CHALMERS
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The Quest for the Rightful Patent Owner

A Study on the Lack of Patent Ownership Transparency

Master's Thesis in the Master's Programme
Entrepreneurship and Business Design

CAMILLA GIMSKOG
ALDA HANJALIC

Department of Technology Management and Economics
Division of Management of Organizational Renewal and Entrepreneurship
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CAMILLA GIMSKOG
ALDA HANJALIC

Supervisor: Bowman Heiden
Examinator: Ulf Petrusson

Department of Technology Management and Economics
Division of Management of Organizational Renewal and Entrepreneurship
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Department of Technology Management and Economics
Division of Management of Organizational Renewal and Entrepreneurship
Chalmers University of Technology
SE-412 96 Gothenburg, Sweden
Telephone: + 46 (0)31-772 1000

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CAMILLA GIMSKOG & ALDA HANJALIC
Department of Technology Management and Economics
Chalmers University of Technology

ABSTRACT

Knowledge has always been present in society, but the importance of knowledge has not always been perceived in the way that it is today, as the core value driver. To leverage the value of knowledge and R&D efforts one must be able to own and protect them, and as the intellectual economy continues to expand, the importance of protecting these assets is growing. One way of claiming ownership of one's assets is through patenting. The increasing volume of patents, together with an unstructured patent system, has lead to a lack of accurate patent ownership information. This causes information asymmetry, which could potentially have a negative impact on the industry and society.

This study was set out to investigate the impact of inaccurate patent ownership information on innovation and the knowledge economy. This was partly achieved by performing five case studies where the number of patents found in public databases where compared with the number of patents from published lists or full patent lists received from the companies, and partly by literature studies combined with the compilation and analysis of the published comments on the proposed USPTO regulations on attributable ownership.

Findings from the study indicate that the patent records are currently not accurate and fully transparent and that there are several reasons behind this, where a main reason is the poorly regulated infrastructure of the patent system. Findings also show that many actors within the patent system believe that increased accuracy is necessary, but difficult to achieve. The main impact from increasing ownership information accuracy would be an increase in efficiency of innovation, a more efficient marketplace and it would enable better risk management. In order to achieve this all actors and stakeholders within the patent system need to be involved, however, there are currently not enough incentives for increased transparency. Finally, this study has identified that some actors are not convinced that inaccurate ownership information causes any substantial negative impact and these actors are requesting further investigation in order to justify the costs associated with increasing the information accuracy.

Key words: intellectual assets, intellectual property, attributable owner, patent ownership, patent transparency, patent system weaknesses, information asymmetry, knowledge economy.

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Lastly, we want to thank our supervisor Bowman Heiden for not only introducing us to the world of intellectual property, but also for supporting us in the writing of this thesis and providing us with ideas on how to tackle the issues which arose along the way.

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Camilla Gimskog & Alda Hanjalic

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GLOSSARY

Attributable owner	The ultimate parent company to which a patent ownership can be attributed
Communicative actions	Actions related to increasing the intellectualization of business as well as the economy at large
Intellectual Assets (IA)	Intangible assets such as knowledge, experience and services
Intellectual Property (IP)	Controlled intangible assets through the use of IPR. In this study IP only refers to patents
Intellectual Property Rights (IPR)	Different legal rights to protect intellectual property, such as patent, trademark, copyright, design right
Intellectual value chain	A value chain where knowledge is the input and output in the refining process
Knowledge economy	An economy where the most valuable asset is knowledge
Network effects	The more users a certain product or service has, the greater the value and benefits are to the users
Ownership transparency	The possibility to view a company's entire patent portfolio through the use of public databases
Patent ownership	Who ultimately controls and maintains the patent, and thus is able to grant others a license to the patentable invention
Patent portfolio	All patents owned by a specific organization
Priority date	The filing date of the very first patent application of a certain invention
Private portfolio	A patent portfolio that has been published by the portfolio holder or a portfolio that has been given to the authors of this study by the portfolio holding company
Public portfolio	A patent portfolio that has been extracted from a public database (USPTO)
Technology roadmap	A plan for the technology portfolio in terms of new products, services, entering new markets etc.
USPTO	United States Patent and Trademark Office

1 INTRODUCTION

This study has focused on the issue if patent ownership information is inaccurate. The purpose of the introductory chapter is to describe the background to the theoretical concepts and nature of the chosen area, as well as to frame the purpose and research questions.

1.1 The Rise and Importance of Patents

Knowledge has always been present in the society, but the importance of knowledge has not always been perceived in the way that it is today, as the core value driver. The emergence of the knowledge economy required several fundamental societal shifts (Petrusson and Heiden, 2008). With companies moving more upstream in the value chain, knowledge, in the form of intellectual assets, has become the most important value driver and differentiator for companies to achieve competitive advantages (Arora et al., 2000). This significant shift comes however with difficulties. Intellectual assets are objects where their pure existence is questioned, since they are essentially the creation of the human brain and depend on beliefs that they exist. Therefore, there is a need for a structured and trusted system for the intellectual assets to be considered property and capital, i.e. having ways of leveraging the assets (Petrusson, 2004). One of the main vehicles for knowledge protection is through intellectual property rights, where patent protection is one of the most common (Spence, 2007).

Due to the economy shifting towards being more knowledge intense, there has been an increase in protecting this knowledge through intellectual property rights. This increase can be observed by looking at the patent filing trends, which have steadily increased both globally but also within specific countries. According to global filing statistics provided by WIPO (2014), the global patent filings grew by 9% in 2013, the majority of these patents were filed in China followed by the US. The USPTO issued the largest quantity of patents in 2013 compared to other patent offices, closely followed by Japan. The constant increase of patent filings and granted patents within the USPTO are visualized in Figure 1, which shows that during the last 10 years the number of applications filed in the US increased by 60% and the number of issued granted patents in the US increased by 80% (USPTO d, 2015). The most recent decrease of patent filings was in 2009, due to the financial crisis (WIPO, 2013).

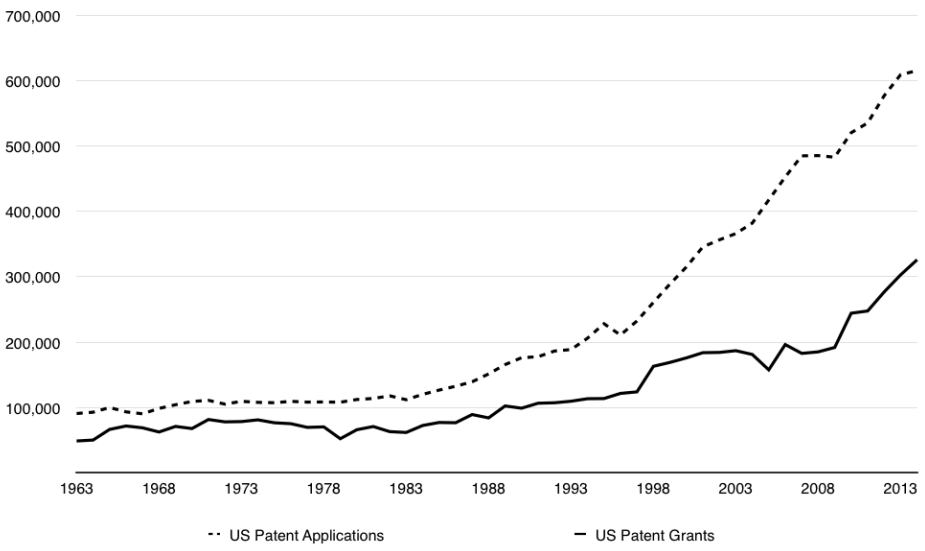

Figure 1: Number of US patent applications and grants. Source: USPTO d. (2015)

Recent studies suggest that the entire US economy depends on intellectual property of some sort, since virtually all industries either produce IP or use IP (U.S. Commerce Department, 2012). The industries that are intellectual property intense accounted for approximately $5 trillion in value added, which equals close to 35% of US GDP in 2010[1]. In addition, these IP intensive industries directly support around 27 million work opportunities in the US. These research findings are illustrated in Figure 2.

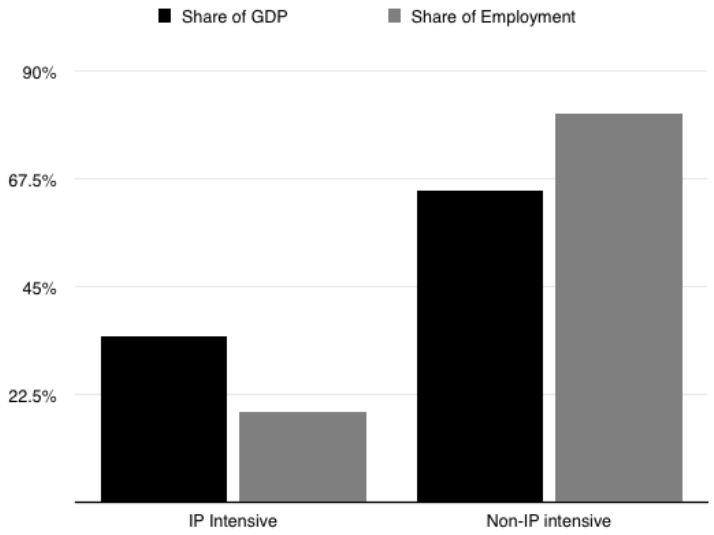

Figure 2: Split between IP and non-IP intensive industries value added to GDP. Source: U.S. Commerce Department

[1] Gross Domestic Product in 2010

1.2 Patent Ownership and Transparency

The possibility to protect intellectual assets, in the form of e.g. a patent, allows disclosing of inventions while still having a monopoly for the invention for a predetermined amount of time in order to be able to capitalize on R&D efforts. However, disclosure of the invention is not just a possibility, it is the prerequisite for obtaining a patent and the pure foundation of the patent system (Spence, 2007). The purpose of the patent system is to promote and enhance innovation. Patents are increasingly being leveraged into new business models and the transfer of patents is an important source of technology for organizations since they through patent transfers and licenses further build upon a certain technology (Chesbrough, 2006). With the emerging patent marketplace and increase of patents, it is highly important that patent information is treated in the transparent way that it was intended to. However, one aspect of disclosure which addresses who the owner of a patent is, also known as notice, is currently voluntary in the US. Thus, when a patent changes owners, the new owner is not obliged to report, i.e. give notice, of this change. Due to this administrative structure of the patent system, the USPTO highlights that their database is not entirely accurate.

1.3 Challenges and Current Actions with Patent Ownership Transparency

In 2014 the USPTO proposed a new set rules, which addressed the fact, that patent holders have previously not been required to continuously update patent ownership information unless the patent is object for litigation. At the same time, one of the largest patent holders in the US, Microsoft, addressed the lack of transparency in their own way by publicly disclosing all their patents on their webpage. This law proposal is the starting point of this study. The USPTO has identified that inaccurate patent ownership information is a problem and the reasons why, therefore this study aims to further investigate whether or not this is an actual problem and how accurate the arguments from the USPTO are. Even though disclosure and notice of patents is a mandatory element in order to obtain and maintain a patent, disclosure of the accurate owner is not mandatory. The importance of transparency, according to Chien (2015), lies in the fact that the public is reliant on accurate ownership information to properly manage their patent portfolios within the patent market space. Many other systems in society, such as the financial system, rely heavily on that companies keep accurate book keeping of the financial assets. This has however not been a requirement within the patent system.

Not knowing who owns which of these valuable assets, in the sense of who controls and thus is able to grant others a license to the patentable invention, is considered by many organizations to be a problem, however this problem needs further investigation.

1.4 Purpose

This study aims to investigate the impact of inaccurate ownership information on the patent market, since this has not been clearly defined by the USPTO. The aim of this research is thus not to investigate issues and obstacles for specific actors, industry areas etc.

1.5 Research Questions

In order to fulfill the purpose of this study, three main research questions have been extracted which the study aims to answer:

1. *To what extent are the public patent records currently inaccurate in regards to patent ownership?*

Since the USPTO claims that their records are not 100% accurate, the first step is to investigate the extent of the current inaccuracies when it comes to the public being able to identify the company currently in control of a patent in an easy manner through the USPTO. Inaccuracy is here defined to be the discrepancy between what is found when searching on a company in the USPTO database and what the companies themselves state that they own. This thesis has defined patent ownership as who, an organization or and individual, ultimately controls and maintains the patent. The owner is ultimately the one who is able to grant others a license to the patentable invention.

2. *What are the key reasons why patent ownership information is inaccurate?*

As a continuation on the first question, the next step is to look into the types of and reasons for those inaccuracies, how they have emerged and if they are possible to remedy.

3. *If updating the patent records with accurate ownership information would be mandatory, would this entail any impact to the industry and society?*

The final research question ties back to the first question. If this study can show that the current system does not disclose updated patent ownership information, the next step is to address if a solution to make it more accurate would have any affect on innovation and the knowledge economy. This question will further focus on if a solution is essential for the future development and function of the patent system and market.

1.6 Delimitations

The following delimitations have been made in this study:

- IPR is a broad term including patents, trademarks, copyright, trade secrets, industrial design and geographical indications. In this thesis, only currently granted patents will be studied.

- The study only looks at granted US patents and the USPTO is the only source used when referring to public data. The US market has been chosen due to multiple reasons, such as that the USPTO is one of the largest patent offices that receives a significant percentage of all patent applications, as well as that the US innovation space is highly affected by litigation and NPEs.

- The study only looks at the comments on the USPTO proposal for the qualitative empirical findings. This study has not taken comments from private individuals into consideration but only comments from companies and other organizations.

1.7 Disposition

Chapter one introduced the reader to the context of the subject matter and the reasons behind the importance of this topic. The purpose of the research and the research questions are also outlined along with the chosen delimitations.

Chapter two guides the reader through the execution of the study to create an understanding of how the information and empirical findings have been collected and used. It also discusses the validity and reliability of the study in the light of how it has been performed.

Chapter three outlines the theoretical framework that is the foundation and the background to the study and which all empirical findings will be discussed against.

Chapter four introduces and guides the reader thorough the investigation and the empirical findings that has come from it.

Chapter five analyzes the findings in the light of the theoretical framework trying to answer the research questions set up for the study.

Chapter six zooms out and discusses the large, holistic, impacts of the issues identified in the empirical investigation and theories. Here the authors also discuss possible actions that could be taken to mitigate current issues.

Chapter seven outlines the main conclusions for each of the research questions that have come from the study and discusses the challenges in performing the study and finally provides suggestions for further research.

1.8 Reading Directions

For the IP professional reading this thesis, the aim is to draw attention to the existence of this issue and why companies and patent offices should be more involved in trying to solve these inaccuracies. Thus, the focus should be on chapter four, the empirical findings, as well as chapter five and six which analyze and discuss the empirical findings in the light of existing theory.

For students and other professionals reading this thesis, the aim is to highlight a problem, which is often not visible, and thus many do not know about. Especially for students who are entering the world of intellectual property and professionals who have no previous experience with the subject matter, it is important to understand the complexity and lack of structure of patent data. Thus chapter three, the theoretical framework, along with the empirical findings

and discussion in chapters four to six are recommended in order to fully understand the patent system as such.

Finally, for a quick review of the conclusion of this study, chapter seven provides the key insights.

2 METHODOLOGIES

This chapter aims to help the reader understand how the study has been performed in terms of overall research design and the research methods and data collection used to answer the separate research questions. The chapter will also evaluate the validity of the research findings.

2.1 Research Design

The overall purpose of this research was to study patent ownership, the socially constructed[2] phenomenon, from two different angles, looking at both a quantitative and qualitative aspect of the same situation. It studied observational facts in the form of numbers of patents, with an ontologically and epistemologically objective view of what is reality and knowledge. However, the main focus of the study was to look at the subjective issues occurring in the socially constructed patent system. The starting point was in the USPTO's law proposal and effort to increase the patent ownership transparency. The study investigated how the current situation looks like and to what extent the situation has an impact on industry/society.

The study was initiated with a literature review of the patent space and its systems and stakeholders. The purpose of this structure was to formulate relevant research questions to which answers would contribute to the development of intellectual property as a valuable asset. The literature study was also set out to create a solid and thorough theoretical framework which the empirical findings can be weighed against to allow for a purposeful discussion. The literature review was performed in consultation with the supervisor to ensure that appropriate theories were chosen. The analysis of the findings and collected data was performed with a base in the theoretical framework. The analysis aimed to connect the empirical findings with existing literature in order to investigate if inaccuracy in the patent system is an actually issue along with if there are any benefits to increased accuracy.

2.2 Required Data

The study aims to answer three research questions which each require different data from both primary and secondary sources. The required data for each question is outlined in Table 1.

[2] The development of jointly constructed understandings of the world, such as the construction of money and languages.

Table 1 Overview of data required in order to answer the chosen research questions

Research Question	Necessary Data
RQ 1	- *How to perform searches on patent owners in public records* - *If the total amount of patents currently owned by a certain company are easily identified* - *Discrepancy between amount of patents attributed to an owner found in a public patent database search and those found in a patent received or publicly uploaded by a specific company*
RQ 2	- *Ways in which ownership is recorded and reassigned when a patent transfer, of any sort, occurs* - *Problems, inconsistencies or other systemic issues in these procedures* - *Studies of the companies targeted for this question to create context and understanding of how and why records might be inaccurate*
RQ 3	- *Use of patents in the judicial, administrative and business arenas* - *Use of patents that are, or can be, hindered or become inefficient from inaccurate ownership information* - *Impact on society/industry attributable to three different arenas or the interaction between them that can come from being able to attribute current ownership, in the form of control, over a patent/patent portfolio*

Because of the difference in required data research methods, data collection and validity evaluation will differ for each research question and will here be described individually.

