out that this method is very hard to implement.
3.5.1 Managerial Efforts to Retain Human Capital and Its Impact on Valuation

As Moon and Kym (2006) conclude that human capital is an important parameter of intellectual property, it is important to discuss what actions should be taken in order to retain key personnel after an acquisition. Retaining a strong human capital will contribute to retaining strong intellectual capital and that is why it is vital to preserve the value after the acquisition (Moon & Kym 2006). Any efforts to retain human capital would in an acquisition imply cost on top off the initial cost to acquire the human capital. If applicable, these efforts are important to include in the valuation of human capital.

Pfeffer (1995) discusses how organizations can create competitive advantage through effective management of people. One important aspect of this is to provide employment security for the workers. Security signals a long-standing commitment and is likely to increase loyalty, commitment and willingness to invest extra time and effort for the benefit of the organization (Pfeffer 1995). Furthermore, the aspect of monetary compensation is discussed and how aspects as recognition, security and fair treatment often are as important to the workers as a high economic compensation (Pfeffer 1995).

In a quantitative study on knowledge workers, Horwitz, Heng, and Quazi (2003) present findings of the most successful strategies to retain knowledge workers. The study is from a worker’s perspective and shows that the most popular retention strategies were to offer the workers a challenging working environment with high level of freedom to individually plan their work, encouragement from top management as well as providing a competitive compensation (Horwitz et al. 2003).

When it comes to cross-boarder acquisitions (CBA), Ahammad, Glaister, Weber, and Tarba (2012) conclude that the use of financial incentives to retain key people from the acquired company do not appear to be successful when combined with other initiatives. Social and less tangible actions may prove to be more significant factors for increased retention. Furthermore, Ahammad et al. (2012) suggest that managers of the acquirer should focus more on actions related to autonomy and commitment of the acquired company’s employees. In order to enhance retention of key people the firm should invest in training for the employees and implicitly indicate their intentions of committing to building a long-term relationship (Ahammad et al. 2012). Even though the Andebjo case does not consider a CBA, the findings of Ahammad et al. (2012) can be applied in a general context.
3.6 Valuation of Service Contracts

In the case of this thesis, Andebjo is obliged to offer maintenance for the installed base in Company X after the acquisition. Hence, literature related to this topic has been reviewed.

3.6.1 Different Types of Service Contracts

Maintenance contracts can be divided into on-call service contracts and full service contracts. Full service contracts for smaller industrial goods have become more widely used in recent times and imply a transfer of the operating risk to the service provider as the customers pay a flat fee for all equipment repairs. On-call service, on the other hand, requires the customer to pay for individual repair needs as they arise, hence carrying the risk [Huber & Spinler 2014].

The rationale for original equipment manufacturers (OEM) to offer full-service contracts is that they typically generate both higher and more stable revenues. This can be explained by service revenues commonly being more resistant to the economic cycles that determine investments [Huber & Spinler 2014]. Furthermore, full service contracts imply several other positive effects for the OEM. Firstly, the learning is transferred from the customer to the OEM enabling development of more cost-efficient services. Secondly, it protects the OEM from losing revenues to third party on-call service providers that have entered the market at discounted prices lately, forcing even full service contract prices to fall [Huber & Spinler 2014].

Rahman and Chattopadhyay (2007) present three different policies for service contracts outsourced to external service providers. The three scenarios are all full-service contracts and include both corrective and planned preventive maintenance. The first policy presented is a service contract that include full system maintenance and terminates at either a specific predetermined time, a specific usage level or when the system needs to be replaced due to complete failure. The second policy presented is a contract which include full maintenance and service until renewal of the system is needed. The third and final policy includes full maintenance for the entire period and includes replacement of system if needed during the contract period [Rahman & Chattopadhyay 2007].
3.6.2 Pricing of Service Contracts

The pricing of services in order to increase profitability is discussed by Reinartz and Ulaga (2008) that recommend a four bullet action plan to increase profits. First, recognize that you are already a service company. This implies realizing what actions create value for your customers and charge them if they are now free. Secondly, industrialize the back office. Make sure that the back office cost is as low as possible and not eating up the revenues from the services. This can be achieved through cost monitoring, adapting new technology and flexible customer service platforms. Third, create a service-savvy sales force. Product sales are not the same as service sales and hence the company needs to take actions to develop these capabilities. Lastly, focus on the customers’ processes. In order to create more value and revenue it is vital to shift from internal focus to customer focus. This can for example be achieved through equipment sensors to understand how customers use the products (Reinartz & Ulaga, 2008).

Cost-Plus Contracts

Cost-plus pricing is a way for companies to secure margins by determining the price as the cost plus a desired markup. Among the advantages of such a pricing strategy is its simplicity and ability to communicate, each sold unit will increase profits as it more than covers its cost (Grasset, 2015). However, there are also several drawbacks with using cost-plus pricing. Firstly, it does not take market prices and competitors into account which may be harmful especially on competitive markets. Secondly, it does not give the supplier any incentives of lowering the production cost but rather ends up in increasing cost (Grasset, 2015).

Hanson (1992) studies the dynamics of cost-plus pricing and also presents research finding that cost-plus pricing is both preferable and more common in situations when firms lack pricing experience. Hence, this naturally leads to small firms more often using it. Other reasons for using cost-plus pricing is fear of harmful outcomes in competitive biddings and uncertainty residing in long-term contracts. Furthermore, it allows good internal communication between departments and fast price setting when having many products or services (Hanson, 1992).

There are a few variations of cost-plus pricing; Cost-Plus Incentive Fee where the incentive fee is based on performance, Cost-Plus Award Fee where predetermined award fees are included, Cost-Plus Fixed Rate including predetermined labour rates and Cost-Plus Fixed Fee which is a cost-plus contract also including a fixed fee (Rodriguez, 2016).
Fixed Price Contracts

Fixed price contracts are when the supplier and the customer agree on what should be included in a service and the appropriate price for it. Fixed price contracts are specifically suitable for situations where the requirements are easily described and not likely to change (Wiggins 2014).

Chanter and Swallow (2008) study service contracts in facility management that are similar to equipment services. They split fixed term contracts into Lump sum contracts and Measure and value contracts. In general, fixed price contracts are made for risk bearing transfers and these two versions assign different sized portions to the parties. Under a lump sum contract the service provider agrees on supplying services for a lump sum based on fixed quantities and prices and hence take the risk for variations itself. These contracts are reasonable if there are sufficient information before the writing of the contract in order to minimize the risks. Hence, they are not always good for maintenance contracts as the need can vary a lot (Chanter & Swallow 2008). In Measure and value contracts, on the other hand, the service provider commits on doing a certain service at a specified price but to a quantity that is later to be measured. Furthermore, prices can be slightly adjusted according to a predetermined model in order to cope with changes in cost due to market reasons, for example inflation (Chanter & Swallow 2008).

3.6.3 Valuation Methods

Generally, there is not much research in specific valuation methods for service contracts. Probably due to the nature of contracts being rather situation specific and the applicability of general valuation methods being high.
Chapter 4

Results and Analysis

In this chapter the results of the thesis will be presented and summarized in order to fulfill the purpose of the study. The results are presented in the order of the research questions and is presented as narrative interpretations of the opinions of the interviewees. For the interview script and the list of interviewees, please see Appendix I and Appendix II.

4.1 What are the Key Factors Affecting the Valuation of a High-Technology Subdivision Without a P&L?

When discussing the key factors to consider for the valuation of Company X, the general consensus is to establish financials either from market projections or to transfer previous internal sales. Also, legal and a few other aspects are raised.

Banker A suggests the first efforts would be to establish an understanding of what cash flow the unit would generate. Affecting the cash flow would be cost induced from functions missing due to not being a standalone company, differences in spending culture between the companies and understanding future price levels on products. Expert A supports this and suggests to evaluate the possibility of the division to repay the acquisition price. Banker F also supports using a DCF and points out that
a good method to create a forecasted cash flow is to look at similar companies and what cash flow they generated at a similar market development phase.

Consultant A, Investor A and Banker I also stress the importance of establishing a P&L from a market point of view. Consultant A sees the usage of machines internally as a proof of concept and thinks that the commercialization should not be impossible to do, furthermore, the retaining of key employees is considered key. Investor A thinks it is vital to do financial simulations of the business case but see the non-existing sales as no bigger problem as you still buy the future profits. Banker I stresses to assess if the technology is commercially accepted, if so, he sees the valuation more or less as a business plan exercise.

Banker C and Banker D stress the difficulty of this valuation case and Banker C compares it to valuing a start-up. Both suggest a market based method and the creation of a business case for the forecasting of costs and revenues in order to reach a value from a DCF. In addition, Banker C lifts the possibility of a valuation from the alternative savings from using the techniques internally if possible. Even though the situation is the hardest possible for assessing a value, Banker C puts emphasis on the importance of doing a proper valuation.

"If a company cannot put numbers on the deal and give it a value other than a good gut feeling, then it should never go on with the acquisition."