2.3 Research Methods (RQ 1)

Since the USPTO claims that their records are not 100% accurate, the first step was to investigate whether or not the current patent system is transparent and accurate when it comes to the public being able to identify the company currently in control of a patent, without being a professional searcher within these databases. This study performed a sample test by looking at five multinational companies with patent portfolios exceeding 1 000 patents, this in order to be able to point to whether or not there are inaccuracies in the system. For this research question a relatively simple search in the public records was performed in order to draw parallels with other markets where more advanced searches are not necessary, such as the stock exchange.

To answer the first research question, the strategy used was mainly and firstly deductive which, for a quantitative study is the most used (Bryman & Bell, 2011). The researchers started in theory extracting the hypothesis of there being a discrepancy between public and internal records and testing that theory. The starting point was to compare full company patent portfolios to the number of patents that can be attributed to that same company, when looking in a public database, USPTO. These numbers were then compared for each company to see if there was a discrepancy between actual patent ownership and how the patent

ownership is reflected in public databases. To what extent the researchers can attribute the correct owner of a patent, was performed as a quantitative study and was generally objective. As described in Bryman and Bell (2011) a quantitative study is, to some extent, identified by being the collection of numerical data and conducted with an objective view on social reality. This study used USPTO's public database to investigate whether or not it actually has some inaccurate data in relation to ownership information, as the USPTO claims it does. Thus, this quantitative part of the study mainly looked at the number of patents.

2.3.1 Data Collection (RQ 1)

All data collected to answer research question one was collected from existing databases, both internal and external. The public patent data was collected from the USPTO's patent full-text and image database[3]. The searches were made on some variations of the company name in order to find the largest amount of patents possible owned by the company. E.g. for Microsoft searches were conducted with the search terms: Microsoft, Microsoft corp. and Microsoft Corporation, finding that searching for Microsoft Corporation generates the largest number of patents. That number of patents was then chosen for the "public portfolio" number. The search string used in the advanced search in the database was: (AN/"e.g. Microsoft Corporation" AND APD/19950101->20150430)[4]. The search includes all patents, which are currently assigned to Microsoft Corporation and have an application date between January 1st 1995 and April 30th 2015. The time limit was set to eliminate all patents that are no longer in force.

When searching for reassignment of patent ownership, the USPTO has an additional database where all the recorded patent transfers are published[5]. Additional searches were performed in this database to investigate whether or not some of the identified patent transfers were actually recorded with the USPTO, since this is not a legal requirement.

For the study five companies have been chosen to compare their public and private portfolios. Three of them, Microsoft, Intellectual Ventures and Qualcomm have published their private portfolios on their webpages, while the other two, which are anonymized, have provided the researchers with their private portfolios. The researchers have reached out to multiple companies, however many companies were hesitant to provide this information as they consider it as confidential.

2.3.2 Validity (RQ 1)

To have consistency in the evaluation of integrity of the findings in this study the validity for question one was evaluated by using four criteria suggested by Bryman & Bell (2011), that also have equivalent criteria for evaluating qualitative research, which was used for research

[3] http://patft.uspto.gov/netahtml/PTO/search-adv.htm

[4] An alternative search string could have been "Microsoft*" to include all different spelling variations of Corporation, however this was not the approach in this study since the objective is to use a simple search to illustrate the different sources of problems which are present in the patent system.

[5] http://assignment.uspto.gov/

question three. For quantitative research the criteria are: internal validity, external validity, reliability and objectivity.

Internal validity looks at if a finding that comprises a causal relationship between two or more variables is reasonable. Research question one looked at the discrepancy between USPTO records and companies own records to see if the numbers differed. The researchers did not at this stage draw any conclusions on whether or not this discrepancy was caused solely by one reason that could not be remedied by for example refining the search string or looking into different records. I.e. the internal validity was ensured by not drawing any conclusions in causality between one reason for the discrepancy and a non-transparent patent system in regard to ownership. The internal validity was further supported by the discussion of causes and remedies under research question two.

The reliability sees to if the findings are likely to apply at other times. I.e. are the measurements reliable or do they fluctuate. In this case the exact numbers used will fluctuate over time when patent transfers are recorded or new patents are granted. However, the study does not look at, or even draw conclusions from, exact numbers but rather the indication of the numbers compared not matching to a hundred percent. This is very likely to continue over time and the reasons for that are discussed under research question two.

Objectivity looks at if the researchers have let their own values intrude to any meaningful degree. Objectivity has been ensured in two ways. Firstly, the researchers have been consistent in that the collection of the data and the data collection methods are disclosed to the reader. Secondly, the main part of the data is public. The only data not provided to the reader is the identification of Company X and Company Y, this because of them choosing not to be disclosed in the thesis. However, the reader not being able to identify these companies does not create significant limitation for the discussion or conclusions since all relevant numbers are disclosed.

The external validity looks at if the results can be generalized. In this study the researchers have calculated a percentage of attributable patent ownership for five companies and to that discussed reasons behind why the numbers can be more or less correct. This research is only applicable to companies owning patents but is not limited to the companies included in the research or any specific industry. The conclusions from this research could to a large extent be generalized to more companies in the patent system, since the issues discussed is present in the system as well as in the different companies analyzed, which have different patent portfolio sizes that represent different technology areas. There can be variations between companies but the research looks at the system from a broad perspective and some of the companies analyzed in this study are large portfolio owners, which can represent the problem in a significant way. However, this study is limited to five companies and although this can give an indication of whether or not there are any notable discrepancies in the system, the study does not provide any generalizable evidence of the total extent of the discrepancy or if any particular industries have more or less discrepancy.

2.4 Research Methods (RQ 2)

Research question two can be seen as a sub-question to question one, where the researchers investigated the reasons behind the discrepancies and compare distribution and impact of the different issues identified. The strategy used to answer this research question is a combination between the deductive and inductive approach. The first step is deductive, starting in theory looking into the ownership transparency issues identified in earlier research and comparing that to observations from the five case studies performed. The findings from the case studies that differed from the theory section were approached with an inductive strategy starting in the observations to look for patterns and then creating a tentative hypothesis of impact and actual existence of specific issues.

2.4.1 Data Collection (RQ 2)

The additional data needed to answer this question was data concerning the five chosen companies and the reason was to understand the context for the theoretical ownership transparency issues to be able to analyze the impact and extent in real life cases. The data gathered was patenting activity, collected through Cipher, an analysis tool developed by Aistemos[6]. Other data was collected from the companies' web pages, press releases and annual reports to further create an understanding of how patents are used by the companies, e.g. if they are acquiring external patents, divesting their own portfolio, engaging in licensing activities etc. Aistemos has further provided the researchers with their internal research on data accuracy for one example company, which is used to demonstrate the data discrepancy in this study.

2.4.2 Validity (RQ 2)

Since research question two can be seen as a sub-question to research question one, the same validity evaluation criteria are used.

Internal validity can be considered high since the study looks at many different causes for the discrepancy found in research question one and evaluate severity and impact of the different causes. The internal validity can be somewhat weakened if the causes evaluated are not all of the causes for the discrepancy. However, the empirical findings of causes, when studying question one, are also compared to theoretical findings on causes to ensure a holistic view of the issues causing discrepancy.

The reliability is ensured in the same sense, looking at both empirical and theoretical findings when determining which causes to evaluate. Seeing that others have identified the same issues before strengthens the reliability in finding the same issues if performing the same or a similar study again. To ensure objectivity the researchers have spent time measuring impact and ease of remedy for each cause allowing the reader to distinguish between causes and also gain insights into the functionality of a patent search in public databases.

[6] www.aistemos.com/cipher-patent-analytics

The external validity for research question two is the same reasoning as for research question one.

2.5 Research Methods (RQ 3)

Here the researchers attempted to answer if a solution to increase the accuracy of ownership information, and thus transparency, of the public patent records would have any impact on industry and society. The study will discuss and analyze potential impact of ownership transparency against the concepts brought forward in the theoretical framework to evaluate whether the inaccuracies identified in research questions one and two are currently constituting a problem to industry and society. Relating the issues to strategies for monetizing on patents in order to analyze if this is an issue worth solving.

This part of the study requires a more, qualitative approach, meaning that it will be investigated through looking at interpreted and constructed aspects of reality and using that to form new theory (Bryman & Bell, 2011). Here the study has taken into consideration subjective comments and opinions from actors in and/or with strong connection to the patent space. These subjective issues were extracted from comments and opinions. This led to a subjective approach to social events, the view was ontologically subjective where reality was created by the viewer and epistemologically subjective since the knowledge is tied to individual experience and negotiated by dialogue (Bryman & Bell, 2011). For this an inductive strategy was used which is the most common strategy related to qualitative research, since it aims to generate new theory (Bryman & Bell, 2011). Here the research took a bottom up approach, observing data in the form of the comments submitted in response to the USPTO law proposal on attributable ownership and then breaking these down into categories from which a framework for analysis was created. These observations were furthermore compared and analyzed in the light of the findings from the five case studies performed.

2.5.1 Data Collection (RQ 3)

The comments and opinions for the qualitative analysis was mainly collected from the USPTO's website, where the comments published by companies, organizations and individuals, on the US law proposal on attributable ownership are stored. The findings from the case studies concerning extent of different types of inaccuracies was collected from the patent analytics tool Cipher. Additional data to create context for the companies in the case studies was then collected from public sources such as company websites and annual reports.

2.5.2 Validity (RQ 3)

The validity is here assessed from the alternative evaluation model for qualitative research proposed by Lincoln & Guba (1985) and Guba & Lincoln (1994). They propose that trustworthiness and authenticity are the two main criteria from which to evaluate qualitative research. Trustworthiness is comprised of four criteria: credibility, transferability, dependability and confirmability.

The credibility criterion outlines how believable the findings are and if they appear to be objective. Here it can be argued that the credibility of the research is high due to the limited possibility for interpretation in the empirical findings. Since interviews have not been performed but rather all comments and opinions have been collected, as quotes, from publicly submitted documents, the credibility is high. Therefore, credibility does not decrease due to the researchers not having performed respondent valuation, i.e. providing companies with our findings and how we have interpreted their answers. This since the researchers did not perform any interviews. In fact, credibility can be seen to increase since quotes from written documents of the comments are a substantial part of the empirical findings, in this way the reader themselves, along with companies that are mentioned, can evaluate if the researchers interpret the quotes correctly, and also draw their own conclusions. However, the opinions and the ways of forming expressions certainly are adapted to what outcome of the law proposal a specific entity wanted. The researchers have tried to be as careful as possible not reading in too much in the comments, rather stated opinions, arguments and issues have been collected and incorporated to this study as had they been answers in an interview, i.e. no broad interpretations have been made by the researchers in the empirical data collection.

The transferability criterion aims to evaluate if the findings apply to other contexts. However, this is often not possible in qualitative research since the results are very dependent on the specific context in which the study has been performed as is the case for this study. For the dependability criterion Guba and Lincoln (1994) argue that in order to establish trustworthiness of a research study, researchers should have the approach that the empirical data is able to audit, i.e. complete records of the collection should be kept. Looking at the dependability of the qualitative part of this study it is very high, since all empirical data was collected from public databases and documents are possible to audit for any reader of this study. The confirmability criterion looks at if the researchers have allowed own values to intrude on the findings, or the study, to a large extent and have managed to act in good faith and stay as objective as possible. The researchers have tried to stay as objective as possible, what speaks to the confirmability of the study is that all qualitative sources are publicly available, therefore the researchers have not had any room for interpretation when it comes to twisting words or lead interviewees in specific directions etc. Lastly the authenticity will be looked at from the perspective of the study as a whole.

2.6 Fairness and Authenticity

The credibility of the entire study has been increased since the researchers have used more than one method and source of data to study the social phenomenon of patent ownership. This is referred to as triangulation. Even though the different methods and data sources look at two different angles, size and impact, of the stated problem it can, by Denzin's (1970) broader definition, be seen that the research has used triangulation since more than one observer and multiple theoretical perspectives are used.

The criterion of fairness looks at if the research objectively or fairly represents more than one viewpoint amongst the players in the relevant area. The research has included both comments pro and against the proposal to make it mandatory for patent owners to update the ultimate

owner to a patent. The study has looked at comments from all different players in the field, organizations and companies as well as individuals. The authenticity criterion aims at evaluating if the research has helped in creating better understanding and perspective of the area, as well as having encouraged and empowered members of the area to be involved. The research has tried to compile important information to look at the issue at hand from a holistic perspective down to specific issues and possible solutions. The study highlights inaccuracies and has tried to discuss them from different perspectives. It has taken into consideration several different companies and tried to find solutions that can be helpful for everyone, it also tries to encourage companies, organizations and individual stakeholders to open up their way of thinking about the patent system and finally calls to action.

3 THEORETICAL FRAMEWORK

This chapter presents the literature used to build a theoretical framework. The purpose of the framework is first and foremost to describe the context of the study and the nature of intellectual property as an intangible asset. Secondly, it describes how IP can be managed and the different ways of extracting value out of IP. Finally, the chapter aims to describe current actions taken by organizations to improve the patent system and increase ownership transparency.

3.1 Theory Overview

The aim of this chapter is to present theories, which will aid to answer the research questions of the study. A number of frameworks will be described which try to conceptualize the intangibility of patents and the problems with keeping accurate ownership records. Table 2 provides an overview of the theories presented and the purpose of including these theories in this study.

Table 2: Overview of theoretical framework

Theory Section	Elements	Purpose
The Knowledge Economy	- Development of IP	Set the framework and context for knowledge and intellectual property in society and the current economy.
Patent Protection	- Basic elements of patents - Notice - Market efficiency - Characteristics of intangibles - Ownership and infrastructure	Provide background and insight into the basic features of a patent and the administrative context where it is created. Further explain intangibles, their difference from tangibles and how they are governed.
Reasons for Data Inaccuracies in the Current Patent System	- Patent reassignments - Inconsistent data entry - Corporate structures - Patent data software	Present the different reasons to why patent data is not always accurate.
Value Extraction of Patents	- Patent transfers - Licensing - Litigation - Non-practicing entities	Outline the features and characteristics for the current ways of extracting value out of patents.
Information Asymmetry and Strategic Patent Behavior in the Business Arena	- Information asymmetry - Market failure - Relating obstacles	Present different challenges the patent space faces and the reasons behind these.
Development of the US Patent System	- America Invents Act - Identification of attributable owner	Show the efforts that have been made to improve the current patent system.

3.2 The Knowledge Economy - The Development of IP as a Tradable Good

In recent years, society has witnessed a move from the industrial era, where factories, large capital investments and natural resources are considered essential, to an era where the important assets are intangible (Petrusson & Heiden, 2008). With this societal change, a large part of the developed economy is moving from a material to an intellectual value chain and with that comes the change in the hierarchy of what type of resources are more or less valuable. Those assets considered most valuable during the industrial era, such as manufacturing capabilities and capital in terms of physical assets and property, are starting to lose rank in favor of knowledge and communication abilities. It is important to keep in mind that tangible and intangible goods are, and behave, inherently different and the transition from the old to the new value chain has not been, and still is not, that easy and obvious. Even though the new value drivers in the knowledge economy are intangible, it does not imply that physical goods are obsolete. The production of physical goods will continue; however, the value will be generated by the intellectual dimension of those goods (ibid).

According to Drucker (1993), the society does not fully comprehend how knowledge works and behaves as an economic good, even though knowledge has become the essential societal resource. However, what can be said is that an economy based on knowledge resources does not behave in the same way as the traditional assumptions on how an economy should behave. Arora et. al (2002) explain this economic change as *"Understanding how scientific and technological knowledge is produced and applied to economic goals is the key to understanding the process of modern economic growth"*.

As knowledge becomes the essential societal resource, the importance of managing knowledge increases. Spender (1996) identifies two types of knowledge, *tacit* and *explicit.* Tacit knowledge is described as the knowledge possessed by an individual, which has not been written down in any way. Due to its nature, tacit knowledge is often difficult to articulate as well as it is difficult to transfer between individuals, thus it is referred to being incommunicable. Explicit knowledge represents the opposite of the spectra, as this refers to codified or abstracted knowledge, which can be transferred between individuals and also controlled by the ultimate owner (ibid).

3.3 Patent Protection

Intellectual Property Rights (IPRs) are the legal tools used by inventors and organizations to protect their intellectual assets and prevent others from using and exploiting them commercially (Spence, 2007). This section aims to explain patent rights, which is one type of IPR.

In the US, the foundation of the patent system was created in 1790 by President George Washington and the same year the first US patent was issued for an improvement in the making of potash[7] (Chesbrough, 2006). The patent system has grown and evolved throughout the years and patents now serve many different functions for companies. Patents can be used

[7] Substance derived from the ash of burnt plants, which is sometimes used for making soap.

as a deterrent to sue, they can signal the value of a company to investors and they can also provide an insight into the R&D efforts and output of a company (Chien, 2015). There are currently three different types of patents in the US, which aim to protect new inventions: *utility, design* and *plant patents* (Spence, 2007).

Utility patents are valid for 20 years from when the patent is filed at the patent office, known as priority date, and is granted for a process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof (USPTO a, 2014)

Design patents protect the non-functional aspects of an invention, i.e. the way an article looks, and has a limited term of 14 years (USPTO, 2012).

Plant patents protect new inventions or discoveries of asexually reproduced plant varieties and the protection lasts for 20 years (USPTO a, 2015).

The patent right gives the inventor the right to exclude others from making, using or selling their invention within the territories where the patent is granted, however this monopoly right comes with certain requirements (Spence, 2007). According to USPTO there are four prerequisites for inventors to receive patent protection in the US (USPTO a, 2014):

1. *Novelty:* the invention has to be original and novel worldwide.
2. *Non-obviousness:* the invention has to have an inventive step, which is not obvious from prior art or through the combination of different inventions to a person who is skilled in the art.
3. *Utility:* the invention needs to have an industrial use and also be reproducible, e.g. mere ideas cannot be patented.
4. *Disclosure:* the claims of the invention have to be specific enough to enable a person skilled in the art to reproduce and make use of the invention. Another aspect of disclosure is stating who the inventors are, and if the inventor assigns the patent to the company, which he or she works for. However, stating the company is not a mandatory prerequisite (referred to as *notice,* see section 3.3.1). A patent application is published in USPTO's public database 18 months after it is filed and any member of the public can access the entire file history of the application (USPTO a, 2014).

3.3.1 Notice

The core function of the patent system, stated already back in 1790 when it was created, is to promote and enhance innovation. Thus, an important aspect of the patent right is to make the innovation available to the public, which is referred to as *notice* (Chesbrough, 2006). Patent notice serves as an aid to promote the innovation as well as the development and commercialization of it (FTC, 2011). Notice enables patent holders and innovators to decrease their level of uncertainty, which could hinder further innovation and competition if the scope of already patented innovations is not clear. In order for innovators to avoid infringement allegations, they are responsible for identifying and licensing patents that read of their new product. Hence, poor patent notice undermines innovation and competition by

raising the risk of innovators not finding the appropriate patents to license and increases the risk of post-launch patent assertions and litigation (ibid).

Another aspect of notice, which the FTC discusses in their report, besides the scope of a patent, concerns assignment records. This is the main difference between the prerequisite of disclosure and notice, as notice refers to the disclosure of the ultimate owner of the patent, not just the invention. While disclosure of the invention is as stated mandatory, notice of the owner is a voluntary action. According to the FTC (2011), assignment records play an important role in clearing patent rights. They highlight that one strategy for navigating within a patent landscape is to concentrate the search on patents held by competitors or others who are likely to operate within the same technology area. This strategy however, is not adequate if the public lacks notice of assignment. Another dimension they address is the consequences of inaccurate information. If patents of interest are found, then knowing who the actual owner is essential to seeking a license and also essential for an organization to determine if they already have rights to the patent through an existing cross license. The FTC strongly believes that accurate and mandatory recordation of assignments would help with these notice problems they have identified, as it is necessary to ensure public notice when the patent owner has the right to exclude others from their invention (ibid).

3.3.2 Market Efficiency Through Increased Transparency

Transparency, when it comes to markets such as stocks, has throughout the years had a crucial impact on the efficiency of that market. The Securities and Exchange Commission (SEC) in the United States describes transparency as a fundamental role in the fairness, competitiveness and efficiency of market (Bloomfield & O'Hara, 1999). However, Bloomfield and O'Hara highlight that it is problematic to define what a transparent market actually is, since transparency has many different characteristics depending on what type of market and property it is. The authors discuss whether or not transparency matters for market efficiency. This is a well discussed and challenged subject, and through their research they come to the conclusion that for the stock market, trade disclosure concerning the involved parties and financial data increases the market efficiency due to prices converging faster in more transparent markets.

As Bloomberg and O'Hara (1999) emphasize that transparency is a complex subject, the complexity and importance of it is further increased when the tradable object is of intangible nature, such as patents. Looking and intangibles as an economic good, they possess different characteristics than tangibles, which Foray (2004) explains in his research.

3.3.3 Characteristics of Intangibles

There are many reasons why intangibles are considered difficult to manage and trade. Foray (2004) identifies three intrinsic characteristics held by intellectual assets that make them different from tangible assets, when looking at them as an economic good.

Difficult to Control
The nature of knowledge is that it sees no boundaries - it is fluid and non-excludable. When knowledge has been made public there is no natural stop of the spread and the asset can no longer go back to being private. To this adds the diminishing boundaries between people, societies and nation borders in the increasingly globalized communication of the world.

Non-rival
Positive externalities is a well known concept for economists and describes a situation where the production of one person or entity benefits third parties without giving any financial compensation. The reach of these positive externalities is limited in a situation where the benefit produced is exhaustible, e.g. when a musician has a concert people within a certain range even outside of the venue can hear and enjoy the music, free of charge. However, people in other cities and other countries cannot hear the music at all. When the positive externality is inexhaustible, like knowledge this limitation does no longer apply. Knowledge, when having been acquired, can be used and re-used numerous times without hindering anyone else from using it.

Cumulative
Innovation is becoming increasingly cumulative, meaning that it to a large extent builds upon previous innovation. The creation of software for example is built upon multiple previously developed components. The key to innovation in this intellectual era is the collective progress that comes from that accumulation of knowledge. Intellectual input creates intellectual output, which is creating and promoting new ideas, products and services. The collective progress does not only mean the collective of a specific company but rather create benefits for entire societies, both consumers and industries. Due to the cumulativeness and complex structure of some technologies, Chesbrough (2006) highlights the importance of licensing between patent holders to enable the development of a new innovation.

These characteristics presented by Foray (2004) are one way of explaining why IP has been, and still can be, difficult to utilize as an asset of trade but also why the trade of IP has been increasing. Due to these intrinsic differences between tangible property and intellectual property, the right to control IP becomes an important factor to extract commercial value, some claim even more important than the intellect itself (McClure, 2008).

3.3.4 Ownership and Infrastructure
Intellectual property is a very special kind of property due to the fact that it does not exist in itself (Petrusson, 2004). This means that the ownership of an intellectual asset only exists as a creation of the human brain and depends on beliefs that they exist and that someone can claim ownership.

"Since patents and other types of intellectual property rights are socially constructed, they only claim beliefs and thus there needs to be a market and infrastructure in order for IP to have any value" - U. Petrusson, 2004

Petrusson emphasizes the need for a trusted system, to uphold the beliefs, in order to be able to claim ownership of an intellectual asset. The ownership being dependent on a trusted system can be shown even with tangible assets. Hernando De Soto (2000) discusses how capital can be dead, in many developing countries, due to the lack of trust in, or lack of, systems to uphold ownership rights, or as De Soto refers to them, formal property rights. As an example he uses a common asset such as a house. One might have a house and use it as shelter and therefore it is capital, but since one cannot leverage the asset, in the sense that regardless of one's investment and improvement of the asset one cannot be sure to be entitled to the return on that investment. Because of the ownership uncertainty and consequences thereof the capital is, according to De Soto, considered dead.

With the possibility to own and thus control, comes the ability to sell or trade and with that the willingness to invest. A parallel can therefore be drawn between the issue with real estate property and intellectual property, which to some extent can be seen as the dead capital of the developed countries. Even though intellectual property is not as tangible as land or real estate, Petrusson (2004) explains that it is still very similar in the sense that it needs a functioning system to be utilized as capital. It is a socially constructed good, fully dependent on markets and infrastructures that allows for it to be proprietary and to have any value. The fence around it cannot be set up with bushes or bars but has to be set up as an imaginary fence held up by trusted institutions. In the knowledge economy, IP is the building block in the construction of businesses, not the physical goods (ibid).

Petrusson (2004) has developed a framework describing the settings and structural platforms in which intellectual property rights are constructed and used. This framework is defined as *the three arenas,* these arenas, illustrated in Figure 3, have different types of communicative actions in order to extract value from the IPRs. The administrative arena consists of the regulatory aspects of IP, i.e. the patent offices and courts of appeals. In this arena patent examiners evaluate whether or not the patent applications should be granted. The second is the judicial arena, which is constituted by the states that allow the patent owners to perform their right to a monopoly and exclude others from using their invention. Lastly, the third arena is the business arena, which operates on an international level and where the role of intellectual property can greatly vary depending on the specific market it operates in. The administrative and judicial arenas are strongly connected to national laws and regulations, thus complicating the infrastructure of intellectual property as every country has their own structures and proceedings. Chesbrough (2006) also discusses the international aspect of business and IP, stating that due to the ever increasing internationalization of the business arena, harmonization of national patents laws is an important improvement which much be addressed by the legislators, i.e. judicial and administrative arena.

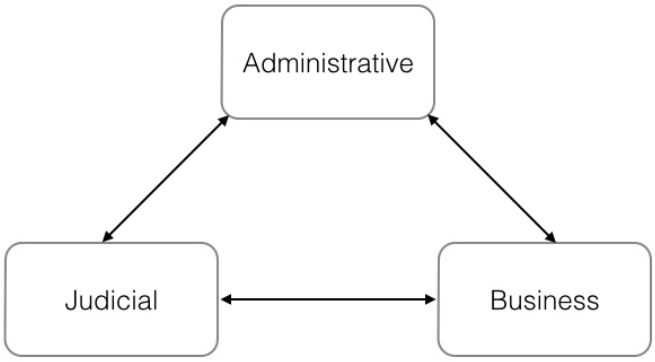

Figure 3: Petrusson's (2004) three arenas

Petrusson (2004) further emphasizes the importance of companies possessing competencies of the communicative actions in all of the three arenas, since important decisions regarding a company's IPR must be considered in each of the arenas. The arenas are further more not mutually exclusive, they are all connected and dependent on each other. Thus actions in one arena might lead to implications or benefits in the other arenas, as well as that information that one actor possesses can lead to an advantage when communicating within the different arenas. Even though Petrusson has developed a framework for the creation and use of IP that is adjusted for a knowledge economy, he emphasizes that the current infrastructure and marketplace is not satisfying to unveil the true value of intellectual property. According to Petrusson, an important aspect of the communicative actions is to collectively create an infrastructure adjusted for an economy where wealth and value is created by IP. Chesbrough (2006) contextualizes the importance of proper infrastructures as he throughout his research has witnessed that patents are, in many industries, seen as an enabling factor for new firm creation and eventually new market entry.

3.4 Reasons for Data Inaccuracies in the Current Patent System

Patent reassignments not being reported continuously, or even at all, is one of the reasons for incorrect information in patent databases. However, it is not the only source of error. Thoma et al. (2010) state that although innovation is constantly seen as an important value driver and reason behind economic growth, it does not seem to appear to any larger extent in basic statistics and analysis. They claim that the knowledge economy keeps slipping through the fingers of statisticians and therefore the research in the innovation space has faced big data constraints over a long period of time. Although these types of large sets of data have increased in later years, there is still no reliable standard approach. Chien (2015) adds to this discussion by saying that the public is reliant on accurate ownership information to manage patent risk and in order to facilitate patent transfers. She describes the current patent system as *"it is impossible to know who owns a particular patent, or what patents a particular entity owns"*. This problem of unclear ownership affects companies in many different ways according to her, it makes risk management and decision-making concerning patents more difficult, it creates arbitrage and hold up opportunities for patent holders and it hinders the core function of the patent system. Some of the major sources of error for faulty patent data, which both Chien and Thoma et al. have identified, are outlined below.

3.4.1 Patent Reassignments

During the application process, and throughout the lifetime of a granted patent, the owner of the patent may change several times (USPTO b, 2014). The USPTO encourages owners to record the ownership assignments or name changes, which is later shown in USPTO's reassignment database. There are however no legal requirements for updating the assignment information, it is a specific responsibility of the parties involved to provide the information to the USPTO. Due to this reporting being voluntary, and also involving a certain cost per patent, the USPTO's public database of assignment data is not 100% accurate (USPTO b, 2015). It is only when a patent is used for assertion that a party must show that it is the legal owner to the patent (Dubal et al., 2012).

From a historical perspective, reassignment activity has grown substantially in the US and continues to grow (Chesbrough, 2006). In 1980, approximately 2 000 reassignments were reported to the USPTO, while in 2003 this number had grown to 90 000 reassignments annually. Chesbrough emphasizes that although the data is not complete and does not cover all the events of reassignments, he believes that this increase indicates that the market for IP is growing. Chesbrough further elaborates on reassignments and identifies nine different reasons to why a patent might change owners:

Transaction with employees

Normally the first reassignment occurs at the same time the patent is published, when the ownership is transferred from the inventor to their employer company due to contractual obligations.

Correction and bookkeeping changes

Correct mistakes on the initial published title or if the company's official name has changed.

Affiliated company transfers

Refers to internal reassignments within the company from one branch or business unit to another. It can also be the case of transfer from the mother company to a subsidiary or controlled spin-off company. Another event is the formation of a joint venture with another company, thus reassigning patents from either one or both of the companies to the new joint venture. In the case of a joint venture being separated then patents can be assigned to either one of the companies or split between them.

Merging & acquisitions

When two companies merge into one, or when a company acquires another company and thus the ownership of the patents change.

Transfer of IP bundles with other assets

The event, where patents are transferred from one company to a separate company together with tangible assets. The tangible assets serve as a complementary to the patents in order for the invention to be exploited.

Standalone IP transfer
Only patents are transferred between two separate companies, without any complementary services or tangible assets. Often the transfer relates to either one or more patent portfolios for a certain technology.

Licensing contracts
In this case the reassignment is solely temporary with the purpose to validate a licensing agreement between two companies. Once the license terminates the patents are reassigned back to the original owner.

Transactions with research organizations or individuals
This event relates to reassignments, which are not between two companies, instead when universities, government agencies or individuals are involved. Universities often reassign patents to companies in order for them to commercialize the technology, while at the same time it is common practice for companies to donate patents which they do not utilize to a university, due to tax purposes and to maintain close relationships with the researchers.

Security agreement
Patents can be used as security for a loan and it is not unusual for banks to require that the patent owner reassigns the patent to the bank.

3.4.2 Inconsistent Data Entry

When a patent attorney is drafting a patent application there is no formal structure to how the attorney should write the assignee name (Thoma et al., 2010). Therefore, human error is widely present in the current patent system. Not only simple spelling mistakes but also different variations in the spellings and variations in the company name, such as 'International Business Machines' and 'IBM'. Figure 4 illustrates an example of different spellings and variations of IBM currently used for some of their patents.

INTERANATIONAL BUSINESS MACHINES CORPORATION
INTERANTIONAL BUSINESS MACHINES CORPORATION INTERNAIONAL BUSINESS MACHINES CORPORATION

INTERNATIONAL BUSINESS MACHINES – IBM
IBM CORP. (INTERNATIONAL BUSINESS MACHINES)
IBM CORPORATION (INTERNATIONAL BUSINESS MACHINES)

Figure 4: Variations in spelling and naming conventions of company name. Source: Thoma et al., 2010

3.4.3 Corporate Structures

With companies constantly being merged and acquired into other companies, the structures become more complex. In addition, there is a large problem in matching of subsidiaries to the

correct ultimate parent entity (Thoma et al., 2010). Figure 5 illustrates the variety of entities included in a parent company.

Subsidiary	Ultimate Owner
ADHESIVE TECHNOLOGIES INC	MINNESOTA MINING & MFG CO
AVI INC	MINNESOTA MINING & MFG CO
D L AULD CPY	MINNESOTA MINING & MFG CO
DORRAN PHOTONICS INCORPORATED	MINNESOTA MINING & MFG CO
EOTEC CORPORATION	MINNESOTA MINING & MFG CO
NATIONAL ADVERTISING CPY	MINNESOTA MINING & MFG CO
RIKER LABORATORIES INC	MINNESOTA MINING & MFG CO
TRIM LINE INC	MINNESOTA MINING & MFG CO

Figure 5: Different entities within a single company. Source: Thoma et al. (2010)

3.4.4 Patent Data Software

Due to the difficulties of actually finding out what patents a company owns and who is the owner to a patent, many companies are attempting to sort and structure patent data, where Thomson Reuters is one of the pioneers, with more than 45 years of expertise in global patent research (Thomson Reuters, 2015). Since then, many have followed with both patent search tools and patent analytics tools.

3.5 Value Extraction of Patents

With the evolution of the knowledge economy and with that the importance of turning tacit knowledge into explicit knowledge, IP has been leveraged into new business models and market structures where they are regarded as the most important value drivers (Petrusson & Heiden, 2008). Arora et al. (2001) suggest that the transfer or IP is in this knowledge economy an important source of technology for organizations and that the markets for technology are emerging. With this transformation, the barriers of entry have been lowered but the competition has increased, which requires more appropriate strategic responses and development of new business models by the organizations (Arora et al., 2000). Current technology markets promote a more efficient use of existing technologies, in order to incentivize further advancements of the technology (Arora et al., 2001). With this development follows a more proactive management of IP, Arora et al. (2000) emphasize the importance of monitoring technologies on an external level in order to support actions such as technology licensing, joint-ventures and technology acquisitions.

The market for patents has seen an increase in technology capitalization and Arora et al. (2000) emphasize the growth in the variety of business models and arrangements for the exchange of technologies. This has not only resulted in new business models but also new actors claiming presence within the market space. Chesbrough (2006) refers to these as secondary market actors who are not pursuing the actual R&D and commercialization instead

they act as intermediaries. Arora et al. (2000) further suggest that technology trades have in the recent decades become a more common action than before, which Serrano (2010) agrees upon stating that 13.5% of all granted patents have been traded, and thus changed ownership, at least once during their lifecycle.

Even though intrinsic problems in the management of IP and knowledge as an economic good exist, there are currently many different ways of monetizing and leveraging IP. This section will further explore the most common ways of extracting value out of patents.