Banker C

Banker G, Banker H, Investor C and Investor D also lift market based approaches. Banker G points out that a key to valuing this division would be to look at the market and how large share the division could potentially catch. He stresses the importance of looking at competitors when doing this market analysis in order to get a comparable company that can be used to determine the potential market share of the division. Banker H would look at potential synergies that could increase the sales from the division. Furthermore, the value for the company for the seller should be estimated by not including the potential synergies. This way, the bargaining interval is determined. Investor C thinks that the key factor in valuing the division is to determine why this is an interesting target, if increased sales is the reason, a projection for this is a must.

Another way of projecting cash flow for valuation presented by Banker B, Banker E, Expert C and Banker J is to look internally rather than on the market. Banker B would analyze whether the division could be separated from the mother company’s
P&L and also try to set up a separate balance sheet for the division. This would allow for valuating the division like a normal company which would be more accurate. He suggests a market approach as a complement as presented in the results above. The internal approach is supported by Banker E who thinks general best practice is to hire accounting consultants to establish a division specific P&L separated from the parent. If not possible, a replacement cost method for the technology or a market forecast as basis for a multiple valuation to similar public companies, however, slightly deducted due to small size risk premium.

Expert C thinks that the fit in the acquirers portfolio is one of the major determinants for the value of the buyer. Another aspect with vast impact on the value is the discount rate and how risk is assessed in the cost of capital. As the division in this case does not have any external sales and any own P&L Banker J suggests tracking back internal sales and create a projected cash flow based on these sales and a potential market price for the machines. From the projections of cash flow Banker J suggests to do a DCF analysis and complement it by looking at multiples, as EBITDA, if there are good comparable companies that could be used. If it is not possible to create projections for cash flow Banker J suggests looking at the assets of the division and try to look at other comparable companies and create multiples on equity in order to get a value.

"If the creation of a P&L really is impossible, the seller must put itself in the acquirer’s position to understand what synergies and potentials they can forecast in order to come up with a value both can agree on."

Banker E

Expert A and Investor B elaborate mostly on legal aspects. Expert A sees the three most important considerations as the ability of working round the patent i.e. its strength in restricting others, how much the patents would save Andebjo from instead paying royalties and how much income the services would induce. Investor B says on the same topic that patents sometimes make it easier to copy as the invention has to be presented, therefore the must be based on future cash flow. Expert D also focuses on the legal aspects of the patents and points out that a key factor to the patent value is whether the patents are filed in the right countries, e.g. in the countries where they the products would be sold and where potential infringement could occur, and also if an infringement could be detected.
4.2 RQ1: Should a Division be Valued as a Company or as the Sum of Its Parts?

Most interviewees would prefer valuing the company as a whole but see no contradiction in a sum-of-parts valuation if that is easier in the specific case. The major disadvantage of a sum-of-parts valuation presented is the risk of missing values that do not reside in the considered assets.

Banker G and Banker H prefer using sum-of-parts valuation. Banker H believes it is theoretically the most correct method but emphasizes the challenge of using it in this case as it may not take into account all values. Banker G believes a valuation of the parts would be a good fit as the different parts can be valued reasonably correct.

Investor A, Investor C and Banker E are positive to the approach but would value the whole unit as a cash flow generating entity on the first hand. Investor C states asset by asset valuation would be his primary benchmark. Investor A is slightly positive to an asset based valuation, if it is easier he thinks this method is better than the valuation of the whole unit.

Consultant A, Consultant B, Banker C, Banker F, Banker J and Banker D see no contradiction in using sum-of-parts valuation but lift different factors having to be considered in order to get a correct value. Consultant A states that valuation by parts sometimes is necessary despite more easily overvaluing certain assets. Consultant B believes an aggregated valuation is better as the obtained value from a sum-of-parts valuation probably must be upward adjusted due to values missed. Banker C and Banker D both assess that it is easier to value the division as a full company but also says it depends on the specific case. Banker F does not see any fundamental problem with valuing each asset separately but emphasizes that this method would likely increase the risk of missing components, such as know-how or employees, in the valuation. Banker J also believes that there is nothing wrong with using a sum-of-parts valuation but points out that it is appropriate to use several different valuation methods and that these should always provide similar results. Banker B considers a sum-of-parts valuation to be better suited for companies that can be divided into separate businesses but points out that it could possibly be used for assets as in the Andebjo case. Banker B also states that valuing the technology separate often can get very speculative, he would not value a company by its assets without valuing the entire company as a sanity check.
Investor B, Investor D and Banker I on the other hand do not support the use of sum-of-parts valuation. Investor B and Banker I state the ideal company as being cash flow generating without assets, hence they see asset valuation as inappropriate. Expert D states that it would be wrong to value patents from potential license revenue if not intending to license them implying that the division instead must be valued from a product and market point of view making a valuation of the entire division more suitable. Investor D thinks asset valuation is inappropriate as the purpose of the acquisition is not the assets but rather commercialization of the products.

### 4.3 What Would be the Preferred Method for Valuing the Division as One Whole Company?

As seen in Table 4.1, the preferred method is to use a DCF. This is supported by all experts except for Banker E and Investor B who prefer using multiples.

Banker B and Investor A would use multiples as a complement to create a more comprehensive picture. Investor C prefers a DCF valuation but would use a sum-of-assets valuation as primary benchmark. Consultant B would use DCF valuation on the unit but tweak it by using a different discount rate during the effective dates of the important patents.

Consultant A sees the situation as too uncertain to consider using only one method and that all methods are highly inappropriate in different occasions. In conclusion a DCF together with a market approach is preferred. Furthermore, Consultant A considers the prevalent internal usage as a proof of concept enabling forecasting for the DCF.

Banker E and Investor B distinct themselves from the other interviewees by considering a multiple valuation based on market forecast being preferred. Similar to combining methods with a DCF for the purpose of triangulation of the value, Banker E would use multiples followed by a DCF.

<table>
<thead>
<tr>
<th>Method</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCF</td>
<td>17</td>
</tr>
<tr>
<td>Multiples</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4.1: Number of primary valuation methods selected by the interviewees.
4.4 RQ2: How to Value Intellectual Property?

The interviewees were asked about their opinions about the most common IP valuation methods. Some non method specific topics were also raised. Banker A puts forth the importance of maturity of a patent as the value clearly depends on if the patent is under development, newly developed or already creating cash flow for the owner. This opinion is shared by Consultant A who adds that the accuracy of a patent valuation, regardless of method, is dependent on how closely related a patent is to a product and its proximity to the market. Investor A and Investor C, both representing industrial companies doing many acquisitions present a view on patents being the key to the market rather than something that creates value itself, when doing a valuation it is still cash flow that counts.

"If the intention is not to sell the patents, the value of them is not important. Rather the value lies in to what extent the company believe they can sell the associated machines on the market."

Consultant B

Expert A explains that patents can have a larger value than the company owning them as they could be worth more as part of other companies’ products. He also brings up that the value of a patent is heavily associated to its legal strength. Lastly, everyone was also asked to rate each method in terms of usefulness on a scale 1 to 5. A summary on how the respondents rate the usefulness of different valuation methods for IP-assets is shown in Table 4.2.

"The more you evaluate a patent, the less it is worth as you find ways to go around it."

Expert A

<table>
<thead>
<tr>
<th>Method</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income Based</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>9</td>
<td></td>
<td>4.18</td>
</tr>
<tr>
<td>Market Based</td>
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<td>Cost Based</td>
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<td>6</td>
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<td>2.81</td>
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<td>7</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2.60</td>
</tr>
</tbody>
</table>

Table 4.2: Ranking of the usefulness of different valuation methods according to the interviewees. Varying number of responses on different methods come from some interviewees not having knowledge about certain methods.
4.4.1 Income Based Methods

When asked about their view on income based valuation methods, most interviewees were very positive except Banker E and Investor C that were more skeptical. Banker E was skeptical as it is heavily dependent on the assumptions made. Even though it in principle is correct, Banker E states it will be even more fluctuation than doing a DCF on a regular company. Investor C is slightly more positive but agrees on large fluctuations in value and dependence on the patents strength.

Banker A and Expert A believe that an income based method is the best suited and most appropriate method for valuing intellectual property and suggested the use of a DCF analysis, Consultant B thinks it is the easiest. Banker B, Banker D and Banker J state that income based methods are the most used methods in the industry. Banker H points out that it always comes down to using an income based valuation as the cash flow is what matters in the end.

The optimal case for using a DCF would, according to Banker A, be when the patent is mature and creating cash flow but still has clear growth potential. This is supported by Consultant A who also adds that it is inappropriate for patents with unclear areas of usage or which are early in their development cycle.

Expert A points out that the discount rate has large effect on the results. However, errors from the discount rate are still small in comparison to risk errors, e.g. risks associated with legal patent issues which he suggests should be included in the discount rate used. These risks could be analyzed by adding them into the model and doing a Monte Carlo simulation for the credibility of the valuation model to be further strengthened. When using these methods, Banker B prefers using WARA (Weighted Average Return on Assets) to find the discount rate for the patents, he also points out that the required return rate for intangibles normally is higher than the WACC. This is similar to Expert C who prefers DCF or a license based method, however, the cost of capital he suggests is a risk adjusted WACC. Banker I adds that the discount rate is a major determinant and that return on equity should be calculated as risk-free rate plus market rate plus company specific risk of 10-30 % depending on riskiness. Investor D explains that a venture capital firm must have high aim for the portfolio return, around 20 %, hence assigns specific investments discount rates of 25-75 % depending on riskiness as some yield negative return.