3.5.1 Patent Transfers

Due to the costs of maintaining patents and especially large patent portfolios, every patent owner faces the same challenges throughout the life cycle of a patent. The questions they face include whether or not a patent should be further renewed and kept within the organization, if the patent should be sold to an external actor or to let the patent expire and thus the invention will be available for everyone to use without the need of a license (Serrano, 2010). The option to transfer the patent to an external party can sometimes generate higher revenue than if the patent remained within the original organization. Chesbrough (2006) indicates that a significant portion of a company's patent portfolio is not in active use within their current business model, he uses Procter & Gamble as an example who stated that they only utilized 10% of their portfolio. Thus the remaining 90% could have an increased value for P&G if it where sold, or licensed, to other organizations.

A reason why possibility to transfer patent is so important is because companies no longer can solely rely on their own resources and capabilities to create new innovation. Chesbrough (2006) claims that in order for a company to be successful, it has to take advantage of external innovation. A patent portfolio acquisition can enable a company to enter new technology markets or extend their current protection within existing markets.

3.5.2 Licensing

Licensing, as a way of leveraging intellectual property, has historically not been especially common. Research conducted in 2002 observes that licensing of patents is as low as 5% of issued patents, and that the patents, which ever generate any royalty revenue, is even lower, around only 3% (Vermont, 2002).

Despite the low percentage of licensed patents in 2002, the importance of licensing has increased over time. As previously mentioned the cumulativeness of technology is one of the reasons, where licensing is necessary in order to obtain access to underlying technology (Chesbrough, 2006). Chesbrough emphasizes the importance for companies to shift their focus of innovation from their own firm to the network, which the firm operates within. However, he acknowledges the obstacle patent owners face of finding other organizations that want to license their patents. According to an EU survey from 2013 on patent licensing activity by patenting firms, most firms report increasing licensing revenues over the years and an increase in the number of licensing deals over all large industries where patents and patenting is relevant (European Commission, 2013).

3.5.3 Litigation

A patent gives the owner a right to exclude others from using their invention and thus one way the patent owners can defend their rights is through litigation. Looking at the US patent market, along with the increase in patent grants the number of filed patent litigation cases has also grown (PwC, 2014). This increase is illustrated in Figure 6. Chesbrough (2006) suggests that the patent culture in the US is significantly more litigious than the business environments in Japan and Europe. Along with this increase and litigious patent culture, Chesbrough claims that many companies develop a defensive patent strategy, meaning that they build large patent portfolios to ensure that they can operate within their market and to avoid patent infringement claims. The goal with a defensive strategy is to minimize the risk of a negative outcome from patent litigation, which could be an injunction in certain markets or million dollar settlements. On the other side, having an offensive patent strategy with respect to litigation is very costly, as the legal fees for patent litigation are often several million dollars (ibid).

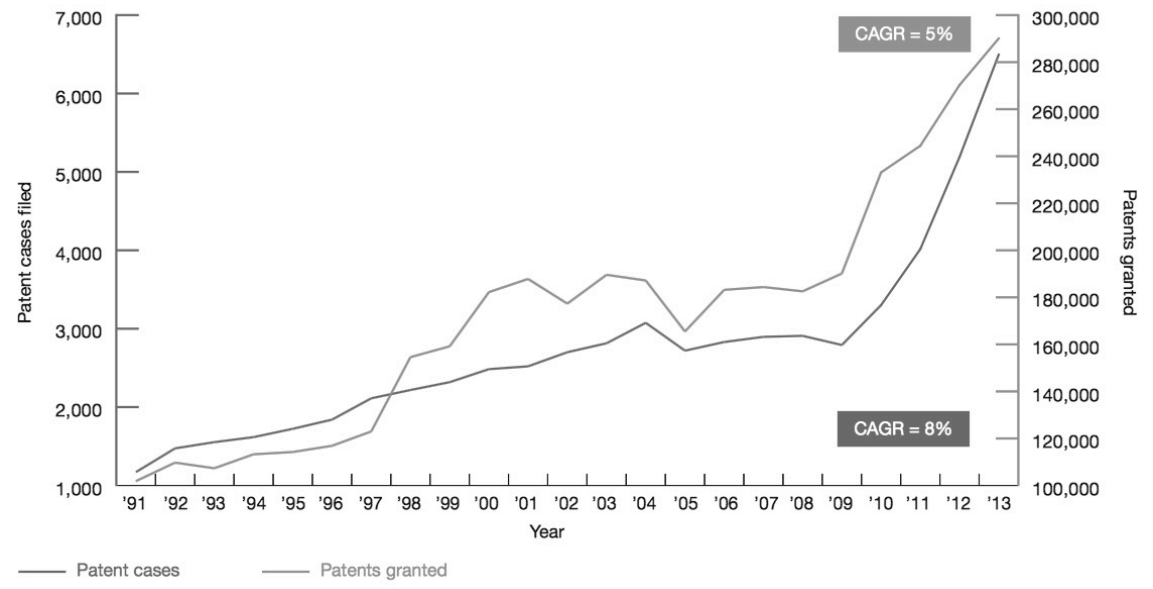

Figure 6: Patent case filings and grants. Source: PwC (2014)

Non-Practicing Entities

Non-Practicing Entities (NPEs), Patent Assertion Entities (PAEs) or patent trolls, as they are also referred to, have in recent years drawn a lot of attention[8]. The Federal Trade Commission (FTC) defined in 2011 the difference between PAEs and NPEs, stating that a patent assertion entity is a company whose business model focuses on *purchasing and asserting patents* (FTC, 2011). The term NPE covers the spectra of companies who primarily develop and transfer technologies, such as universities, research centers and semiconductor

[8] The term *patent troll* was coined by the former head of Intel's patent licensing activities, Peter Detkin, who drew a parallel between these assertion firms and trolls from children's fairy tales, who hide under a bridge and wait until an unsuspecting person crosses the bridge and then attacks.

design houses. There are companies and inventors that choose not to pursue with their inventions in the form of manufacturing, sales, development etc. and instead choose to license, or even sell, those assets to others who have the necessary experience, capabilities, resources, incentives etc. to commercialize the inventions/technologies. Other companies take another approach and invest in R&D and engage in the commercialization process, but are not able to keep the business going because of different reasons and are then forced to seek alternative yields on investment and therefore license their IP (Patent Freedom, 2014).

For multiple reasons these companies utilize and monetize on their intellectual property in inherently different ways than operating companies. Chesbrough (2006) talks of how the asymmetry between NPEs and practicing companies comes from the fact that, unlike other companies, NPEs do not practice the technology that they are patenting. Therefore they often end up in stronger negotiation positions, since defendants can no longer use a defensive "counterclaim" strategy, often used between practicing entities, which results in cross licensing. This since they do not conduct any operations that could possibly infringe on the defendant's patents. Another reason for the asymmetries caused by NPEs not practicing the technology they own patents for, is that it becomes difficult to settle on the basis of a "business solution" since the NPEs most often do not care about technology exchange but solely money (ibid).

The cost for companies caused by these types of activities, here referred to as NPE activity, is extensive. In 2014 the cost for companies to resolve disputes forced by non-practicing entities exceeded 12 billion dollars, including costs for settlements, judgments and legal fees (RPX, 2014). This type of activity is not unusual, statistics from RPX further show that in 2014 NPEs sued around 2 000 different companies more than 3 600 times.

Figure 7 visualizes the trend of damages that are awarded to NPEs, which is actually increasing opposite to damages awarded to practicing entities where median damages have been decreasing since the period of 2000-2004 (PwC, 2014).

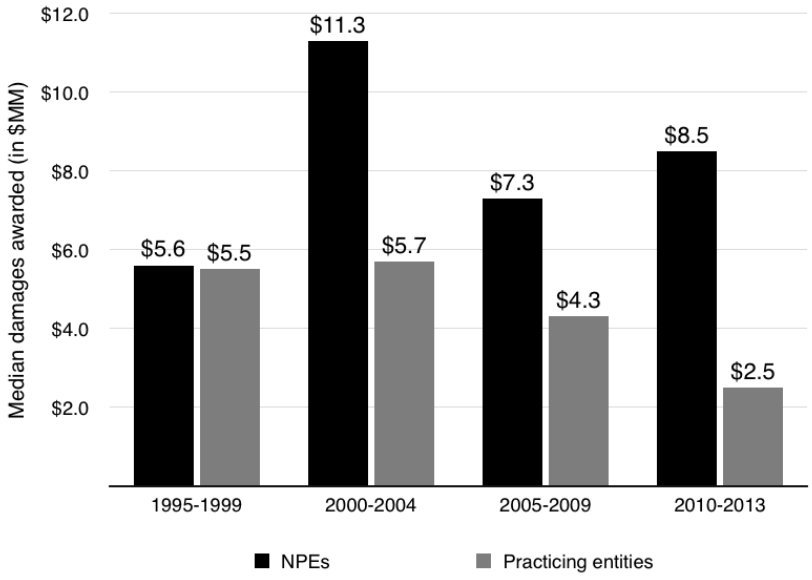

Figure 7: Median damages awarded, NPEs vs. practicing entities. Source: PwC (2014)

3.6 Information Asymmetry and Strategic Patent Behavior in the Business Arena

Asymmetric information is far from a new concept and can be identified as a common feature of any given market interaction (Lofgren et al., 2002). An actor on one side of the transaction often knows more than one on the other side. This can be exemplified by a buyer knowing less about the quality of the product than the seller or the job applicant knowing more about his/her abilities than the potential employer. The question then becomes what the effect and/or issues arise from this information asymmetry. If one part is more informed about the transaction content than the other, how can, and will, the better informed party leverage that advantage to effect e.g. prices, quality and traded quantities (ibid).

A basic principle in economic theory is that, in a perfect world, a free market generates outcomes where all resources have been efficiently allocated, i.e. all possible trades that will benefit the most parties have happened (Haltom, 2011). The way the market does this is to connect potential buyers and sellers through prices. In situations where this is unable to occur, for example as described above, where information is asymmetric and one party has a better leverage of affecting the prices, the outcome is market failure (ibid).

Asymmetric information is a very common feature of the patent system, both due to administrative sources of error mentioned in the section 3.4 but also due to deliberate company strategies of not giving notice of patent ownership in order to gain strategic advantages (Chien, 2012). Chien studied 915 patent litigation filings made by PAEs and discovered that in approximately a third of the cases, the filing entity, the plaintiff, was not the same recorded patent owner as of the initiation date of the litigation. She also identified that in 10% of the cases, the patent owner had been assigned the rights but did not record said assignment until the litigation case was initiated. Chien (2012) also puts this in the context of it being a well known and widely discussed issue, companies assigning patents to a large amount of subsidiaries and shell companies, mentioning actors such as Intellectual Ventures and Acacia.

In these cases, where not disclosing patent ownership is intentional and part of a company's strategy, Chien (2012) believes that the reason is to gain a certain advantage from that asymmetry in information between a specific company and the public. There are several reasons for this type of strategy, companies might not want competitors to know what they are doing or a company looking to assert their patents might not want it to be know what patents they hold so that possible assertions targets can not prepare. The consequences of these strategic actions is that this makes it difficult for companies to rely on patent information in decision making processes and in order to clear rights and thus request licenses before e.g. product launches (ibid).

Companies argue that these types of strategies are created in order to gain competitive advantages (Chien, 2012). However, that is not how the patent system is set up. Tying back to

Chesbrough (2006), the patent system is in place in order to promote and enhance innovation and therefore it is essential that the system is transparent.

Chien (2012) has suggested different functions patents can achieve, e.g. facilitating risk mitigation and patent transactions, to show stakeholders that the company is investing in the business, signaling value and to add to the efficiency in the cumulative nature of knowledge innovation. In order for patents to function in the way they are supposed to and in the way companies actually want them to function, the information of whether a company owns a patent must be extractable information from the patent records (ibid).

3.7 Development of the US Patent System

In recent years the White House, US Congress and the USPTO have initiated acts and legislative recommendations to further develop and improve the American patent system. This section will further elaborate on the history behind these actions and as well as present their current status.

3.7.1 America Invents Act

The USPTO has since its establishment, back in 1802, gone through numerous changes and alterations to adapt to the increased number of patent filings and grants, which are a result of an increase in innovation worldwide. In 2011, President Obama signed the Leahy-Smith America Invents Act (AIA) with the purpose to make the patent system more efficient and reliable in order to keep up with the rapid evolution of technology (The White House, 2013). This effort aims to benefit the inventors and the patents, which are a key driver of economic growth in the US (ibid).

The US patent system and innovation society has faced many challenges. One of the most observed trends is the increase in patent litigation activity and the vast activity of especially PAEs (The White House, 2013). As an effort to improve the incentives for future innovation and to ensure that the USPTO grants patents of highest quality, the White House issued, in 2013, a set of legislative recommendations and executive actions. One of the proposed legislative recommendations was to *"Require patentees and applications to disclose the 'Real Party-in-Interest'"* in order to update the ownership information.

3.7.2 Identification of Attributable Owner

Based on the legislative recommendations by the White House, in January 2014 the USPTO published a proposal titled "*Changes To Require Identification of Attributable Owner"*, which replaces the former term *real party-in-interest* (GPO, 2014). USPTO's definition of *attributable owner* constitutes the entity, or entities, which have been assigned title to the patent or application, including the ultimate parent entity, as well as anyone necessary to join in a potential lawsuit to enforce the patents rights. The definition further expands to include any entity that directly or indirectly holds an interest in the patent or application, such as licensees (both exclusive and non-exclusive)[9]. The proposed punishment for not complying

[9] This thesis uses a different definition for the scope of patent ownership, see definitions.

with the rules would be patent abandonment, i.e. the patent would no longer be in force (ibid).

The proposal listed a set of rules with the aim to facilitate the examination of patent applications and to provide greater transparency concerning the ownership of patents (USPTO c, 2014). Since patent owners are currently not obligated to disclose their identities, the proposal is a significant change to the current patent system (USPTO b, 2015).

Along with the proposal the USPTO highlighted five different benefits they believe that the new rules will result in:

- *Enhancing competition by providing the public with more complete information about the competitive landscape in which innovators operate.*
- *Facilitating more efficient technology transfers by making patent ownership information more readily available.*
- *Reducing abusive patent litigation by helping the public better defend itself against abusive assertions.*
- *Helping ensure the highest quality patents.*
- *Leveling the playing field for all innovators.*

The USPTO sought public input on the proposal and received 72 responses from companies, law firms, IP organizations, academic and research institutions and individuals (USPTO c, 2014). Based on the response they received from the public, the USPTO decided to withdraw the proposal but they informed that they would still work towards increasing and improving patent transparency (USPTO c, 2015).

4 EMPIRICAL FINDINGS

In this chapter the reader is presented with, and guided through, the investigation and the findings of this study. The chapter will be broken down into the three different research questions. The majority of the findings showcased in this chapter are extracted from public data.

The collection of empirical data has been made with a starting point in the assumption of there being a discrepancy, between public and private data, when it comes to patent ownership. First an attempt was made to show how large the current discrepancy is. This by collecting public data from the USPTO and companies published patent list, and private data from companies' internal databases, on how many granted patents and patent applications every specific company had, and finally comparing those. The majority of the companies used for the analysis have published a list of all their patents on their webpages, other companies have shared their patent information with the authors of the study. The studied companies are of different sizes, both revenue and patent portfolio wise, and they operate within different technology fields.

4.1 Overview of Accessible Data

Since the theory of this study is used as the framework for the analysis, different types of ownership data needed to be collected. For the first research question, the patent portfolio searches were conducted in the USPTO database and the searches were solely for granted patents that are currently in force, hereinafter referred to as the *public portfolio* and compared to the current number received from the portfolio holding companies, in this research referred to as the *private portfolio*. For each company their patenting activity is illustrated. It is important to consider that for some of the companies there is a steep decline after 2013, this is due to patent applications which are less than 18 months old are not published and thus not illustrated in these figures. In order to be able to answer the second research question of this study, data concerning different inaccuracies was collected. Additional searches were performed in the reassignment database to investigate whether or not some of the identified patent transfers actually were recorded with the USPTO, due to this not being a legal requirement (USPTO b, 2015).

4.1.1 Microsoft

An American company with headquarters in Redmond, Washington, founded in 1975 by Paul Allen and Bill Gates[10]. The company is active in the computing sector where their corporate activities includes innovating, manufacturing and licensing of goods and services related to that sector. An overview of Microsoft including financial and patent portfolio data can be seen in Table 3.

[10] www.microsoft.com

Table 3: Microsoft's key financial and patent data

Organization Overview	
Founded	US, 1975
Industry	Computing
Total revenue	$86 billion
R&D spending	13% of total revenue
Licensing income	70% of total revenue
Patent Portfolio Overview	
Public portfolio	28 239
Private portfolio	29 235
Data discrepancy	3%
Main patent coverage territory	US

4.1.1.1 Patent Portfolio Overview

Microsoft has a constantly growing patent portfolio with a patenting activity that has been constantly increasing since the early 90s', which is visualized in Figure 8[11]. The historical patenting activity reached its peak in 2002 and the majority of the patents are filed within the US. Microsoft is currently involved in 86 patent infringement cases as a defendant, almost 80% of the plaintiffs are NPEs. Microsoft only has one active infringement case where they are the plaintiff. When performing a search for Microsoft in the proprietary patent tool Cipher, over 40 different variations of the spelling as well as corporate divisions are grouped under Microsoft.

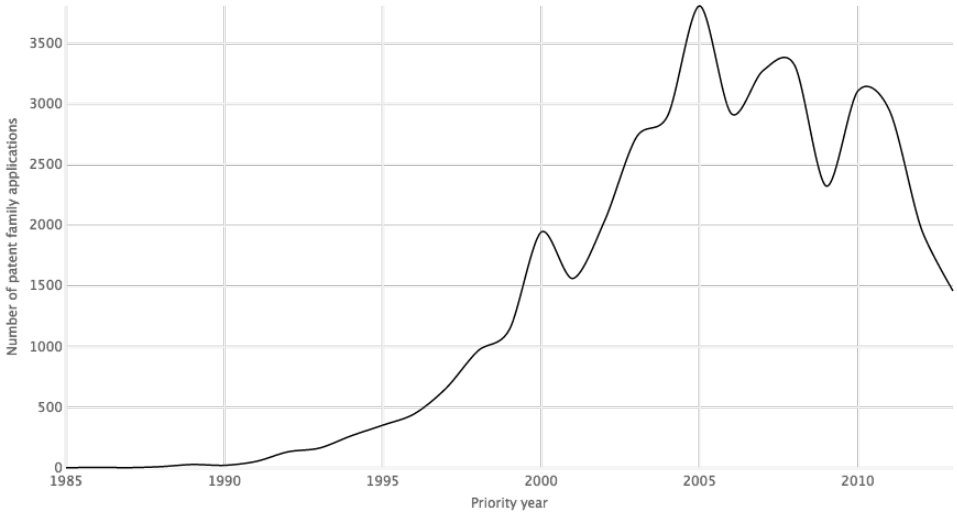

Figure 8: Microsoft's patenting activity. Source: Cipher

4.1.1.2 Patent Transactions

Microsoft has throughout the years been active in both selling and acquiring patent portfolios from other companies, in fact, around 85% of Microsoft's patents have actually been developed at Microsoft, while the remaining 15% have been acquisitions (Ellis, 2015). Looking at their activities in the last few years, some large acquisitions stand out.

[11] Cipher

In 2011 Microsoft acquired Skype, a telecommunications company providing a voice over IP service, for $8.5 billion (Skype, 2011). Although a financially significant acquisition, the IP only contributed to a small percentage of Microsoft's existing patent portfolio. Skype's patent portfolio currently consists of 155 granted patents according to the USPTO database. These 155 patents are still assigned to Skype, since in USPTO's assignment database there is no reassignment of patents from Skype to Microsoft. Hence Microsoft's portfolio is not complete in the public databases due to the lack of consistent reassignment reporting.

One year later, in 2012, Microsoft acquired 925 granted patents and applications from AOL, an American mass media corporation, for the price of $1.1 billion (Ellis, 2015). After this deal AOL was left with a patent portfolio consisting of approximately 300 patent grants and application covering their core technologies. A few weeks after the AOL patent acquisition, Microsoft announced that they are selling 650 of these patents to Facebook for $550 million (Lowensohn, 2012). When searching for AOL in USPTO's database, 703 granted patents were found, which indicates that these patents were not reassigned to Microsoft. The second sale, between Microsoft and Facebook, also does not show in USPTO's reassignment database, thus these patents are not registered with Facebook as the new owner.

In 2013 Microsoft announced the acquisition of Nokia's Devices and Services business, which included a reassignment of 8 500 design patents and a license to 30 000 of Nokia's patents. (Ellis, 2015). The acquisition of the business was priced at $7.3 billion, and Microsoft paid an additional $2 billion for the license to the 30 000 patents. This license deal indicates that IP is becoming more important as a tradable asset and that licensing accounts for a significant source of income. Almost 2 000 patents were found in the reassignment database, which were assigned from Nokia to Microsoft in the beginning of 2014.

4.1.2 Intellectual Ventures

A private invention capital company founded in 2000 by Nathan Myhrvold, Edward Jung, Peter Detkin and Greg Gorder, currently headquartered in Bellevue, Washington[12]. They are part in building technology-based solutions and assist in development of privatizing and monetizing assets. They also acquire inventions from innovators and license out and sell patents, thus they refer to themselves as an invention investment company. Currently they have 40 000 intellectual property assets in active programs for monetization. Although they claim to build technology-based solutions, Intellectual Ventures does not primarily create products, thus they are classified as an NPE (Levine & Hals, 2013). They have stated that they have $6 billion in committed capital, $3 billion is the aggregated number for licensing revenue and $0.5 billion that has been distributed to inventors. An overview of Intellectual Ventures including financial and patent portfolio data can be seen in Table 4. Due to them being a privately held company, their annual financial data is not public and thus not presented in this study.

[12] www.intellectualventures.com

Table 4: Intellectual Venture's key financial and patent data

Organization Overview	
Founded	US, 2000
Industry	Invention investment
Total revenue	N/A
R&D spending	N/A
Licensing income	N/A
Patent Portfolio Overview	
Public portfolio	486
Private portfolio	19 498
Data discrepancy	97.5%
Main patent coverage territory	US

4.1.2.1 Patent Portfolio Overview

Intellectual Ventures' patent portfolio has been continuously growing since the company was founded, visualized in Figure 9[13]. The company has mainly US territorial coverage for its patent portfolio. They are frequently recognized as on of the top five holders of US patents (Ellis, 2012). However, they acknowledge that they do not always invest in their own name, which they claim is common practice among asset management firms (Intellectual Ventures, 2012). In Cipher, over 40 different variations of Intellectual Ventures as a patent owner are found, most of them named as different funds and holdings belonging to Intellectual Ventures.

Considering the fact that Intellectual Ventures was established in 2000 and they do not perform any research on their own, it is evident that their patent portfolio is not of organic origin, it has been acquired from other companies and individual inventors. Their litigation statistics show that they are active in 52 patent infringement cases as a plaintiff[14]. All the defendants in these cases are operating companies.

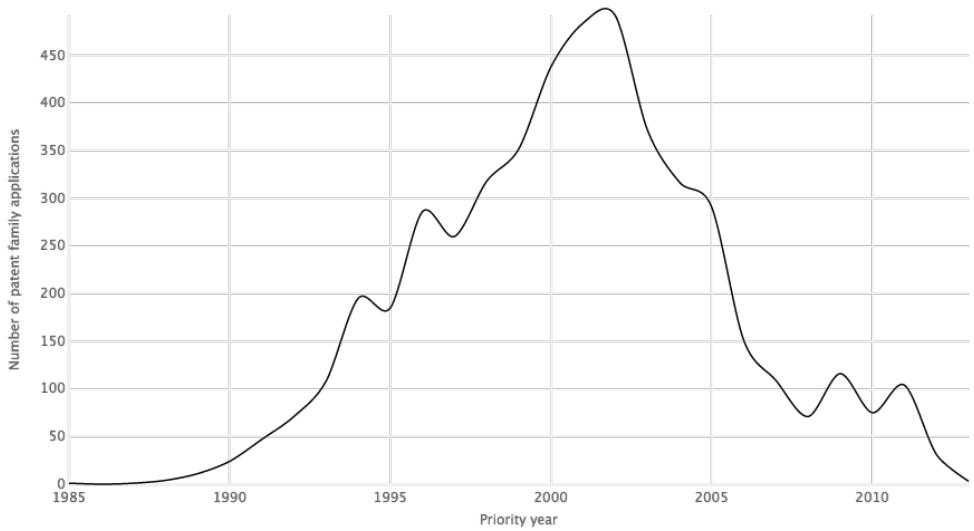

Figure 9: Intellectual Venture's patenting activity. Source: Cipher

[13] Cipher
[14] Cipher

4.1.2.2 Patent Transactions

Looking at the patent transactions Intellectual Ventures performs, they are mainly acquiring patents to build up their portfolio within different technology fields, however they do also offer patents for sale[15].

Their recent acquisitions include patents from Kodak's bankruptcy sale in 2012, which had multiple buyers but the acquisition was led by Intellectual Ventures and RPX Corporation (Kodak, 2012). This consortium purchased over 1 100 patents for $525 million, a significantly lower number than the estimated valuation of $2.6 billion (Jinks, 2012). In the reassignment database almost 1 200 patents were, in the beginning of 2013, reassigned from Kodak to 'Intellectual Ventures Fund 83 LLC'.

In 2014, a report revealed that Intellectual Ventures acquired another 200 patents, even though they have in recent years been struggling with raising new fund money (Levine, 2013). Many of their initial investors, such as Google and Apple, have declined to fund further investments due to Intellectual Ventures' business model, while Microsoft and Sony continue to fund. Both Google and Apple have been litigated multiple times by Intellectual Ventures (Levine, 2014).

4.1.3 Qualcomm

The company was founded in 1985 by Dr. Irwin M. Jacobs, Dr. Andrew Viterbi, Harvey White, Franklin Antonio, Andrew Cohen, Klein Gilhousen, and Adelia Coffman[16]. Qualcomm became a public company in 1991 and is headquartered in San Diego, California. The company is seen as a pioneer within mobile internet, creating unique digital wireless technology. Currently almost two-thirds of Qualcomm's profits come from their licensing business with wireless technology (Nusca, 2014). An overview of Qualcomm including financial and patent portfolio data can be seen in Table 5.

Table 5: Qualcomm's key financial and patent data

Organization Overview	
Founded	US, 1985
Industry	Telecommunications & semiconductors
Total revenue	$26 billion
R&D spending	21% of total revenue
Licensing income	30% of total revenue
Patent Portfolio Overview	
Public portfolio	11 752
Private portfolio	13 030
Data discrepancy	10%
Main patent coverage territory	US

[15] www.intellectualventures.com
[16] www.qualcomm.com

4.1.3.1 Patent Portfolio Overview

Qualcomm has continuously filed for patents in order to increase their patent portfolio over the years. Looking at their patenting activity, 2013 is the most active year so far (considering that all applications filed in 2014 are still not published), this activity is illustrated in Figure 10[17]. They mainly apply for patents in the US, but they have been increasing their patent filings in Asian countries such as Japan, Korea and China. 60 different variations of Qualcomm's name and corporate divisions are found in Cipher, showcasing the difficulty of performing searches in public databases. Further more, Qualcomm is currently active in 17 patent infringement cases as a defendant, where the majority of the plaintiffs are NPEs (82% of all cases). As a plaintiff, they have one active lawsuit against an NPE.

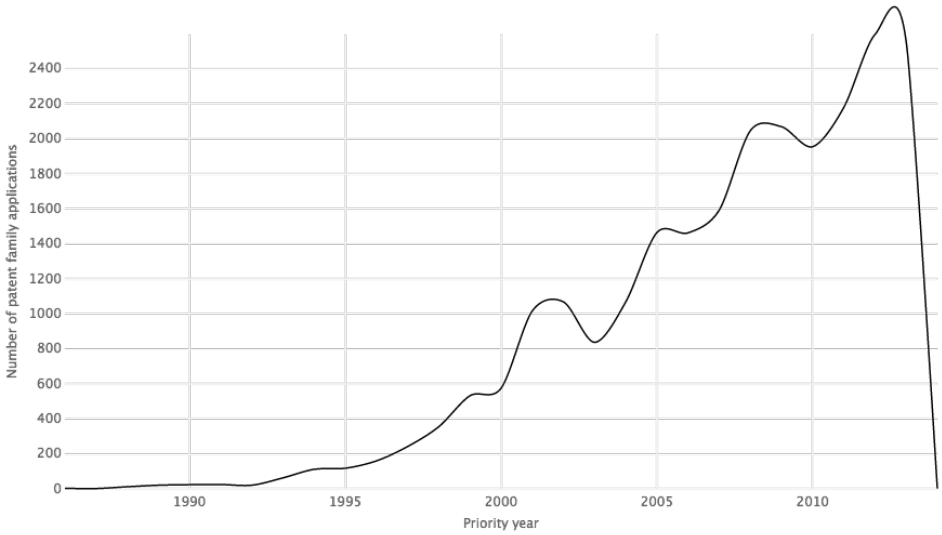

Figure 10: Qualcomm's patenting activity. Source: Cipher

4.1.3.2 Patent Transactions

Although having a substantial patent portfolio, Qualcomm is active in acquiring patents to further expand. Most recently in 2014, Qualcomm announced that they acquired a portfolio from Hewlett-Packard with the aim to further enhance and diversify their mobile patent portfolio (Qualcomm, 2014). The portfolio consisted of approximately 1 400 granted and pending US patents and 1 000 granted and pending patents from other countries, the purchase price was not disclosed. When searching for patent transactions in USPTO's reassignment database, in early 2014, Qualcomm reassigned more than 1 300 US granted patents and applications from different assignors.

4.1.4 Company X

An established European multinational company operating within an industry where IP is of high importance. The company is currently looking to expand its licensing business even further to continuously generate value from their intellectual property, this ambition includes acquiring and partnering with other actors. A significant source of revenue comes from their

[17] Cipher

licensing activities, which can be seen in Table 6 where additional financial and patent portfolio data is presented.

Table 6: Company X's key financial and patent data

Organization Overview	
Founded	EU, 1970's
Industry	N/A
Total revenue	>$20 billion
R&D spending	16% of total revenue
Licensing income	4% of total revenue
Patent Portfolio Overview	
Public portfolio	13 409
Private portfolio	10 347
Data discrepancy	30%
Main patent coverage territory	US

4.1.4.1 Patent Portfolio Overview

Company X has always been a very active patent filer within their industry. The size of their patent portfolio has continuously been growing and they are currently in their peak of patent activity, as seen in Figure 11[18]. The majority of their portfolio has coverage in US, but almost half of their patent families have a granted family member in Europe and Asian countries such as China and Japan. Company X is currently active as a defendant in 15 patent infringement cases, where only 2 of the plaintiffs are operating companies, the rest are NPEs. Company X has started 4 cases as a plaintiff against other operating companies.

Company X has over 240 different name variations when looking through their patents in Cipher, some of them are different local offices, technology divisions and some are just pure misspellings of their corporate name.

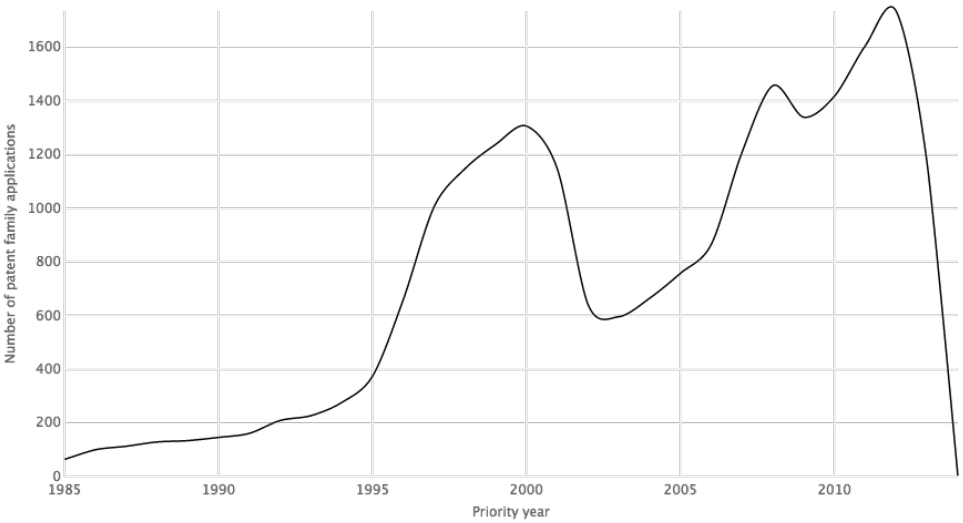

Figure 11: Company X's patenting activity. Source: Cipher

[18] Cipher

4.1.4.2 Patent Transactions

Company X has in recent years divested parts of its portfolio and they intend to further divest. In 2013, they sold a couple of thousand patents to an NPE. The NPE stated that they aim to leverage a strong and multidimensional patent portfolio for further discussions with key industry players, i.e. operating companies, who are interested in licensing these patents. This patent sale, with an undisclosed price tag, received a great deal of attention as NPEs have in recent years increased their litigation activities. In the reassignment database almost 800 patents were recorded from Company X to the NPE.

4.1.5 Company Y

An American international company founded in the 1980's serving multiple industries and markets with high technology. They are active in monetizing their own IP as well as acquiring external IP. An overview of Company Y including financial and patent portfolio data can be seen in Table 7.

Table 7: Company Y's key financial and patent data

Organization Overview	
Founded	US, 1980's
Industry	N/A
Total revenue	>$5 billion
R&D spending	6% of total revenue
Licensing income	Not stated in balance sheet
Patent Portfolio Overview	
Public portfolio	912
Private portfolio	1 077
Data discrepancy	15%
Main patent coverage territory	US

4.1.5.1 Patent Portfolio Overview

Company Y has since their inception been active in filing patents and increasing the size of their patent portfolio in order to expand into multiple markets, illustrated in Figure 12. During the financial crisis in 2009 they had a significant decrease in their patenting activity but have since then continuously grown and reached their peak in 2013[19]. The vast majority of the portfolio is protected within the US, although they have coverage in most European countries as well as in some of the largest Asian countries. Company Y own patents which have almost 60 different spelling variations of their corporate name, in addition, their corporate name is not very unique, thus multiple different companies emerge when searching for them in public databases. Further on, from a risk perspective, they have been litigated multiple times and are currently involved in 18 patent infringement cases as the defendant against NPEs. They are currently not involved in any case as the plaintiff but historically they have sued others a few times.