Both Banker B and Banker D suggest the Relief from Royalty method, Banker D also recommends the Multi-period Excess Earnings method. Banker A and Banker J are not familiar with the Relief from Royalty method but suggests using third party
price for a similar patents to find cash flows, which essentially is the same. Banker B points out that license calculations should be used with conservative figures for a buyer, around 2-10% of revenues is common on the market but this varies from case to case. He also points out that the royalty rate is often determined from the EBIT margins of the products. Banker I also prefers using DCF valuation for patents, however, he dislikes the Relief from Royalty method as it is based on the existence of license opportunities which are uncommon. Expert D adds that Relief from Royalty is not appropriate if licensing is not the purpose of the patent acquisition. Furthermore, Expert D elaborates on how to determine the license fee and concludes that the license fee could be determined as a share of the added value to the product in which the patent is used. The exact fee is a factor that has to be negotiated but he adds that fees are usually somewhere around 5%. Investor D adds that the Relief from Royalty method is good if the industry considered licenses a lot, otherwise, determination of license fees is very speculative.

Banker C stresses the difficulty to get a correct value from using a DCF but that there is no better model. Banker F supports this notion of high uncertainty when using a DCF and lifts an approach of doing several different scenarios and weight them together by looking at their probabilities. Banker G also believes that a DCF valuation would be good but points out that the method often gives a value that is slightly high.

4.4.2 Market Based Methods

In general market based methods are considered as difficult to use due to poor public data of patent transactions and hence few comparables, however, it can always be used as as a complement to other methods. If data is available many believe the method to very accurate.

Banker A sees the market approach as preferable if the patent is mature and already used for products generating cash flow. Expert D likes market based methods and says that if having good understanding of the patent transaction market, the attained values can never be too far off. Expert A and Banker H point out that using a market approach is usually a good compliment to using an income based method. Generally, it gives a lower value as it includes the transaction risk. When using multiples, Expert A suggests going to either RPX, Intellectual Ventures or IAM Magazine for retrieval of relevant transaction data. Banker J thinks market based models are good and in the general case should give a similar value the the DCF if it is possible to find good data on similar transactions. Investor D adds that even if closely related patents are not found, one can draw conclusions from similar ones. As a complement when
lacking data, one can use similar technology transactions or company transactions comprising of technology.

Both Banker B, Banker C, Banker D, Banker F, Banker G, Banker H, Expert C and Investor C all lift the difficulty of using a market based method as there is very limited transaction data for patents and because every patent is unique. Banker I says it is useless due to the same reasons. Banker D and Consultant A complement with the notion of this method being optimal if there is a case where a patent with the exact similar conditions prevailing could be used as comparison, they believe this to be highly unusual though. Banker E is generally positive to using a market approach for patent valuation, but concludes that the data is too poor for any usefulness, either due to no similar patents or due to comparables being too old. Expert C adds that this is the best method for the really unusual occasions when data actually exists.

"Multiples are very hard to use for patent valuation, there are limited transaction data and most assets are unique."

Banker D

Consultant A thinks that the existence of revenue streams connected to the patent is important in order for the market approach to work properly. To only look at similar patents in terms of technology is not sufficient due to the uniqueness of patents. Somewhat similar, Consultant B would not use this method if the intention is not to further sell the patent as it will not represent the value the company will enjoy from it.

4.4.3 Cost Based Methods

Most interviewees believe that cost based methods provide a lower value than the other methods which is is not based on economic rationals of value. However, many think it is a good benchmark and sanity check to the usage of other methods which is widely used by practitioners.

Expert A considers cost based methods to be accurate for accounting purposes but not for business decisions based on economical rationales. Banker C, Banker D, Banker H and Banker I believe a cost based method gives a complementing picture to a DCF analysis. Banker C and Banker D describe the value obtained from a cost based valuation to serve as a base level for the value of the patent which is useful for determining a range in negotiations. Investor D likes cost based methods and says
investors typically use them when acquiring venture capital portfolio firms for the technology.

"It is never wrong to use a cost based approach as a rock bottom for the value, it illustrates if the patents create or destroy value compared to the cash flow they can generate."

Banker C

Investor C has actually used cost based valuations a few times in his profession as it is the most concrete method for valuing patents. In contrast, Consultant B sees it as interesting but difficult as R&D progress is not easily forecasted.

Consultant A, Expert C and Banker J are rather skeptical to cost based methods as they seldom give realistic values for the acquirer, however, according to Consultant A it can be used as compliment to other methods. Banker F also points out that a cost based method very seldom gives a reasonable value but is still often being used anyway. Banker G and Banker J point out that the value is usually rather low. Even though it does not provide a perfect value, Banker G says it is still always used as a sanity check of the value from another valuation method, hence it is very useful.

Banker B believes cost methods in general are very limited but very useful in a few specific cases when the product of the company can be considered a commodity. Similarly, Banker E and Expert D think a cost based method is a sound way of valuing patents if having a clue on how much it would cost to develop similar technology internally. However, Banker E sees it as difficult to obtain the development cost from the seller.

4.4.4 Real Options

Real options is generally considered a complex method that is not widely used. The difficulty lies in many parameters to determine having large impact on the result and it is not easy to communicate to non experts. However, the interviewees having much experience of real options see it as an enhanced DCF valuation.

Banker A sees real options primarily for usage in the bio tech sector and for patents in an early development stage having great potential. Investor C considers real options as more theoretical than practical and suited for complex rather than simple products.
Banker I is unfamiliar with option pricing but likes the idea of the sequential decision making it allows, especially if this also can be included in the transaction price.

Banker G believes this method to be accurate and especially suitable for valuation of patents. Using real options is by Expert A considered to provide a more exact valuation but he also points out that it often requires a lot more work and greater cost. He believes the method is not such a good fit for this specific case as it is not that complex. Banker J also thinks it can give a more accurate value and sees it as a technical expansion of the DCF from where he would retain the values. This view is similar to Consultant A who says it is the most theoretically correct method but that it is easy to get lost in different probabilities and other parameters. He believes probabilities can only be attained in the pharmaceuticals industry. Banker C thinks real options are appropriate in oil exploration companies while Banker D and Banker G on the same topic think its usefulness is highly dependent on the characteristics of the IP-assets.

"I am generally skeptical to real options, they must be based on hard facts on for example probabilities and therefore have a very limited use."

Consultant A

Expert C thinks mathematical requirements and complexity are too high to be used in reality. Therefore, the method is not used in reality but only a schoolbook example. This is in line with Investor D who is a fan of math but dislikes complex methods if accuracy is not improved. Banker B, Banker C and Banker D see this method as very unusual. They all stress the complexity of the method and that it for a client becomes a black box as it is very hard to understand the logic behind the analysis. Banker D believes it to be a good method in some cases but stresses the high risk of getting it wrong as the complexity is very high and the parameters used are many and very sensitive.

Banker H points out that using real options could be suitable for patents as it takes into account a rather binary result of future events which can be the case for patents. However, the many assumptions made can sometimes make the method too complex and it can be hard to trust the generated value.


### 4.4.5 Qualitative Methods

Qualitative methods are generally regarded as good way of assessing the quality of a patent and therefore an input to quantitative methods. Scoring based methods seem to be widely used, even if not named like that, while indicators is not well known probably due to being more complex.

Expert A considers scoring based methods as worthless in most cases regarding a transaction and point out that they can best be put to use when comparing different patents in a large patent portfolio. Banker E is on the same note and states that if there is no monetary link from the score, it cannot be used in acquisition cases. Banker J does not like qualitative methods as they are very subjective and therefore cause great uncertainty. Banker H believes it could be useful in some cases as a complement in an income based approach but points out that these models tend to be very subjective.

> "It is very seldom that qualitative methods actually provide a value, therefore they cannot be used as a standalone method. But, it can be used as a part of another method to help provide background on the quality of the patent."

Banker F

Banker B, Banker D, Banker G, Investor C and Consultant A believe qualitative methods not being useful as they only give an indication of the quality of the patent. Banker C, Banker F and Banker I put forth similar views of this method but believe it to be a very good quality assessment of the patent that could be used as a part of a DCF analysis. They think it can be a fundamental part of including technical expertise into the cash flow projections needed for a DCF. Consultant A thinks it can be used in order to really get an understanding of the business. Expert C completes this statement by saying that the real value of a patent resides in its predictability which can be assessed in qualitative methods, however, no monetary value is obtained so it can only be used as a complement. Investor C use it especially for assessing legal aspects.

Indicator based methods are considered worthless by Expert A. Banker B is unfamiliar with these methods but still enthusiastic about methods that are scientifically developed, however, he sees little potential for the usage of valuation. This is somewhat similar to Banker E who thinks this method could be used if the explained variable is in monetary terms, however, he deems this as impossible. Consultant A
has a view quite opposite to Banker B, he is also not familiar with the model but
generally skeptical to scientifically developed methods whose link to monetary values
is not obvious. Banker J is carefully positive but thinks that strong correlation to
value still does not provide an exact figure and is not situation specific. Banker I who
likes the idea of a non subjective method for risk and possibility assessment.

4.5 RQ3: How to Value Key Employees?

There seems to be no established method on how to value employees. Most inter-
viewees come up with ideas on how to do, among the more common is to look at
differences in cash flow with and without employees and to use a cost approach.
Furthermore, a challenge presented is how to keep employees after acquisition.

Most interviewees state that it is extremely hard to value employees. If one necessarily
needs to put a value on employees, Banker E elaborates on two methods; the first
one based on the drop in revenues the company would face if an employee left, for
example for sales persons with personal relationships to key accounts. Investor D lifts
the same example and Consultant B suggests this method for valuing employees in
a consulting firm. Banker K suggests looking at the value contribution to the total
value that could be assigned to the specific employee. The second method of Banker
E would be to simply look at the cost of recruiting a similar employee.

"It is hard to value employees as you can never lock them in, they could
leave tomorrow."

Banker D

Similar to the cost approach presented by Banker E, Banker A elaborates on esti-
mating the value through the cost of employing someone with similar qualifications.
Expert A points out that valuation of employees will be very subjective as the value
differs from which perspective you look at it. He points out that all personnel in
some sense can be replaced and suggests simply looking at what the cost would be
to replace them as a valuation. Included in this cost would be salary, training and
gaining of experience. Banker B refines this method by presenting a cost approach
looking at three key parameters; the cost to hire the employee, the direct education
cost and the loss in productivity during the learning period for the new employee. He
has previously used this method professionally. A similar approach is presented by
Consultant A and Consultant B. Banker F also suggests a cost approach and states
that this is usually considered the market custom for valuing employees. Both Banker C and Banker D also suggest some kind of cost approach as a last resort.

Banker C, Banker D, Banker E, Consultant A and Investor B lift the difficulty to value employees as they are both very hard to lock in, they could leave directly after an acquisition, and therefore it is very hard to quantify their value. Consultant A discusses two approaches for securing that scientists stay; first and preferred is to let them invest themselves in the venture if possible, second is that they may not be monetary driven people and an understanding of what drives them must be established and offered. Investor B adds that if investing is not possible, offering management positions might be attractive.

Expert C elaborates on a new perspective, the value of the employees is highly dependent on the competence overlap with existing employees. Also a heuristic model is discussed; first put a rule of thumb value on the employee, secondly decide a risk rate including the risk of the employee leaving and thirdly discount the value with the risk rate. This is similar to Banker I’s notion stating that a researcher’s value in this case only really exists if the products are not fully developed. However, he suggests no ideas for the valuation. Banker G says that when it comes to valuing scientists you might have to forecast any potential value of future ideas and also whether having a specific scientist would attract other gifted scientists.

"Employees generally and scientists specifically are hard to lock in. Scientists might not even be monetary driven why you really have to understand the specific individuals."

Consultant A

Investor A and Investor C are in general skeptical to valuing employees. Investor C has done employee valuations for acquisitions a few times but this has ended up in no employment. Rather, they have been consulted using their own one man companies due to stronger contractual rights. Then their value is determined from the hourly rate paid. Investor A presents a reverse engineering sanity check method. This is to allocate the overprice paid compared to the valuation of the business on the number of employees to get a sense if the employees are worth that figure.

Banker J presents two new ideas on how to put a value on employees for economical decision making. If valuing a larger group staff, just use the rule of thumb that the value is 25% of their annual salary. For senior employees, he suggests to look at the amount they are insured for if they have such an insurance.
4.6 RQ4: How to Design, Value and Include Service Contracts in a Transaction?

The service contract is considered straightforward to value as it is clearly cash flow generating. The opinions of the design of the contract are not uniform but many suggest cost plus priced contracts. The length of the contract is also raised as an important factor.

To value the service contract, Banker A points out that depending on the contract the buyer must assess its profit in order to find a value, preferably through a DCF. However, seller and buyer will have different views on the value why it cannot easily be included directly in the acquisition price. Lastly, Banker A emphasizes the importance of long contracts as he has experienced similar deals where price pressure has been enabled too soon after the transaction.

Expert A considers valuation of the service contract as a normal cash flow valuation and puts forth the use of a DCF analysis. This is fully supported by Banker B that also adds that if all service is internal today, internal prices must be translated to market prices. This could for example be done through talking to potential customers. Banker C, Banker D and Banker I consider the formulation of the contract to be the determinant for the very valuation of it, Banker D and Banker J state cost plus contracts to be most common making the valuation rather simple. Consultant B says a cost plus priced Service Level Agreement (SLA) would be suitable for the case and that the value can be deducted from the price. Banker C thinks the obtained value can be included in the transaction price. Banker I would value it through a regular DCF and states it does not matter if included in the transaction price or not, it will be included in both parties’ opinions no matter what.

Banker E and Banker F also think the service contract can be valued through its cash flow after having established the contract and derived revenue and cost. Another approach Banker E suggests is doing a comparative valuation with consultancy firm transactions as they have similar characteristics. Banker H supports this notion of valuing the contract based on its revenue and cost and points out that the contract must be set up from a market price point of view.

"The valuation of the service contract is rather straightforward and can preferably be valued separately."

Banker D
Consultant A shares the opinion that the valuation of the service contract is rather straight forward but adds a discussion on how the contract should be written. The different perspectives of the seller and buyer must be evaluated, if for example the seller does it for cash reasons, they are not too sensitive to higher recurring fees. If the serviced asset is strategically important for the seller, then they will want to secure a longer contract. From the perspective of the acquirer, a long contract with good return is desired also with guaranteed minimum volumes. Investor A adds that the acquirer typically should not appreciate to be locked in to a long contract and that the service should not be offered "free of charge" after being included in the transaction price if cost changes or similar occur.

Banker G talks of different characteristics of a SLA and points out that important factors to agree on are if the service is supposed to be carried out within a certain interval after a fault or if the service provider obliges to make the machines run a certain percentage of the time.

4.7 What Would be the Main Challenges with Such a Deal?

This section puts light on a few different challenges raised by the interviewees and serves to show the complexity of the valuation of the Company X division and similar situations.

Expert A puts forth three main challenges with this case. Firstly, the challenge of determining the royalty rate for the patents, e.g. how much potential licensees would be willing to pay for the right to use the patent in question. A second challenge would be to forecast the future market growth which strongly correlates to the value of the patent in the valuation. Finally, Expert A lifts the challenge of evaluating the legal quality of the patent, a possibility to go around the patent has great negative impact on the value.

Banker C believes the main challenge in this valuation would be to assess whether the patents have commercial value or not. It has to be decided if there is a demand for the products and if there is a risk of competitors going around the patent. Banker D mentions that the main challenge would be to forecast the cash flow for the division. Consultant A puts forth the biggest challenge being the assessment of the possibility to commercialize the products and attract new customers. Consultant A also thinks
the valuation of employees will be a great challenge as it is always a challenge to retain key employees and the risk of loosing them must be quantified correctly.

Banker E and Consultant B think that the creation of future income projections is the hardest part in this deal as it is untested on the market up to date. This is similar to Investor B who thinks the nonexistent cash flow is the most complicating factor. Consultant B adds that it is important to put lots of effort into the business plan. Investor A, Banker G and Banker H see the main challenge as actually arriving at a value and to build a business case if not knowing all details about the company. They suggest sharing risk with the seller through the transaction price partly depending on performance. Similarly, Banker H suggests an approach where the buyer and seller share the risk for example through paying a little less up front and instead pay a royalty based on performance.

"It is better to make a qualified guess of the value than doing nothing."

Investor A

Banker J considers the determination of the discount rate to be a challenge. Usually, the WACC found through industry betas are used for tax purposes. For economical valuation of patents, however, a risk premium should be added. To find this, one idea would be to assign different assets, including patents, on the balance sheet certain interest rates so that the weighted average still constitutes the WACC. Banker C and Banker D point out that the high uncertainty in the valuation requires a very high discount rate.

Banker B emphasizes the difficulty of valuing the division, given that a large portion of its value is derived from technology with an uncertain value. Banker F believes that however the valuation is done it is deemed to give an incorrect value, but he proposes to focus on decreasing the effect of the error as much as possible. Investor C considers the main challenge to be motivating the deal despite the value obtained being uncertain. He would not probably not go forward with the deal without strong strategic reasons.

4.8 Valuation Results

Based on the findings from interviews and the literature review, a model for valuing the division of Company X has been developed. Using this model a valuation has been
conducted using five different approaches. One approach is the aggregated approach where the division is valued as a proper company generating cash flow using a DCF. Furthermore, four sum-of-asset approaches are conducted. The employees and the service contract are valued in the same way in all four approaches. What differs is the valuation of patents done through an income approach, a market approach, a cost approach and a real options approach respectively.

The resulting total value can be seen in Figure 4.1 and Table 4.3. For more detailed examples of how the methods for the different valuations are implemented, please see the valuation spread sheets attached in Appendix III.

Figure 4.1: The resulting values of the different approaches tested for valuation of the Company X division in the Andebjo case.