[19] Cipher

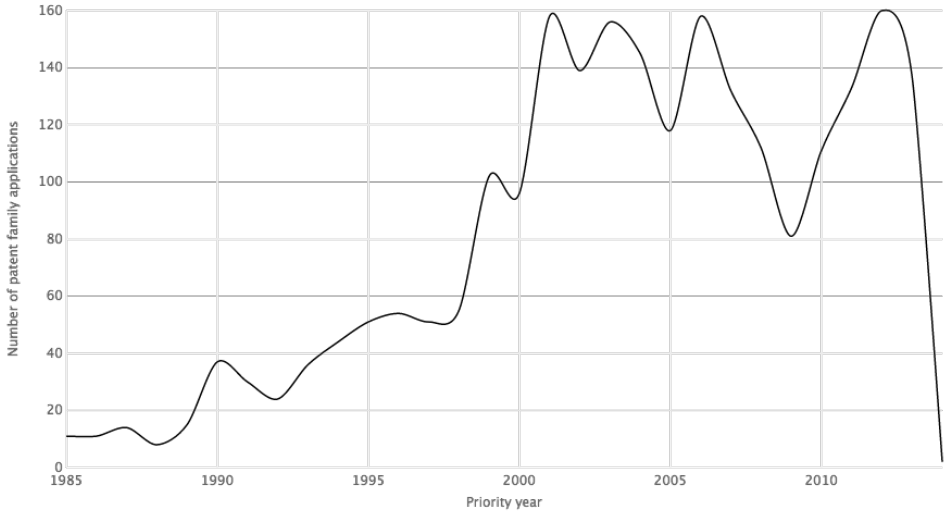

Figure 12: Company Y's patenting activity. Source: Cipher

4.1.5.2 Patent Transactions

In recent years the company has been active in acquiring external technologies and also software services to further expand their business and patent portfolio. In 2014 they acquired a small, but highly successful company, which had roughly 50 patents for an undisclosed price. However, this reassignment has not been recorded with the USPTO.

Company Y acquired another company in 2014 for more than a quarter of a million dollars. This company had a very strong patent portfolio within a certain technology area. The two companies had very little overlap product wise, but were described as a good fit with respect to markets, technology and geographies. There has however not been a recorded reassignment between these companies.

4.1.6 An Example of Data Discrepancy

Aistemos, a patent analytics company with a proprietary tool called Cipher, regularly perform analysis on large amounts of patent data[20]. Their tool has access to the Thomson Reuter Derwent database which includes all the world's patents. The tool further attempts to group subsidiaries and other entities under a parent company, in order to facilitate patent searches. Aistemos performed a comparison of a private portfolio, i.e. a complete list of owned patents by a certain company, and compared that to what could be found in Cipher through the aggregation and grouping of all patents which should be assigned to that specific company. Figure 13 visualizes the discrepancy, where *A* represents the number of patents found in Cipher and *B* the number of patents which the company actually owns according to their own internal patent list. The dark grey area in the middle represents patents found in both Cipher and their patent list. The result is that only 90% of their actual patents can be found through Cipher, i.e. it is almost impossible for anyone through the use of public and proprietary patent tools to find every single patent that this company owns.

[20] www.aistemos.com

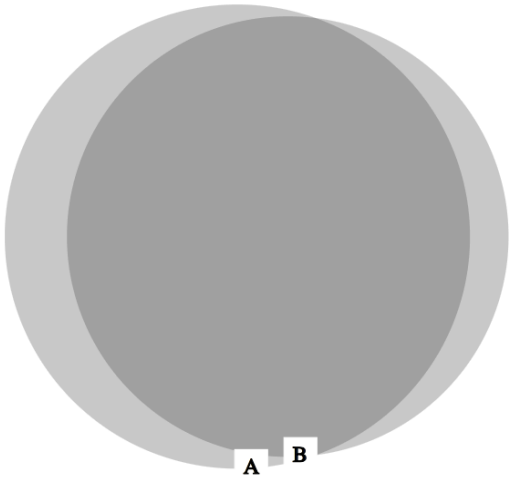

Figure 13: Data discrepancy between patent tool Cipher and actual number of patents owned by a certain company. Source: Aistemos (2015)

4.2 Is Lack of Accurate Patent Ownership Information an Issue?

The second part of the empirical findings is based on qualitative research. The comments from the 72 organizations and individuals concerning USPTO's proposal on attributable ownership have been studied in order to understand how companies and intellectual property organizations address the issue of patent ownership (USPTO c, 2014).

The most frequent comments among the companies and organizations concern the impact on companies that might follow this specific proposal, mainly an increase in cost and administrative burden to comply with all the regulations. Another common opinion is that the punishment for not complying with the rules, i.e. potential patent abandonment, was too harsh. Several companies were on the other side also concerned that the proposal was not enough, that there were too many gaps if the goal is to achieve full transparency.

4.3 Is Patent Ownership Information Currently Perceived as Accurate?

The majority of the companies and organizations that provided comments agree with the USPTO that there is a lack of accurate information on patent ownership and that there is a need for increased transparency. Hence these companies fully support the USPTO's work towards this goal. However, half of them did not think that the specific proposed rules were the best solution, instead they had comments on how the rules should be altered in order to be sustainable and achieve consistent transparency. A full list of all organizations that commented can be seen in Appendix 1.

IBM pointed out that the system is not transparent, through their statement *"Because there is no requirement to record patent transfers, it is impossible to identify with absolute certainty a company's complete patent holdings--or who owns a patent-from the public record".* Electronic Frontier Foundation, an international non-profit digital rights organization, highlighted that the lack of transparency is however a problem which is not common

knowledge *"People not familiar with the detailed workings of the patent system are generally surprised to learn that accurate public ownership records do not exist."*

Only one company specifically stated in their comment that they question whether or not there is an issue with incorrect patent ownership information. i.e. they regard the current system to work satisfying in terms of ownership information. This company, GlaxoSmithKline, a pharmaceutical company, wrote *"The Office has not provided any information leading to the conclusion that they are providing inaccurate information to the public regarding patent ownership. To the extent that this is a problem, the Office should examine the rate at which reported information is inaccurate and the Impact of those inaccuracies to determine whether the benefit to the public outweighs the burdens imposed by the new rules".*

Intellectual Ventures claimed that they support increased transparency but only to a certain limit. According to them, companies have legitimate reasons why they do not reveal all of their assets. These reasons are first and foremost to keep trade secrecy of unpublished applications. i.e. patent applications filed within the last 18 months. Secondly, companies might have a desire not to reveal their technology roadmap. Finally, third parties might wish to keep contractual relationships confidential to the public and thus not want to disclose exclusive licenses they are partaking in. Other companies and organizations also expressed their concern that with the new proposal exclusive licensees will be disclosed as an attributable owner to a patent, thus a company's new market plans and technology roadmaps will be disclosed before they develop anything commercial based on the licensed patents.

4.3.1 The Impact of Accurate Patent Ownership Information

A majority of the companies agreed that information accuracy and increased transparency is important and affects both small and large companies. Three main categories of benefits and importance of transparency are extracted as they were commonly highlighted by the companies and organizations.

4.3.1.1 Innovation

The discrepancy of accurate ownership information affects the spectra of innovation both from a prior art and patent examination point but also when it comes to promoting the inventors and owners of an invention. The Coalition for Patent Fairness, an American organization working towards improving the US patent system, puts it as *"Increased transparency is needed to support innovation currently stifled in the present system due to problems with hidden ownership ... allowing "hidden ownership" undermines the notice function of patents and thereby retards the very progress the patent system was designed to promote".*

BSA, The Software Alliance representing the leading software companies, also adds to this opinion stating that: *"A patent is a grant by the government of a limited monopoly. The traditional trade-off for the grant is disclosure of the invention. In BSA's view, however it is also appropriate after that grant is made to encourage the owner of the patent to disclose the*

attributable owners of the patent". They claim to be a strong supporter of increased transparency when it comes to patent ownership. Further on they discuss the market efficiency issue arising from non-transparent ownership and say that any market is made more efficient when provided with better information. Based on this, they believe that also the patent system and the market of licensors and licensees will benefit from disclosure of ownership information.

The App Association, ACT, also support increased transparency and highlight the primary purpose of disclosure in the sense that patents should allow innovation to be cumulative: *"The patent system is built around rewarding those who invest time and capital in building our innovation economy and allowing their breakthroughs to teach and inform others"*.

Dell, a computer technology company, and Cisco Systems, a networking equipment company, see several benefits for innovation if having attributable ownership, saying that it *"...will promote innovation by providing accurate information to the public… Attributable ownership enables examiners to avoid conflicts of interest; permits determination of what prior art is excludable pursuant to the post-AIA § 102(b)(2) and thereby helps to prevent double patenting; allows the PTAB to verify that a request to initiate a post-- issuance proceeding is made by a proper party; and generally ensures that the information provided by the PTO to the public is accurate and not misleading. Lack of patent transparency puts innovators at a disadvantage when building products, negotiating patent licenses, or defending patent lawsuits"*.

The Software and Information Industry Association, the principal trade association for the software and digital content industries, summarizes the impact on innovation through explaining the different obstacles and stage gates innovators frequently face: *"The availability of complete, current and accurate AO [attributable ownership] information is necessary for a company to determine such essential issues as: whether to make an investment in a particular product; who to license from; whether to license around a particular product; whether and who to collaborate and/or partner with; whether the company should avoid the market altogether; and how to manage liability risks. Many of these decisions must be made early on in the investment and innovation process. An inability to accurately assess the patent landscape in a certain area could result in product developers deciding to refrain from entering the market completely – contrary to the very purpose of the patent system"*. They further describe what synergy effects accurate ownership information entails, stating that *"The availability of complete, current and accurate AO information will also improve the efficiencies of licensing, transparency of the patent system, litigation and patent prosecution"*.

4.3.1.2 Efficient Marketplace

The current Director of the USPTO, Michelle Lee, stated during a speech that *"Ultimately, the marketplace works most effectively in an environment of transparency, allowing innovators to make smarter investments, create jobs, and drive economic growth ... And I would add that the economic benefits of greater ownership transparency are truly*

international in scope; the more awareness there is of the technologies out there, the more cross-licensing opportunities there are across borders" (Lee, 2014).

Many of the comments discuss that the patent market activities are highly affected by the lack of transparency. Companies often struggle to find the current owner of patents, which they wish to license, meaning that ownership information is crucial for facilitating patent licensing. Microsoft, one of the strongest supporters of increased transparency, argues *"Disclosure of the real party in interest for a particular patent reduces the likelihood of opportunistic behavior and gamesmanship and helps to facilitate licensing and the dissemination of technology"*.

Several other companies expressed concerns that the market cannot fully function without ownership transparency. One of these companies, IBM, wrote that *"Proper notice must reveal not only the scope and extent of patented inventions, but also the identity of the true owner of those patent rights, so the IP marketplace can function at optimum efficiency to encourage investment and innovation and "promote the Progress of Science and useful Arts…[21]"*. Hewlett-Packard, an information technology company, discussed the impact of transparency for the early stages of patent monetization and collaboration, stating that *"dissemination of information regarding the attributable owner of a patent would enable innovators to easily identify parties with an interest in the patent and thereby initiate transactions in an efficient manner"*.

Another comment discussing the importance of IP in the world of corporate value and business efficiency comes from Ocean Tomo, an IP merchant bank, *"We concur with the proposition that such disclosure will further improve market efficiency for patent rights. Intellectual property is taking up an increasingly large footprint on corporate balance sheets and is driving significant value for companies investing in obtaining IP through R&D. Changes such as those described here will produce dividends to owners of IP through increased awareness of such assets as well as reduce transaction costs"*.

PatentBooks Inc., a company trying to simplify patent licensing, follows this discussion saying that they *"Support a market-based system that will allow large-scale patent licensing for specific products on a utility basis for specific products (so that licensing patents will become as easy as obtaining water or electricity). Such a system will promote innovation by making available to intellectual property users multiple patents offering competing solutions, so that users may choose among these patents in developing their products or services"*.

Intellectual Ventures stated the opposite, they believe that *"finding sellers and buyers is already possible and not a problem"*, hence they do not agree that increased ownership transparency will increase licensing activities nor eliminate the obstacle of finding the true owners of a patent.

[21] U.S. Const. art. I, § 8, cl. 8.

4.3.1.3 Risk Management

The third and most frequently discussed consequence is that patent holders face difficulties in managing both current and potential risks if the ownership information is inaccurate. This relates highly to the rise of PAEs, which some also refer to as *patent trolls*, who hide behind complicated company structures and shell companies and thus gain an upper hand in litigation. As Hewlett-Packard stated *"hidden ownership puts innovators at a disadvantage when defending patent lawsuits"*. Not knowing who the actual plaintiff is gives the defendant a disadvantage, however another identified issue relates to the lack of information of the true portfolios of PAEs.

The Coalition for Patent Fairness further discusses these issues with the following statement: *"Transparency of ownership is needed at the time of assertion because a defendant must be able to evaluate how to respond based on accurate ownership information. In particular, the more knowledge an accused infringer has regarding those controlling asserted patents, the more readily the accused infringer can buy "patent peace" through settlement - without fear of later suit from another entity controlled by the same people. The public, likewise, would benefit from being informed of who is asserting the rights in a patent. This will enhance the overall function of the patent system without providing any substantial burden on the patentees who already must prepare a complaint or demand letter with the participation of the attributable owners"*.

According to The Software and Information Industry Association, the current system allows for abusive litigation tactics and gamesmanship *"...the present system does a poor job of ensuring that attributable owners accurately identify themselves. Under the present system it is too easy for these owners to hide behind legal fictions. Partnerships, LLCs, subsidiaries, and other legal entities can hold patent rights while the connection between these entities and their corporate parents is often unknown or obscure to the public. This often makes it very difficult to determine what patents a company owns. This dynamic, in conjunction with there being no requirement that patent transfers be recorded, creates an environment that is ripe for abuse and gamesmanship. It allows companies to effectively "hide" their patent portfolio to the detriment of the public interest"*.

The Engine Advocacy Organization, a non-profit group supporting technology entrepreneurship, also believes that attributable ownership would help remedy this issue saying that *"Lack of transparency in the ownership of patents often serves to enable patent litigation abuse, and such abuse by patent assertion entities increasingly targets the smallest—and often most productive—businesses in the economy"*. They believe that these types of law proposals would help in *"leveling the playing field for small companies, startups, and innovators who may be threatened with litigation or otherwise find themselves before the Patent Office"*.

Even though the progress of patent trolls is a hot topic at the moment especially in the US, and many believe abusive patent litigation to be a one-way street to market failure, several of the companies question the size of this problem. These companies speak of the patent troll

problem being too small to impose a rulemaking so broad that it effects, or even hurts, more legitimate companies than it helps curb the problem of abusive litigation. Novartis, a pharmaceutical company, is one company with this opinion commenting that *"rules of this breadth might be understandable if abusive patent litigation were a systemic problem in the USPTO, statistics tell a staggeringly different story. By definition, abusive patent litigation can only arise when a patent is actually granted and asserted, either through litigation or the threat of litigation. While estimates vary, the proportion of patents that are actually asserted is thought to be less than 2% of all granted patents*[22]*. This statistic alone means that a minimum of 98% of granted patents are completely detached from the problem of abusive patent litigation. In practice, that number is even higher, since patent owners like Novartis who are engaged in the legitimate enforcement of patent rights against infringers are also included in the 2%".*

The Minnesota Intellectual Property Law Association, a non-profit organization promoting IP law development, follows the same line claiming that the proposed change may not be economically efficient *"The number of patent suits filed is only around 1% of the total number of patents issued in any given year. So, there are actually only a relatively small number of patent owners and applicants are the focus of the stated goal of the Executive Order. Requiring the overwhelming majority of patent owners and applicants to comply with the proposed rules even though they have no common ownership with any patents being asserted in any patent suit appears unnecessary and does not represent the least onerous approach by which the Office could achieve the stated goal".*

Several entities also recognize the problem of abusive patent litigation, which a small although growing problem. BSA, The Software Alliance mentions that they think ultimate parent entities of the patent titleholders is important to disclose. However this should not be disclosed prior to the issuance of the patent, i.e. not before the patent has in fact been granted by the patent office. The reason they claim is that a patent cannot be asserted before its grant date, hence patent troll activity cannot be executed while an invention is still in the application phase. *"Once the patent issues, there is a potential market for the invention and licensors may benefit from knowing who owns the rights to the claimed invention. In addition, it is after a patent issues when bad actors can hide ownership information and engage in trolling activities".*

4.4 Current Transparency Actions by Companies

As a complement to the USPTO's efforts to increase patent ownership transparency, a few companies have as an own initiative contributed to increase awareness of their own patent portfolios. The first company to voluntarily upload a full list with all their current granted patents was Microsoft in 2013, stating that they are committed to responsible intellectual property management and that clarity around ownership is one component of a well-functioning patent system (Microsoft, 2014).

[22] Attributable Owner Public Hearing, March 13, 2014, Alexandria, VA, Transcript at p. 41

When Microsoft published their patent list, their General Counsel and Executive Vice President Brad Smith commented *"We urge other companies to join us in making available information about which patents they own. By doing so, they will help increase transparency, facilitate licensing, and help ensure that the patent system continues to fulfill its role in promoting and encouraging innovation"* (Microsoft, 2013). Smith further emphasized the importance of collaboration between different parties, stating that: *"We take this step today because we believe that all stakeholders of the U.S. patent system – private companies, the U.S. Patent and Trademark Office, Congress and the courts – share responsibility for taking steps to improve its operation. Sensible improvements to the patent system, such as increasing transparency on patent ownership, will yield tangible outcomes that enhance American competitiveness, create jobs and foster growth in nearly every sector of the U.S. economy"*.

A few months after Microsoft's actions, Intellectual Ventures published a patent list representing approximately 85% of the entire patent portfolio to provide both current and prospecting customer's insight into their portfolio (Intellectual Ventures a, n.d.). They state that the remaining 15% account for patents where public disclosure poses confidentiality concerns such as contractual obligations to their licensors and patents which are newly acquired in order to protect their current and emerging investment strategies (Intellectual Ventures b, n.d.).