<table>
<thead>
<tr>
<th>(EUR)</th>
<th>Income Based</th>
<th>Market Based</th>
<th>Cost Based</th>
<th>Real Options</th>
<th>Company DCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patents</td>
<td>2,586,238</td>
<td>2,521,350</td>
<td>1,620,000</td>
<td>3,416,137</td>
<td>-</td>
</tr>
<tr>
<td>Employees</td>
<td>746,763</td>
<td>746,763</td>
<td>746,763</td>
<td>746,763</td>
<td>-</td>
</tr>
<tr>
<td>Service Contract</td>
<td>412,290</td>
<td>412,290</td>
<td>412,290</td>
<td>412,290</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Value</strong></td>
<td><strong>3,745,291</strong></td>
<td><strong>3,680,403</strong></td>
<td><strong>2,779,053</strong></td>
<td><strong>4,575,190</strong></td>
<td><strong>9,176,390</strong></td>
</tr>
</tbody>
</table>

Table 4.3: The resulting figures of the different approaches tested for valuation of the Company X division in the Andebjo case. Note that the value of the service contract and the employees are computed using only one method each, what differs between the sum-of-asset valuations is the patent valuation method.
4.8.1 Assumptions Made in the Valuations

A general assumption for all valuation approaches performed in this thesis is that, after the forecasted horizon of three years, the ongoing value is computed using Gordon’s formula presented in the literature review. The ongoing value is computed during the life expectancy of the technology which is set to be 20 years. Even though patents will expire earlier, the rationale is that the established market position derived from the patents will enable sales of the technology for approximately 20 years. The growth estimates during this period is a moderate 3 % in order to arrive at a conservative value. When applicable, the tax rate used is 19 % as the UK corporate tax.

Company DCF

In the Company DCF one of the major assumptions is to use a risk adjusted discount rate of 15 % above the WACC of Andebjo. This as the interviews suggested a high risk premium ranging between 10 and 30 %. The sales, cost and marginal figures are obtained from Andebjo internals doing the business case for the acquisition.

Valuation of Employees

Other than the case specific assumptions of recruiting cost, salary, loss in productivity etc. one of the main assumptions is that no discounting is used. Rather, all of the value is assumed to be a present value despite a portion of the value taking place in the future.

Valuation of Service Contract

The main assumption mad in the valuation of the service contract is that the profits are discounted with the WACC and no risk premium added. This is due to the reason that the profits are easily forecasted and not bearing much risk if included in a well written long term contract. Also here, the need for service is estimated during the full lifetime of the technology of 20 years.

Patents - Income Based Method

The Relief from Royalty method is used with the license fee assumption being 7 % of revenues, this is approximately corresponding to 25 % of the operating profits as suggested by the rule of thumb and in line with interview results. Furthermore, the exact same revenue projection used in the Company DCF is used as the base. The discount rate used is the WACC + 15 % risk premium.
Patents - Market Based Method

The assumptions of the market approach is that the databases where data was retrieved for the computations of values are good estimates of the patents in the case. Specifically, most of the used databases are based on US transactions. An average value is computed from the values derived from each database. The database sources are: McCurdy, Daniel P. (2016), Richardson Oliver Law Group (2017), Ocean Tomo Intellectual Capital Merchant Bank (2014) and Hayes Soloway Intellectual Property Worldwide (2016).

Patents - Cost Based Method

The cost approach estimates are fully obtained from Andebjo engineering experts in order to get a well founded unbiased estimate. No discounting is assumed.

Patents - Real Options

The real options approach is based on a few assumptions. The discount rate used is the WACC as the different outcomes already represent the riskiness of the asset. The underlying value in each branch is computed as the expected ongoing value of license revenues given the forecasts of the income based patent valuation using Gordon’s formula. Added is the previous years’ single revenues and previous years’ investment cost is subtracted. This amount is then deducted for tax. The exercise price is estimated to be the investment needed to continue one year with the venture, included is R&D, relocation cost and marketing cost.
Chapter 5

Discussion

In this chapter, the findings from the interviews, the literature review and the valuation modelling will be discussed. The basis for this will be differences, similarities and contradictions between the three sources of input and end up in generalized conclusions.

5.1 Aggregate or Sum-of-Assets Valuation?

The general opinion of the interviewees is rather skeptical to the use of sum-of-parts valuation. Many point out that even though it is not theoretically wrong there is a big risk of missing significant value. Some interviewees prefer it for this case as for example the service contract would be very easy to value on its own.

When doing the valuation ourselves, a Company DCF valuation of the whole division provides a higher value than by valuing the division as the sum of its assets. As the aggregated valuation is the only method that actually takes all the future cash flow into account this could be considered to be a reasonable value of what Andebjo will enjoy post acquisition. Also, it was preferred by most interviewees for the same reason. As the different methods for valuing the patents and other assets for the sum-of-parts valuation value each asset separately, other values of the business may not be included. One of the aspects missed is the potential are synergies that in the Andebjo case would constitute sales channels that they can use for Company X. Another aspect is the technology and products. By only valuing the patents and by
using a Relief from Royalty method this will only provide a value for the patents. The actual value of the technology and the products of which the patents are a part will not be considered while they still are part of the Andebjo case. To decide how big part of the value of technology and products that could be derived to the patents is very hard. We tried to do this and somehow find an appropriate part but could do nothing more that guess how big share of the value actually lies in the patents. Some of the interviewees also discusses whether you possibly could see it like all the value of the company laying in the patents. Without the patents there would be no revenue at all and therefore the total revenue could be assigned to the patents. However, the Relief from Royalty method is one of few ways of finding a certain share why we consider it to be to best methods, still resulting in a lower value than a Company DCF.

Our conclusion is that the Company DCF value in the Andebjo case is higher than the sum-of-assets methods as they do not provide the entire value that Andebjo would benefit from post acquisition. We believe that the sum-of-assets valuation misses to include all the potential future cash flow of the technology in question including Andebjo synergies but instead it only shows the general value of the different assets from a market stand point. The differences between the aggregated value and the sum-of-assets value provided from the valuation should represent the value of the potential synergies and the value of the products and technology for Andebjo. Hence, the sum-of-asset valuations are a good indication of what others might be willing to pay for the Company X division while the Company DCF limits the negotiation span for Andebjo.

5.2 Valuation of IP-Assets

5.2.1 Income Based Methods

Income based methods are by far the most preferred methods according to the external bankers, investors and IP-valuation experts we have interviewed. The average rating on usefulness was 4.18, far higher than all the other methods. The most common rationale for this choice was the fundamental definition of value, that the value of a company lies in the cash flow it can generate for its owners. The same should hence hold for a patent which is something an income based method takes into account. This is completely in line with literature presented in the decision framework in Figure 3.5 and the valuation method application rating in Table 3.1 that suggest income based methods in cases like this.
The challenging part with using an income based method for a situation like in the Andebjo case is how to establish the financials. The consensus opinion of all interviewees, regardless if promoting income based methods, is that some type of financials must be established or it makes no sense to go on with the deal. The opinions on how to make the financials are not similarly uniform, some promote to excerpt them from the the P&L of Company X while some, a slight majority, suggest doing sales projections of the products.

Having established financials, the decision comes to how much of the cash flow actually can be assigned specifically to the patents. This was raised multiple times in the interviews but also in the literature by Kamiyama et al. (2006). The Relief from Royalty method is the single most presented and promoted among the interviewees. However, critical voices have also stated that if the intention is not to license the acquired patent, this method is not appropriate. It is a very tangible way to find a proportion of the cash flow from the DCF to assign to the patent which is an important factor in order to be an objective method, this was obvious during the valuation modelling. Furthermore, if using the full cash flow from a situation like in the Andebjo case, it is a company valuation and not an IP-asset valuation. Hence, this is the way we suggest using the income based method for valuation in the case. If however, the patent has potential to increase revenue of an already existing product we suggest the entire value of the increase to represent the value of the patent.

Another of the more challenging aspects raised by both Kamiyama et al. (2006) and the interviewees is arriving at the discount rate heavily affecting the value. Here, the interviewees suggest many different options. However, we would argue that the best practice found is to use a risk adjusted WACC with a risk premium ranging between 10-30 \%.

The used licensing rate when doing the Relief from Royalty method is of course a major determinant as it is directly proportional to the value. From the interviews, licensing fees are presented as a certain percentage of revenues, typically 2-10 \%. This is somewhat in line with literature and the presented 25\% rule of thumb. For Andebjo its very high margins would imply about a 7\% licensing fee.

In our valuation modelling, the income based method results in a reasonable patent value in line with the market based method and slightly lower compared to real options. The slightly lower value can be partly explained by using the Relief from Royalty method as it assigns a relatively small share of revenue to the patents. As Andebjo does not have the intention of licensing out the patents, this method might not provide the actual value when the patents are used in another way. Despite this,
we consider the Relief from Royalty method to be the most accurate method as it is a good way to objectively find the share of revenues assigned to the patent. Overall, income based methods based on Relief from Royalty to be the best method for valuing the Andebjo case.

5.2.2 Market Based Methods

Market based methods for valuation of IP-assets are the least appreciated methods according to our external interviewees. The average rating was 2.41 which is somewhat less than cost based methods and real options but much less than income based methods.

What most experts point out as the biggest challenge when valuing IP-assets using market based methods is the difficulty to find sufficient data of similar patents that could be used as comparables. Furthermore, they also point that a patent is unique by nature in general making it hard to compare to other patents. These two challenges are also lifted in the literature which makes the interview output in line with existing literature. Kamiyama et al. (2006) point out that one of the biggest difficulties with using market based methods when valuing patents is the low number of trades available. As the experts also point out, Lagrost et al. (2010) point out that the main challenge of using market based methods is to find comparables as patents are unique.

Some of the experts point out that when possible to find previous transactions of a similar patents, the obtained value is most likely very accurate. The method gets its low score in usefulness as it is very hard to use if not finding a good comparable, if you have a good comparable many experts agree that the method would be very appropriate. Under the circumstances of finding a good comparable, many interviewees state that this method would be the best, something that we think is highly likely and support.

The market based approach to value patents in the Andebjo case gives a value in line with the income based and real options valuations. However, it is obtained through very general data of average patent transactions prices why the accuracy is hard to verify. The data found was from several different databases and all contained an average patent price of all their included patent transactions. These prices where multiplied with the number of Company X prices and the average of the sources was used as the output. The different sources gave values both far higher and lower than their average indicating low accuracy of the method. For this case, the interviewees
were right in the sense that it was very hard to find data of previous patent transactions, the case might however be different if willing to pay for access to databases as data in general is increasingly collected.

5.2.3 Cost Based Methods

When it comes to cost based methods for valuation of patents, the opinions of the interviewed experts are rather non uniform. However, many experts say it is widely used and believe it preferably used used as benchmark to other methods explaining it being rated as the second most useful with an average of 2.81. Many of the experts point out that the value retrieved from using a cost based approach seldom provides a fair value for the patent as it is the cash flow generated by the patent and not the cost for developing the patent that is worth something for a buyer. The opinion agreed upon by most interviewees was that cost based methods are a good base level to compare values retrieved from other valuation methods to. Many use the term “sanity check” and conclude that they always complement other valuation methods using a cost based method.

When cost based methods are used, the interviewees clearly state that using an approach where the cost of developing a similar technology is evaluated is better than looking at the cost the patent has induced historically. The preferred method is what Lagrost et al. [2010] call the replacement cost method.

Some experts believe the value generated from a cost based valuation is in general lower than the actual value. Something that still makes the value interesting is that in an acquisition a potential buyer would not want to pay more for a patent than it would cost to develop the same technology in-house if the forecast is accurate and the timing is not rushed.

The value obtained using a cost based valuation method in the Andebjo case confirms the opinions of the experts and the literature. This valuation approach yields the lowest value and hence serves as a base level for the valuation. Since the cost was estimated by Andebjo engineers, we consider this value to be fairly accurate in the sense of a rock bottom for the value of the division of Company X.

5.2.4 Real Options

The general opinion among the interviewees was rather skeptical to using real options because of its complexity. Several bankers point out that even though a reasonable
value could be derived it is doubtful that a customer would approve the method as it is extremely hard to understand. The average rating of real options among the interviewees was 2.60 which is significantly lower than income based methods but somewhat higher than market based methods but lower than cost based methods. In general it could be said that the interviewees and hence best practice have a more negative view of real options than the general view in the literature. [Thomas and Gup (2010)] states that they believe that real options will be the main method for valuation of sequential investment opportunities in the future, this notion is supported only by very few of the interviewees.

When using real options ourselves, we used a binomial decision tree approach and in contrast to the opinion of most interviewees the method was not very complicated to use. The two main things we believe make this method hard to use are firstly that it is easy to get a figure wrong without realizing it as not being very intuitive. Secondly, there are many different parameters that are taken into account in the model and many difficult assumptions have to be made, some of which affect the outcome of the valuation greatly. We believe that when using a real options approach, you have to be much more careful compared to other valuation methods.

The real options approach also provides a reasonable value in the Andebjo case but is hard to verify, similarly to the market approach. In this case the uncertainty lies in the many assumptions that have to be made. The probability of each scenario and their outcomes must be decided and this is a very unstructured process. Furthermore, the sequentiality that is modeled in the approach is somewhat force fitted to the case as it in reality is more of a lump sum investment.

As many of the interviewees claim, the most suitable situation to use real options is when the future can be described as sequential and where there are significantly different outcomes. An example of this would be within pharmaceuticals, for a new medicine it is clear what the potential market could be if the product in question passes test phase 3. As one interviewee also claims, there is in the case of pharmaceuticals data available on the probability of passing different phases. To conclude, we believe real options are suitable when one clearly can motivate both the different potential outcomes, their probabilities and the situation has clear sequentiality.

### 5.2.5 Qualitative Methods

Most of the interviewees describe that they use some kind of qualitative method to assess the quality of patents as a part of a valuation. Many do not have any specific
knowledge of specific methods but essentially all agree that some kind of quality evaluation must be made in order to conduct a just valuation.

What is clear when conducting the valuation modelling is that a qualitative evaluation of the patents is central to make forecasts on potential revenue, determine specific development cost or enabling comparisons to other patents in order to obtain a value. A quality assessment is important which ever method is used but it could be considered even more essential when using a market approach. The value is here obtained through looking at transactions of similar patents. To find a reasonable comparable the evaluated patent has to be thoroughly evaluated to be able to match it to a previous transaction.

In conclusion, qualitative method are important in valuing patents as a quality assessment. However, they cannot be used on their own as never providing a quantitative value according to both literature and interviewees.

5.2.6 What is the Best Patent Valuation Approach?

While the choice of valuation approach heavily depends on the specific case and prevalence of data, the interviews together with our own modelling have given us insight and enabled us to arrive at some general takeaways on the valuation procedure and the accuracy of different valuation methods.

Interviews have claimed that a market based method gives an accurate value in the prevalence of good comparisons while not being very useful otherwise. We did not find any convenient way of finding data why our market based result is only seen as an interesting benchmark. Our recommendation here is to always look for data from similar transactions. In the rare cases when this is found, the value is probably the most accurate of all methods. If not, do not put too much emphasis on the obtained value.

In a situation with obvious sequentiality and different outcomes whose likelihood easily can be assessed, the real options method is likely the most accurate. This is supported by interviews as well as our own modelling and the binomial tree approach is not considered to be too complex to understand or communicate as some interviewees have suggested. If the underlying characteristics is not the above stated (as in the Andebjo case), the model becomes a force fit with many subjective calls resulting in an inaccurate value.
In general, we conclude that income based methods are the best approach for valuing a patent. They are easy to understand and are based on rationales of economic value. Furthermore, an income based method ties closely to conventional company valuation which itself is of value. The Relief from Royalty method is however not flawless if licensing is not the purpose of the acquisition. We recommend to use it as an proxy or for the buyer to assign a certain proportion of revenue to the patent.

Cost based methods are not based on rationales of economic value, but are rather easy use and sets a lower end boundary of the patent value. Therefore, we suggest always using a cost approach as a benchmark to the other approaches, if this is essentially lower than the other ones and the timing is not rushed, it is an indication that it might be better to do the development in-house.

In general, it is of course advantageous to use all approaches as benchmarks to each other. However, when not having enough resources, we hope that the above discussion can assist in the decision of which method to pick and also help in the assessment of when certain approaches are more accurate than others.

5.3 Valuation of Employees

When it comes to valuation of employees and quantifying the value residing in them specifically, few were found in the literature review but many were presented by the interviewees. In general, most approaches presented were ideas rather than established methods, except for a few that had used a cost approach. This creates an output from the interviews of simple and useful methods suggested by people that are experts on valuation of other types of assets. Many of the interviewees also pointed out that there seldom is an occasion where valuation of employees is needed as there is no way of securing an employee to stay after an acquisition or similar.

We conclude that the importance of securing key employees to stay should be a key aspect of valuing employees that highly affects the value. We suggest to offer a stake in the company in order to make employees stay in cases where that is possible, if not we suggest some kind of bonus that is paid out after a couple of years. In cases where employees are not monetary driven, which can be the case for scientists, we suggest to put effort into really understanding how the individual can be attracted to stay and try to offer such conditions.
The general thought among the interviewees was that the best way to go for valuation of employees would be to use some kind of cost approach, specifically, by looking at the replacement cost. Some of the interviewees even put forth more refined models where you take different parameters as; recruiting cost, cost of training and cost of productivity loss, into account. This method was considered the most tangible method as it always works.

The literature presented in the thesis regarding methods for valuation of employees is sparse as little previous research was found. The methods discussed in the literature are based on historical cost, replacement cost, present value of future earning and value to the organization internally. The only one of these methods that was supported among the interviewees was the replacement cost approach.

Some interviewees also present a method where the value is computed through from the value contribution from a specific employee. Some believe this could provide a reasonable value while others think it is impossible to assign one employee such a stake in most cases. When it comes to scientists and researchers, this might be the case but for valuing sales personnel the possible loss in revenue from the employee’s customer contacts should be easier to quantify. This makes the method more suitable to use for employees that easily can be connected to a specific revenue stream. If this method is possible, we consider it to be the best as it is based on economic rationales.

Another more far fetched method that was put forth is to look at the employee’s insurance value and what the company in question has insured them for. This method should provide a reasonable value as to what the employee is worth but the limitation of using this method is that it is best applicable on key personnel and high level employees that have been specifically insured. If possible, we consider it to be a good and quick approximation but limited due to only applicable on some employees.