In February 2015, Qualcomm published their full patent list but without any public announcements of this action. Although publishing their entire patent portfolio was not one of the key terms of the rectification plan they agreed upon with China's National Development and Reform Commission (NDRC), due to Qualcomm's violation of China's Anti-Monopoly Law, they published their portfolio shortly after the announcement of the settlement. The settlement with NDRC includes several terms, one of them being that Qualcomm will provide full patent lists during a negotiation process with anyone who wants to license their current 3G and 4G essential Chinese patents, as well as fine of approximately $975 million (Qualcomm, 2015).

5 ANALYSIS

In this chapter the empirical findings are analyzed from the foundation of the theoretical framework, with the purpose to answer the research questions of this thesis.

5.1 Are the Public Patent Records Currently Inaccurate in Regard to Patent Ownership?

The first step towards determining whether or not current patent ownership information is accurate in regard to who currently control a patent, the organization's portfolios were analyzed. Figure 14 visualizes the current discrepancy between the organizations' private and public portfolios, with the percentage of discrepancy presented in the circles.

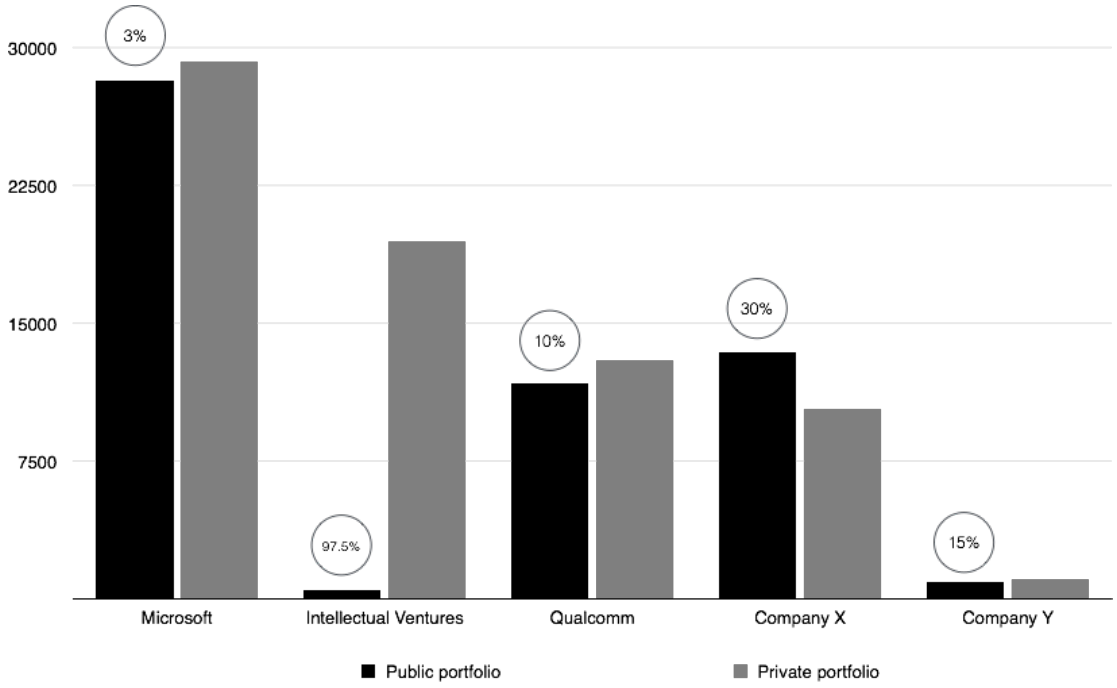

Figure 14: Discrepancy between private and public patent portfolios.

All five studied organizations had discrepancy between their private and public portfolio. Microsoft, one of the companies that has promoted and encouraged others to be more transparent, had the lowest percentage of discrepancy, only 3%. Intellectual Ventures, who also has made an attempt to be more transparent, had a staggering discrepancy, 97.5% of their portfolio was not identified when searching in the USPTO's database. This number is probably even higher, as their private portfolio includes only 85% of their full portfolio (Intellectual Ventures a, n.d.). However, it is important to take into consideration whether or not these are actually the same patents that appear within the private and the public portfolio. Looking at the research performed by Aistemos in 2015, concerning patent ownership transparency, it is evident that despite all efforts to harmonize company names and account for subsidiaries and acquisitions, the databases are still not correct and only show approximately 90% of the actual patent portfolio. If a company like Aistemos, who have put in an extensive amount of resources to structure all the world patents, cannot compile 100%

accurate ownership information, then it is no wonder that more technically simple databases are not accurate.

During the last 10 years, the number of applications filed at the USPTO has increased by almost 60% and the number of granted patents issued by the USPTO in 2014 was 80% higher than the number of grants 10 years ago (USPTO d, 2015). This increase in patenting activity is also visible among the studied organizations, as all of them have in recent years expanded their portfolios, either through in-house innovation or through the means of acquiring other portfolios. With the large increase in patent data, it is not surprising that companies find it difficult to keep track of each individual patent. However, patents are often a large cost for companies, both in terms of maintaining granted patents but also in relation to R&D spending, which in many cases yields patents. Considering that companies dedicate a significant amount of effort into their research, technology commercialization and patenting activity, they should want to present their accurate portfolios in order to show these efforts and attract potential buyers, licensees and financiers.

The next part of the analysis intends to unravel the factors behind the information inaccuracy.

5.2 What are the Reasons Behind the Inaccuracies in the Public Records?

Chien (2015) emphasizes, throughout her research report that it is impossible to know with certainty what a company owns. The Electronic Frontier Foundation agrees to this and state that most individuals do not even know that there is a problem with the patent records, which this study has also identified. Therefore, this section will analyze the identified sources of error to why ownership information is currently to some degree incorrect, based on the empirical investigations. In order to address the problem there needs to be a common understanding of *why* and *how* the problem has occurred.

As suggested by De Soto (2000), a properly trusted and functioning system must be in place in order for any asset to achieve its potential value. Based on the gathered theory, three main sources of error have been identified, and an additional obstacle with respect to patent information retrieval. During the empirical findings, data was collected to test these transparency issues and the five companies that have been analyzed have all shown evidence of the following issues and challenges, which is illustrated in Table 8 and will be further discussed individually. For each of the identified reasons to why ownership data might be inaccurate, an analysis of the frequency and severity of this source has been identified and graded as low, medium and high, where high indicates that a significant part of the inaccurate data from a company is due to that specific error. The most difficult inaccuracy issue to quantify is reassignments, as this requires the knowledge of which patents have not been reassigned. During the empirical investigation the patent transfers which were publically announced have been investigated, but there is reason to believe that not all patent transfers are made public and thus it is difficult to investigate if these have been reassigned. Thus, reassignments could have an even higher degree of frequency among these five companies.

Table 8: Overview of identified inaccuracies among the studied companies

Type of transparency issue	Microsoft	Intellectual Ventures	Qualcomm	Company X	Company Y
Inconsistent Data Entry	Medium	Low	Medium	Medium	Medium
Reassignments	Medium	High	Medium	Medium	Low
Corporate Structures	Medium	High	Medium	High	Medium
Indistinct Company Name	Low	Low	Low	Low	High

5.2.1 Inconsistent Data Entry

The first identified source of inaccuracy comes from data entry, i.e. when a patent attorney drafts a patent application and assigns the patent to an organization. Unlike the stock exchange where every company has their own numerical company code, the patent offices around the world have no such systematic approach to naming companies and attributing ownership to patents. Thoma et al. (2010) also acknowledges this problem, which he claims is mostly related to human error. This administrative problem should not be in place considering the availability of highly developed technology to overcome it.

The evidence of inaccurate and inconsistent data entry is numerous. Just looking at the assigned owners to the patents that Microsoft has declared as theirs, we find misspellings, different divisions and local offices as assignees. Thus, when searching for "Microsoft Corporation" in the USPTO's database, plenty of patents which were misspelled or typed in a different manner will not emerge in the full patent list. The other four investigated companies also showed a high degree of inconsistent name entries, except for Intellectual Ventures who has very few patents assigned to their actually corporate name, thus their main inaccuracies lie in their corporate structure.

It is undeniable that the patent system needs to be properly structured and harmonized when it comes to one of the first and most basic steps in patenting - attributing an owner to the invention. Even though this is a basic step in patenting, giving notice of ownership is not mandatory, which could explain why patent owners do not have a systematic approach internally for giving notice. The lack of structure for giving notice both within the different patent offices and internally among companies leads to these administrative mistakes. There is also a possibility that companies can use this administrative error in a strategic purpose, i.e. giving notice in an inconsistent manner to make their entire patent portfolio more difficult compile for external parties. However, this is difficult to assess just by looking through the USPTO's database.

Misspellings and data entry inconsistency is an error source that is considered to be easier to solve than the others. For example, by searching for "Microsoft*" a significant part of the variations can be caught. With these search alterations it is often easier to identify to which entity the patent belongs, e.g. one can assume that Microsoft Sorporation in fact is Microsoft Corporation. There are however current issues that are not as straight forward as misspellings. Reassignments and corporate structures have a greater impact, since these can not be found through different search string alterations, instead they require a deeper knowledge of the company as such and its patent activities, such as acquisitions and divestments.

5.2.2 Reassignments

IP continues to evolve as an important asset class in the knowledge economy. Arora et al. (2001), therefore suggest that IP is becoming an important source of technology for organizations, which leads to companies exchanging patents in numerous ways. Chesbrough (2006) identified nine different reasons for why a patent changes owner. This variety of transfers indicates that patent transfers are a common activity within the IP marketplace and that several different types of actors are involved in reassignments, such as operating companies, universities and financial institutions. Among the nine different types of patent transfers, not all of them are easy to identify just by looking at reassignment data or press releases, such as whether or not the patent transfer was bundled with other assets or if it was a standalone patent transfer as well as if it was a part of a licensing agreement between two parties. The most common form of transaction was with employees, since four of the five companies have their internal R&D facilities, Intellectual Ventures being the main exception. This transaction depends on the employment contracts within the companies, as the ownership then is transferred from the inventor to the employer.

During the analysis of the reassignment data, few transfers were simply corrections of misspelled company names, which is why there is a significant amount of patents with misspelled ownership data. Although there were plenty of patents that were transferred internally between branches and business units, Skype is one example where there has not been a transfer.

Finally, the last common transaction was in the form of mergers and acquisitions. During the empirical investigation some of the studied companies had acquired other companies, however not all of these transfers where recorded.

Since there is no requirement from the patent office to give notice when either a company has divested, sold or acquired patents, the public records are by default inaccurate. During the empirical investigation of different patent transactions the companies have publicly announced, not all reassignments have been recorded with the USPTO. This complicates the search for a company’s patents, since all acquisitions need to be taken into consideration when searching, although not all of them are publicly announced. Even the USPTO acknowledges the fact that their patent records are currently not 100% accurate. Since their

database is the only official source for American patent information, it is clear that this inaccuracy and lack of data trust leads to cumulative errors for companies when performing landscape analysis and when making strategic decisions, which the FTC (2011) also identified during their research concerning the lack of notice.

Chesbrough (2006), along with some of the comments on the law proposal, suggests that one of the reasons to why patent owners simply do not update their patent records with the USPTO is because it is too burdensome. Especially for those patents covered in multiple countries, since a reassignment then has to reported to each individual patent office. In addition to the time and paperwork necessary, each reassignment has administrative fees, which for small companies could be a deterrent. In other cases, it is less of an administrative issue and instead a strategic action by the patent owners. Intellectual Ventures was the company that indicated the most that they do not reassign all the patent they acquire, which is most probably due to their business model of asserting operating companies. For operating companies who do not reassign their patent purchases, the strategic reason behind this could be to keep secret if they are entering a new technology area until they have developed a product in order to get a market advantage among their competitors. As IP continues to evolve and grow in importance as Arora et al. (2001) emphasize, it can be assumed that the number of patent transfers will grow, thus the problem of lack of reassignment notice will continue unless it becomes mandatory or economically/strategically beneficial.

5.2.3 Corporate Structures

Thoma et al. (2010) identified the problem of the corporate structures constantly getting more complex, and with that, identifying the ultimate parent company gets increasingly difficult. As long as the companies themselves do not record the accurate information with the patent office, the patent system itself does not regulate this. An associated issue, also stemming from corporate complexity, is that many companies own different brands to which they have patents assigned. Again the patent system itself fails to match these brands to the ultimate owner. This problem is showcased in the research, when the search for Microsoft Corporation in the USPTO does not include patents developed by Skype, since these have not been reassigned to Microsoft even though they have acquired Skype but the system does not have any way of grouping them together. All of the five investigated companies had a medium to high degree of patents assigned to different subsidiaries and brands. Company X had a high degree due to their prior collaborations with different companies where patents are assigned in multiple combinations of the names of the collaborating parties.

Continuing with issues concerning corporate structures, Chien (2012) covers the widely discussed issue of companies reassigning patents to shell companies and subsidiaries. Chien brings up Intellectual Ventures as an example. Looking at the empirical study of Intellectual Ventures, this issue is inevitable and indicates that corporate structures is a frequent issue for transparency in the patent system. Even though Intellectual Ventures is one of the world's largest patent owners and the fact that they have published a list of a large part of their portfolio, the patent search in USPTO's database still finds substantially no patents, in relation to what they actually own. They have stated that they do not always acquire patents

with their own name, i.e. they use shell companies as the purchaser of the patents, therefore it is difficult to find their patents through public databases. Even when there are products and tools on the market such as Aistemos' patent analytics tool Cipher, that has put significant resources into grouping those subsidiaries but has not succeeded to a hundred percent, the overlap in Figure 13 truly shows the difficulty. Assigning companies with a numerical code, as proposed under section 5.2.1, instead of the system having to rely on correct spelling and corporate grouping, would be an enormous step. This along with mandatory recording of what patents companies own, could be a solid start for creating a more transparent system.

Even though there are companies deliberately hiding behind the systematic chaos that the current system represents, a significant reason to why the rest of the data is inaccurate is because companies rarely update the records with consistent or even any, new information. This can be seen as a symptom of the lack of structure in the system. The USPTO along with Chesbrough (2006) recognizes these issues that originates from recording reassignments not being mandatory. Since there is an amount of administrative work needed to update patent information, it can be difficult for patent owners to see the future financial advantages of keeping accurate patent records. There are thus very few incentives for companies to update and give notice to their patents since they do not see any immediate benefits, rather the opposite in form of administrative costs.

5.2.4 Indistinct Company Names

To add to the weaknesses with assignee names and corporate structures, the problem with indistinct company names was also evident during the empirical investigation. For companies such Qualcomm, a search in the USPTO's database does not give any significant risk in getting a patent list including several other companies' patents that have no relation to Qualcomm. This is because Qualcomm is quite a distinctive company name. The same goes for the other companies, except for Company Y that has a name currently held by several different entities, thus complicating the search. To illustrate with an example of this issue, we can look at "CSR", a company name with many registered patents, but where the entities are clearly different. One is an Australian mining company, the second on is a Bluetooth company from the UK and finally the third one is a Chinese railway company. These companies are obviously different and they patent different technologies, however currently there is no administrative way for the patent system to tell them apart, unlike the stock exchange which has its system to tell every single company apart through unique numerical codes.

5.2.5 Final Remarks

To conclude this section, it is evident that due to inaccuracies in the patent system along with many companies not wanting to be entirely transparent when it comes to which patents they own, the patent records are currently not 100% accurate. However, everyone does not know how poorly structured the current patent system is and how burdensome it could be to a perform search in USPTO's database to find all patents a company owns. It requires the knowledge that not all patents are reassigned, that misspellings frequently occur as well as knowing that each separate brand and subsidiary within a parent company might have patents

in their own name. Without the knowledge of how wrong the system is it is difficult to take any action towards trying to solve these issues and understanding the impact in terms of cost and benefits of a new solution.

The different sources of error have different degrees of severity and some are more difficult than others to mitigate. Spelling errors and corporate name inconsistency is one issue that can be mitigated in a fairly easer manner, through the digitalization of the patent offices and harmonizing the patent filing team within companies as well. Corporate structures are however more difficult to solve, as it along with the issue of reassignment demands a new standard to emerge from the patent offices. The solution would thus be to make reassignments mandatory and that the ultimate corporate names (e.g. the company that owns a shell company) is stated as the owner instead of a subsidiary or local office. Finally, indistinct corporate names require an approach that has its roots in the stock market, where each listed company has its own unique numerical code. This solution might be the one that requires the most a globally harmonized patent system, as a company should have the same numerical code in every patent office in the world to avoid inconsistency and data misunderstandings.

5.3 Would Accurate Ownership Records Entail any Impact to the Industry and Society?

How would anyone, or everyone, that is operating within the patent space be impacted from improving the accuracy of ownership information when it comes to patents? This section aims to figure out the impact of accurate ownership records when it comes to extracting value out of patents. The USPTO themselves identified several benefits that the law proposal would lead to and these will be further analyzed in this study.

The empirical findings, in the form of the comments on the USPTO law proposal and case studies, will be discussed in the light of the theoretical framework. The analysis will look at the challenges and impacts of the current, not fully transparent system in regard to patent ownership, in the administrative, judicial and business arena. Each of the arenas will be thoroughly analyzed, as well as the different actions for extracting value from patents. As all the arenas and monetization actions are all exposed to ownership information, they will face different challenges and implications of inaccurate information. However, all three arenas are connected and affect each other, thus a lack of structure in the administrative arena will lead to implications in the business arena and actions on the judicial arena. An overview of the main challenges discussed in the analysis is presented in Figure 15, which also aims to illustrate how the errors in the administrative arena have great impacts on the business and judicial arena in the form of information asymmetry.