To conclude, the most useful method for valuation of employees is to use a structured cost based approach. The method we suggest is to take three parameters into account; recruiting cost, cost of training and cost of productivity loss. The recruiting cost and cost of training can be seen as direct costs that lie early in the process of hiring someone new. As the salary cost of someone with similar expertise should be approximately the same, the cost for recruiting includes mainly the HR cost of finding and going through the hiring process as well as a potential signing bonus. The cost of training includes the direct cost of training the newly hired. The cost of loss in productivity is computed from the time it takes for the newly hired to get to the same level of productivity as the previous employee and the initial productivity level. The value of loss in productivity is represented by the white triangle shown in Figure 5.1.
and together with training cost and recruiting cost it represents the total replacement cost used in the method suggested.

Figure 5.1: Framework for computing cost of loss in productivity when replacing an employee.

5.4 Service Contracts

The general consensus of the interviewees is that the valuation of the service contract of the Andebjo case is rather trivial. As a service contract in general states the amount of service and the price level of the service, as agreed upon, it is already in one way or another forecasted what cash flow the contract will generate. Based on this forecast, the general opinion of the interviewees is that a DCF valuation is the most appropriate valuation method. Interestingly enough, some also lifted the idea of valuing the service contract separately even if doing an aggregated valuation and not an asset valuation. The reason for this was exactly due to the simplicity of valuing it.

While the very valuation turned out not to be a delicate issue according to the interviewees, how to write the contract did not result in an obvious consensus. A common idea is to develop a cost plus contract which is entirely in line with the literature in a situation where the party offering the service has an information disadvantage. This is exactly what Andebjo has in this case as Company X know how their equipment is serviced today. As a complement to a cost plus contract, a benchmark can advantageously be done through the transferring of internal prices to market prices as
suggested by some interviewees. This depends on the accessibility of internal prices and hence the cost of this.

Some ideas raised by interviewees suggest that Andebjo should not be eager to be locked in to a long term contract while some state the opposite. After having listened to different arguments for both sides our conclusion is that a long term contract would be beneficial for Andebjo. As stated in some of the literature reviewed, the service transfers the learning to the company conducting it. This will be crucial for the success of taking the new technology to market as Andebjo will have to learn the product as fast as possible. For the same reason, a full service contract would be beneficial. This in order to learn from both recurring maintenance and emergency breakdowns of the products. This can be designed as an SLA agreement in line with the interviews.

Most interviewees think that the contract easily can be included in the transaction price as the expected benefit for Andebjo is easily computed, regardless of the design of the contract. However, as pointed out in the interviews, services should not be offered free of charge after having been deducted from the transaction price. Cost of service is far too uncertain for the acquirer to do that in this case, especially under a long term contract.
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Chapter 6

Conclusion

In this chapter the conclusions drawn from the research are presented which aiming to answer the research questions. Furthermore, the academic contribution is discussed and the limitations of the research is presented along with further research that would increase the knowledge within the area of the thesis.

6.1 MRQ: How to Value a Subdivision, Including Technology, Patents and Employees but no P&L, for a Carve-Out Acquisition?

The purpose of this thesis is to investigate and find best practices for valuation of a subdivision when a P&L does not exist and large value lies in specific assets. This should serve as a guide for valuation in the deal Andebjo is considering. To fulfill this purpose, 26 experts have been interviewed and literature on the area has been reviewed, serving as foundation for developing a valuation model used to test and compare different valuation methods. The aggregated results from the interviews and our own experiences from the valuation modelling make up the answer to the research question. The main research question has been divided into four sub-questions; RQ1, RQ2, RQ3 and RQ4. The answers of these together answer the main research question; How to value a subdivision, including technology, patents and employees but no P&L, for a carve-out acquisition?
6.1.1 RQ1: Should a Division be Valued as a Company or as the Sum of Its Parts?

According to our research, a division should preferably be valued as a whole company and not as the sum of its parts. A sum-of-asset valuation has the risk of missing values of assets such as technology but also values that cannot be assigned to a specific to asset or origin from potential synergies. This results in sum-of-assets valuation typically providing a lower value compared to valuation of the entity as a whole. The values of the assets attained will be from a general market point of view and not their potential value aggregated to a company.

6.1.2 RQ2: How to Value Intellectual Property?

According to our research the best way to value intellectual property in general would be to use an income based method. We suggest using the Relief from Royalty method with a risk adjusted WACC as discount rate and a license fee obtained from the market for similar patents. When special prerequisites are prevalent the market based methods or real options will provide a more accurate value and should therefore be used. Market based methods should be used if data from transactions of similar patents exist and are easily obtained. Real option based methods should be used when the product development can be described as sequential, there are several possible outcomes for the patent and probabilities for each scenario are easily estimated.

A cost based method is always a good benchmark to use as a complement to any of the other methods. In every situation, we recommend using as many methods as possible as they complement each other creating a good picture of the actual value.

6.1.3 RQ3: How to Value Key Employees?

If employees are to be valued we conclude that the best overall approach that always works would be to use a cost based method and look at the cost of hiring someone with similar competence. This cost is best computed by taking three parameters into account; recruiting cost, cost of training and cost of productivity loss. However, in the rare occasions applicable when an employee can be directly associated with a cash flow, we suggest that a valuation based on that is more accurate. This likely more appropriate for roles as executives and sales persons but for example not scientists.
6.1.4 RQ4: How to Design, Value and Include Service Contracts in a Transaction?

We have found that a service contract should be included in the transaction by determining the conditions beforehand as the value otherwise will be included indirectly anyway. As the cash flow is easily forecasted, it can with favour be valued on its own through a DCF or included in a company DCF. Cost-plus pricing should be used when designing the contract as the acquirer, also service provider in this case, would have an information disadvantage. In general, it is advantageous for the acquirer to set up a long contract as it secures future revenue and contributes to internal learning and know-how.

6.2 Contribution to Science

This thesis is a case study whose purpose is the establishment of a best practice derived from interviews with corporate valuation professionals. Hence, the theoretical contribution is not major. The major theoretical contribution is the establishment of a structured method for valuing employees, something that was previously lacking in literature.

The empirical contribution of this thesis is the guide for companies on how to value a business unit without a P&L having large values in IP-assets and employees, such characteristics are often shared with tech start-ups. This is a common situation for industrial companies as Andebjo but is not much dealt with in previous research. Hence, companies have not been directed in their valuation approach, something that this thesis has aimed to bridge by suggesting different approaches depending on the characteristics of the context. Another specific empirical contribution is that real options methods are found to not be as complex to use, if using binomial valuation, as the practitioners of the market believe according to our interviews.

6.3 Limitations and Further Research

The main limitations of the research can be summarized into three categories. Firstly, the interviewees are not evenly distributed, neither regarding expert category nor nationality. This could have been mitigated by consciously choosing the interviewees aiming for more variety rather than just accepting all the willing employees. Secondly, we only tried one method for each valuation approach in the valuation modelling.
This could have been improved by narrowing down the study and rather focus on for example income based approaches allowing the testing of more than one method. This is a great example of further research but we aimed for a broader perspective on the subject. Lastly, the results lack generalizability as the results and conclusion drawn from the interviews were only tested on one specific valuation case. This could be improved by conducting the same valuation on other cases within both the same as well as other industries, this would provide a better understanding of the differences of the methods. To do this is something we would have liked to do as further research in order to comprehensively assess the accuracy of different methods. A less time consuming remedy would have been to find similar studies to do cross check benchmarks on.

6.4 Final Words

Writing this thesis has been a great learning opportunity with unique experiences. We have had the chance to interact with industry experts within the field of company and patent valuation as well as gotten insight into a market leading multinational industrial company. In addition to forming an understanding of valuation of small companies and patents we have also acquired experience from conducting research and working within the business development team of Andebjo. We hope that our research will help industrial companies in the valuation process when acquiring technology in the future.


Appendix I

Interview Script

Initial questions

- Tell me about your Role
- Tell me about your Experience

Background to the Case

- Acquisition of carve-out division
- No P&L
- The carve-out is a high-technological division with many patents, early stage products and existing product line mostly used internally for previous parent
- Value lies in a few key employees attached to the deal
- Limited sales on market, most sales on internal markets to previous parent
- Shift in production location

1. What’s your initial thoughts on valuing this division?
   - What are the key factors to consider?
   - What method would you use to value it as a whole company?
   - If picking one, which would you choose?

2. What is your thoughts on valuing the division asset by asset? (IP assets, employees, service)

3. How would you value IP assets?
   - Income based/DCF
     - Rate usefulness 1-5:
   - Market Based/Multiples
4. How to Set Up, Value and Include Service Contracts in a Transaction?

5. How would you value key personnel?
   
   • Compute the difference with and without the personnel?
   • How does key personnel affect if not possible to value?

6. What are the main challenges to consider with such a deal?
## Appendix II

### List of Interviewees

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<td>EY Valuation &amp; Business Modelling</td>
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## Appendix III

### Valuation Model

**Company X DCF Valuation**

Note that all figures are manipulated

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<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Segment Profits</td>
<td>340,000</td>
<td>3,117,700</td>
<td>6,795,481</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depreciation (Less)</td>
<td>-</td>
<td>80,000</td>
<td>80,000</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>-</td>
<td>1,000,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Marketing</td>
<td>-</td>
<td>144,444</td>
<td>144,444</td>
</tr>
<tr>
<td>EBIT</td>
<td>-</td>
<td>884,444</td>
<td>1,893,256</td>
</tr>
<tr>
<td>Tax on EBIT</td>
<td>-</td>
<td>191,874</td>
<td>1,058,497</td>
</tr>
<tr>
<td>Capex (Factory fitting year 1-3)</td>
<td>-</td>
<td>200,000</td>
<td>200,000</td>
</tr>
<tr>
<td>Depreciation (Added)</td>
<td>80,000</td>
<td>80,000</td>
<td>80,000</td>
</tr>
<tr>
<td>Investments in Net Working Capital</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Free Cash Flow</td>
<td>-</td>
<td>1,044,444</td>
<td>1,581,581</td>
</tr>
<tr>
<td>Value contributions (discounted)</td>
<td>-</td>
<td>799,844</td>
<td>1,002,884</td>
</tr>
<tr>
<td>Total Value</td>
<td>9,176,390</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Patent Valuation Income Based
(Relief from Royalty)

Note that all figures are manipulated.

<table>
<thead>
<tr>
<th>Region</th>
<th>FKK 200</th>
<th>FF3 Double</th>
<th>Andeljo 93 Single</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>200,000</td>
<td>300,000</td>
<td>-</td>
<td>200,000</td>
<td>1,000,000</td>
<td>2,000,000</td>
<td>2,000,000</td>
</tr>
<tr>
<td>FKK 200</td>
<td>200,000</td>
<td>300,000</td>
<td>-</td>
<td>200,000</td>
<td>1,000,000</td>
<td>2,000,000</td>
<td>2,000,000</td>
</tr>
<tr>
<td>FF3 Double</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>250,000</td>
<td>500,000</td>
<td>1,000,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Andeljo 93 Single</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>250,000</td>
<td>500,000</td>
<td>1,000,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Revenues</td>
<td>500,000</td>
<td>2,600,000</td>
<td>5,850,000</td>
<td>5,850,000</td>
<td>5,850,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**APAC**

| FKK 200     | -             | -            | -                 | 250,000| 500,000 | 1,000,000| 1,000,000 |
| FF3 Double  | -             | -            | -                 | 250,000| 500,000 | 1,000,000| 1,000,000 |
| Andeljo 93 Single | -     | -            | -                 | 250,000| 500,000 | 1,000,000| 1,000,000 |
| Revenues    | -             | 950,000      | 2,550,000         | 2,550,000| 2,550,000|

**Germany**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>200,000</td>
<td>1,000,000</td>
<td>2,000,000</td>
<td>2,000,000</td>
</tr>
</tbody>
</table>

**North America**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>300,000</td>
<td>600,000</td>
<td>1,200,000</td>
<td>1,200,000</td>
</tr>
</tbody>
</table>

**Total Revenues**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,100,000</td>
<td>8,050,000</td>
<td>17,700,000</td>
<td>17,700,000</td>
</tr>
</tbody>
</table>

**License Fee**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>7%</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
</tr>
</tbody>
</table>

**License Revenue**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>77,000</td>
<td>563,500</td>
<td>1,239,000</td>
<td>1,239,000</td>
</tr>
</tbody>
</table>

**License Revenue After Tax**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>62,370</td>
<td>456,435</td>
<td>1,003,590</td>
<td>1,003,590</td>
</tr>
</tbody>
</table>

**Value contributions (discounted)**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>49,666</td>
<td>289,426</td>
<td>506,751</td>
<td>1,740,395</td>
</tr>
</tbody>
</table>

**Patent Value**

2,586,238

## Patent Valuation Market Based

Note that all figures are manipulated.

### Input for value calculations

<table>
<thead>
<tr>
<th>EUR/USD</th>
<th>Number of patent families</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9</td>
<td>58</td>
</tr>
</tbody>
</table>

### RXP 2016 - The Market for Patents, CIP forum presentation

Family transaction price average, 2015 USA 38,700
Value 2,012,400


Asking prices for packages between size 51 and 100, 2016 USA 49,500
Value 2,574,000

Ocean Tomo Intellectual Capital Merchant Banc

Family transaction price average, 2014 USA 87,750
Value 4,563,000

Hayes Soloway Intellectual Property World Wide

Family price 10-30k USD for patents fulfilling; not litigated, no licensees and no broad claims, 2014 USA 18,000
Value 936,000

**Patent Value**

2,521,350

88
Patent Valuation Real Options

Note that all figures are manipulated

<table>
<thead>
<tr>
<th>Real Options Valuation</th>
<th>Today</th>
<th>1 Year</th>
<th>2 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Option Value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After tax value of previous and future revenues less investment cost</td>
<td></td>
<td>8,132,272</td>
<td>8,132,272</td>
</tr>
<tr>
<td>60%</td>
<td></td>
<td>4,879,975</td>
<td>4,879,975</td>
</tr>
<tr>
<td>5,040,989</td>
<td>30%</td>
<td>2,094,903</td>
<td>2,094,903</td>
</tr>
<tr>
<td>1,344,444</td>
<td>10%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4,430,497</td>
<td>70%</td>
<td>908,810</td>
<td>908,810</td>
</tr>
<tr>
<td>3,416,137</td>
<td>30%</td>
<td>1,659,146</td>
<td>1,659,146</td>
</tr>
<tr>
<td>750,201</td>
<td>50%</td>
<td>1,003,590</td>
<td>1,003,590</td>
</tr>
<tr>
<td>318,958</td>
<td>50%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Patent Value</td>
<td></td>
<td>3,416,137</td>
<td>3,416,137</td>
</tr>
</tbody>
</table>

Patent Valuation Cost Based

Note that all figures are manipulated

<table>
<thead>
<tr>
<th>Value calculation</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor cost</td>
<td>100,000</td>
</tr>
<tr>
<td>Hardware cost</td>
<td>100,000</td>
</tr>
<tr>
<td>Signal processing cost</td>
<td>300,000</td>
</tr>
<tr>
<td>Merging cost</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Total cost</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Sensor</td>
<td>100,000</td>
</tr>
<tr>
<td>Adaption of firm ware</td>
<td>20,000</td>
</tr>
<tr>
<td>Implementation of form extraction</td>
<td>30,000</td>
</tr>
<tr>
<td>System Testing</td>
<td>20,000</td>
</tr>
<tr>
<td>Machine developments</td>
<td>100,000</td>
</tr>
<tr>
<td>Programming</td>
<td>300,000</td>
</tr>
<tr>
<td>Technology merging efforts</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Total Value</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Tax (19%)</td>
<td>380,000</td>
</tr>
<tr>
<td>Patent Value</td>
<td>1,620,000</td>
</tr>
</tbody>
</table>
## Valuation of Service Contract

Note that all figures are manipulated

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service to seller</td>
<td>300,000</td>
<td>309,000</td>
<td>318,270</td>
<td>327,818</td>
</tr>
<tr>
<td>Revenues</td>
<td>90,000</td>
<td>92,700</td>
<td>95,481</td>
<td>98,345</td>
</tr>
<tr>
<td>Margin</td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>Profit</td>
<td>90,000</td>
<td>92,700</td>
<td>95,481</td>
<td>98,345</td>
</tr>
<tr>
<td>Tax</td>
<td>17,100</td>
<td>17,613</td>
<td>18,141</td>
<td>18,686</td>
</tr>
<tr>
<td>Total Profit</td>
<td>72,900</td>
<td>75,087</td>
<td>77,340</td>
<td>79,660</td>
</tr>
</tbody>
</table>

Value contributions (discounted) | 65,925 | 61,406 | 57,197 | 562,234 |

Value of Service Contract 746,763

## Valuation of Employees

Note that all figures are manipulated

<table>
<thead>
<tr>
<th>Employee 1</th>
<th></th>
<th>Employee 1</th>
<th></th>
<th>Value calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruiting cost</td>
<td>130,000</td>
<td>Cost in prod.</td>
<td>195,000</td>
<td>Recruiting cost</td>
</tr>
<tr>
<td>Annual Salary</td>
<td>130,000</td>
<td>Recruiting cost</td>
<td>130,000</td>
<td>Training cost</td>
</tr>
<tr>
<td>Training</td>
<td>10,000</td>
<td>Training cost</td>
<td>10,000</td>
<td>Cost</td>
</tr>
<tr>
<td>Loss in productivity</td>
<td>60%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time to full capacity</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Employee 2</th>
<th></th>
<th>Employee 2</th>
<th></th>
<th>Value calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruiting cost</td>
<td>120,000</td>
<td>Cost in prod.</td>
<td>24,000</td>
<td>Recruiting cost</td>
</tr>
<tr>
<td>Annual Salary</td>
<td>120,000</td>
<td>Recruiting cost</td>
<td>120,000</td>
<td>Training cost</td>
</tr>
<tr>
<td>Training</td>
<td>30,000</td>
<td>Training cost</td>
<td>30,000</td>
<td>Cost</td>
</tr>
<tr>
<td>Loss in productivity</td>
<td>40%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time to full capacity</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Value 509,000

Tax (19%) 96,710

Value of Employees 412,290
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