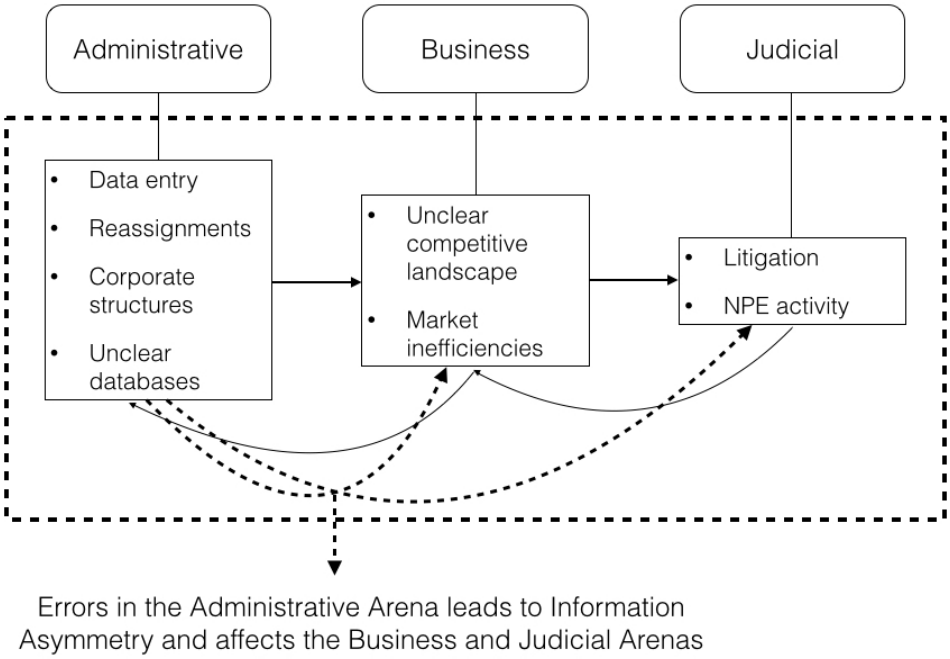

Figure 15: The main challenges for the patent system in relation to the three arenas.

5.3.1 Administrative Arena

The administrative arena is the platform where the intangible assets are turned into property through patent registration. In the empirical findings, the ownership errors due to inconsistent data entry, reassignments and corporate structures originated from the administrative arena and are then used strategically in the business arena. Even though indistinct company names is an error identified when searching in the administrative arena, companies can, in the business arena be separated through the knowledge of what type of company it is and their type of innovation. However, in order to be able to distinguish ownership when facing companies with indistinct names, such as Company Y in the case study, the searcher must be well-versed in the business model and technology development of the company. Thus, even if distinction is possible it takes time and resources that could be used for core activities which create more value for the searcher. As discussed in section 5.2, the patent system is not properly harmonized nor structured in order to make sure that patents can function in the way that they were intended to function, there are simply too many weaknesses. The administrative arena is the first arena where the results of a company's R&D investments are disclosed. For companies it is therefore crucial that there is a proper administrative infrastructure for patents, to enable innovation to later be leveraged within the business arena (Chesbrough, 2006).

Innovation, which is one of the three main areas that the comments to the USPTO covered, relates highly to the administrative arena. The patent system was built to encourage and promote innovation. Several of the commenting organizations as well as the academics

Chesbrough (2006) and Chien (2012) have stated that declaring ownership, i.e. notice, is an important element however it is currently not mandatory. Innovators rely on that patent offices have accurate and functioning databases to find prior art and competing technologies, and thus Chien and the FTC (2011) emphasize that they are reliant on that the ownership information is correct if they need to reach out to other patent owners. Human errors such as misspellings of company names and unstructured requirements of how to write corporate names is one part of the inaccurate information, where the responsibility mainly lies in the hand of the USPTO. However, recording reassignments and giving notice are issues which both the USPTO and the patent owners are responsible for, and this was the error which had high frequency among the five studied companies. When the attributable ownership proposal was presented by the USPTO, they identified several benefits which they think that the proposal would lead to in the administrative arena. One of these benefits is *"helping ensure the highest quality patents"*. Whether or not the filed patents after this proposal would actually have a higher quality is difficult to assess, since quality is difficult to measure. However, without a proper system, no matter how well written the patent claims are and how innovative the inventions are, the database itself has to be reliable and usable for the patent holders in order to find prior art and know how their inventions differ from existing patents. Otherwise the society ends up with a patent system holding a large amount of patents that do not have the necessary inventive step in relation to each other, and could therefore be invalidated at any time, meaning large inefficiencies and resources wasted on keeping useless patents alive.

Even though these arguments for increasing patent transparency sound good in theory, research that provides substantial evidence of these inefficiencies and waste is needed in order to convince actors in the current system that they will in fact benefit on being more transparent. As GSK pointed out in their comment to the USPTO, they want more evidence of that there is a problem, and what impact it actually has. This evidence needs to be quantified and compared to current situations to show actors what they are currently loosing and what can be gained, since every decision has an opportunity cost.

5.3.2 Judicial Arena

It is evident that the judicial arena is highly dependent on accurate ownership information. In the event of litigation, the patent must be updated with information of the current owner. However, this does not solve the fact that companies can create shell companies and use these to hide their true identity. During the case studies, Intellectual Ventures stood out with their low degree of transparency due to their high frequency of not reassigning patents as well as their large variety of different corporate entities. The judicial arena has, according to research by both PwC (2014) and RPX (2014), seen an increase in litigation activity from NPEs. The four operating companies in this study have also seen an increase in litigation from NPEs. Mainly from PAEs, if taking into account the more appropriate definition by the FTC in 2011. Based on the theoretical and empirical findings, it has become evident that it is important to clearly define the difference between PAEs and NPEs, as the term NPE is often misused. Universities and research centers are in fact NPEs, but they often end up in the

same category as “patent trolls” even though they contribute significantly to innovation, but do not often commercialize it on their own.

An additional benefit of attributable ownership identified by the USPTO, is that it would *“reduce abusive patent litigation by helping the public better defend itself against abusive assertions”*. Hewlett-Packard stated that the hidden ownership puts the patent holders at a significant disadvantage when they are defending themselves against patent lawsuits. This since they are unaware of both the financial and legal strength of the plaintiff. This is especially related to certain NPEs, which often hide behind shell companies. When an unknown shell company litigates, it is often difficult to know whether it is e.g. Intellectual Ventures or some small NPEs suing. It is therefore difficult to assess the risk and potential outcome of the lawsuit when the ownership is unknown. Even though a company can sometimes identify the ultimate owner of a shell company once they have been hit by a law suit, if they put resources into investigation, the current non-transparency makes it very difficult to be prepared and assess risk when a patent holder does not know where the risk can come from in the future. Although litigation is formally processed in the judicial arena, the reasons behind initiating an infringement suit stems from the business arena, as well as analyzing the strength of an opponent. When companies move from acting in the business arena to the judicial, the reasons are often to protect their business models or as a strategic act in order to enhance their competitive advantage or market position.

The attributable ownership proposal, along with the entire America Invents Act, is partly aimed at minimizing the operations carried out by the NPEs. Many companies who commented on the proposal highlighted the fact that attacking the NPEs is not the most efficient way to handle the transparency issue. Novartis highlighted the estimation that only 2% of all patents are litigated, thus developing regulatory proposals which address only 2% of all patents is not serving the purpose of holistically improving the patent system. There is an element of risk that the SMEs and startups suffer greatly from the proposal, while the NPEs find new ways of operating within the IP marketplace that benefits them. The issue of transparency is greater and has a broader scope than solely abusive patent litigation, however it is often hidden in the shadows and not receiving as much attention as abusive patent litigation. With this said, in order for the lack of transparency to be accepted as a problem worth solving by the larger mass, a significant increase of effort needs to be put into mapping and quantifying if there are current costs caused by non-transparency and if there are gains to be made from transparency in terms of utilization and monetization, and not just NPE litigation.

5.3.3 Business Arena

Although the majority of the errors emerge in the administrative arena, the business arena is the one that faces the greatest impact and the most obstacles when ownership information is neither transparent nor accurate. Without a proper structure in the administrative arena, Petrusson (2004) suggests that patents cannot function in the way where they generate value in the marketplace. IBM also emphasized that the IP marketplace will not function at optimum efficiency in terms of encouraging investments and future innovation without

accurate ownership information. Not only is the business arena connected with the administrative, the actions leading up to a presence in the judicial arena also stem from the business arena. Thus, inaccuracies play a role through all three arenas.

Intellectual Ventures provided comments on why companies sometimes need to be secretive with their ownership information. They brought up three different reasons why companies do not want to fully disclose their assets. They have applied the same reasons to their own public patent list, which is currently only 85% complete. The first reason they claimed was that innovators want to keep trade secrecy of unpublished applications. It is thus important to remember that the USPTO is not proposing to disclose applications younger than 18 months, all patent applicants have the right to keep applications unpublished up until 18 months. The second reason was that companies do not always wish to reveal their technology roadmap. However, patents are public in order to promote innovation, thus trying to keep technology under the radar actually undermines the entire purpose of the patents. Their third and final comment was that parties might want to keep contractual relationships confidential to the public, especially exclusive licenses. This was a frequently discussed concern among several companies and an aspect to the definition of attributable owner, which might be too broad. The definition of attributable in this study, is limited to the ultimate parent company i.e. not including other beneficiaries of the patent such as those with licenses. We regard that the licensees have a limited impact to how the patent is managed, thus their involvement is not sufficient to claim as ownership.

Even though it is possible to argue that secrecy is important for specific companies in specific situations, the findings in this study points to a more systematic problem, that this secrecy does not promote the innovation system as a whole. As has been showcased throughout this study, the IP marketplace, or more specifically the patent marketplace, is built upon multiple activities and actors where the purpose is to monetize and leverage IP, albeit in different ways. This is a marketplace that is constantly developing and expanding, a trend which Chesbrough (2006) has identified and which Serrano (2010) quantifies by stating that 13.5% of all patents have at least once during their lifecycle been traded. With the knowledge that reassignments are not mandatory, it is reasonable to assume that this number is in reality even greater than what was found in the five case studies. The research by Vermont in 2002 indicated that only 5% of all issued patents are licensed, as well as that only 3% of all issued patents generate any royalty. The discrepancy between the number of licensed patents and how many of them generate royalty can be due to cross-licensing, where the output is not always royalty instead it is access to the other party's patent portfolio. Based on these numbers, it is evident that the IP marketplace is not functioning to its fullest, especially when considering the fact that many patents are never used internally nor do they generate any value for an external organization. Chesbrough (2006) exemplified this issue with P&G, who only utilize 10% of their patents, and it is likely that other large companies have a similar low utilization percentage.

Tying back to the USPTO's proposal on attributable ownership and the benefits they have identified that the proposal would lead to, a significant portion of the benefits would be

attributed to the business arena. These benefits are however descried by the USPTO in a very unclear manner, thus the following analysis aims to unveil what these benefits actually entail.

Benefit 1: Enhancing competition by providing the public with more complete information about the competitive landscape in which innovators operate

Within the business arena companies never operate isolated from the market and their competitors. In fact, Arora et al. (2000) conclude that the competition has increased. Before presenting a new innovation to the market, they need to identify their competition and how they can differentiate. However, how can patent owners know their competitive landscape if they cannot identify what their competitors own? Thus, an obstacle in performing a competitive analysis with the purpose to identify the patent landscape is undoubtedly the inaccurate ownership information, which the FTC (2011) also confirms in their analysis of unclear notice. The FTC further concludes that poor patent notice actually undermines innovation when innovators cannot find the appropriate patents within the landscape (FTC, 2011). Searching for a technology area and trying to find the patents that way is difficult since patents not often are worded so that they reveal the technology itself. E.g. all Wi-Fi patents cannot be found by searching for Wi-Fi as a keyword. Presumably, companies also want to look at what close competitors patent rather than finding individual patents that might be in a certain technology field. Having complete information about the competitive landscape and being able to find the IP risk in that way can enable innovators to better position themselves in the market, identify opportunities and if necessary start a dialogue with the present patent holders.

The competitive landscape is not static, in fact patents are changing hands frequently as the importance of IP increases in the knowledge economy according to Arora et al. (2001). which Serrano (2010) identified this increase and the five studied companies have also seen an increase in exchanging patents. Companies therefore need to be able to identify and monitor the changes of the landscape, otherwise they risk finding themselves unprepared when key technologies change hands and perhaps ends up in the possession of a PAE or a close competitor. The reassignment of patents can thus create risks for companies, however not knowing that the reassignments have occurred at all, is an even greater risk. From the case studies, Intellectual Venture's full portfolio is highly difficult to find through public sources, since it has a complex corporate structure with many different companies listed as patent holders (which are difficult to identify as it is a private company). The complexity is not only related to the non-practicing entities, Company X also has a complicated corporate structure, which causes obstacles in trying to identify their full portfolio.

Although the above mentioned benefits sound reasonable, further investigation needs to be done on how more complete ownership information can enhance competition. In this research the benefits of being able to identify portfolios held by competitors needs to be quantified and measured against benefits of not having to disclose ownership information. Further more, it is important to consider future benefits for the system as a whole and the continued growth of innovation and not only see to current costs and gains.

Benefit 2: Facilitating more efficient technology transfers by making patent ownership information more readily available

As technologies continue to evolve and become more and more complex, companies can no longer invent everything themselves, they need to reach out to other companies and share technologies (Chesbrough, 2006). Both Foray (2004) and Chesbrough (2006) identified that IP has a cumulative characteristic, therefore companies often need access to former technologies in order to be able to build on or commercialize their new products. When ownership information is not accurate, this creates a barrier for innovators to identify the current owner of a patent that they would need to license. I.e. monetization activities such as licensing and patent transfers are increasing in importance and with that comes a need to monitor the marketplace. This ties well with what both Arora et al. (2000) and the FTC (2011) state, that monitoring external technologies is necessary in order to support monetization activities. The problem, which companies that commented on the proposal also highlighted, is that the landscape is currently unclear since the ownership is inaccurate. Finding the appropriate buyer or seller is difficult, according to Hewlett-Packard, this causes transaction costs to increase, which has a negative impact on the market. However, Intellectual Ventures disagree. It is peculiar that Intellectual Ventures claim that this is not an issue, considering that they published their patent list in order for prospecting customers to get insight into their portfolio. Insight, which before this action was not possible to obtain, since Intellectual Ventures has a limited amount of publically transparent patents. This raises the question of how prospecting clients in the past have approached Intellectual Ventures with the purpose to acquire or license patents. It could be so that they wish to license and sell more patents than before, thus publishing their list to attract new customers. Further investigation is needed, on whether increased transparency would in fact lead to increased licensing and/or transfers of patents or not. If this is in fact showcased to be true, it is very likely that companies themselves would voluntarily disclose their patent holdings in order to increase revenue streams.

Whether it is a large company such as Microsoft and Qualcomm, or a small company with a limited patent portfolio that wants to engage in the transfer of patents and innovation, their patents should be easy to identify. Even though a perfect market is not possible to achieve, the possibility to find correct information is one important aspect for efficient markets, which Bloomberg and O'Hara (1999) identified in their study.

Benefit 3: Leveling the playing field for all innovators

The playing field for innovators has significantly changed with the emerging NPEs (excluding research centers and universities). The business models of NPEs are by default in most cases creating asymmetry according to Chesbrough (2006), since they do not practice the technology claimed in their patent portfolios. Operating companies being litigated by NPEs can therefore rarely settle with a business solution where technology is cross-licensed, the NPEs are first and foremost interested in a monetary exchange. Since it is difficult to know what kind of patents the NPE is in possession of, the asymmetry continues to increase and operating companies often have no other alternative then to settle or spend a significant amount of money defending their rights. This rises the question again, whether or not it is an

appropriate strategy to develop regulations and proposals which target NPEs, considering that a significant amount of patent transactions and monetization activities occur between operating companies.

Looking at Table 8 which illustrates the different types of inaccuracies among the five case studies, it is obvious that the reasons and extent of the inaccuracies differ between the companies, as do the five companies' business models with respect to patents as well. In order to minimize information asymmetry and create a more efficient market for patents where companies can co-exist and interact, the same basic conditions are needed. The current situation illustrated by the five cases in the table shows that there are differences, which create different problems and possibilities for extracting value out of patents.

5.3.4 Final Remarks

The empirical findings have indeed found evidence pointing in the direction that transparency is important and that companies and other stakeholders are in fact affected by inaccurate information. The findings further indicate that more accurate ownership records would entail benefits to the stakeholders of the patent system, however there is also a need to research and quantify the impacts more thoroughly and specifically than this study aims to do. The next chapter aims to discuss these findings, from a holistic perspective, taking into account the knowledge economy and the patent system as such, as well as highlight some suggestions on what can be done in order to improve accuracy.

6 DISCUSSION

This chapter looks at the patent system and the knowledge economy from a holistic perspective and discusses the identified issues from the analysis and possible solutions.

6.1 The Challenges of the Knowledge Economy

Drucker (1993) brings up a very fundamental issue in the knowledge economy - that the society does not fully comprehend how knowledge works and behaves as an economic good. It is clear that moving from a material value chain to an intellectual value chain is difficult and takes time. As Petrusson (2004) explains, intellectual property is a special kind of property since it does not exist in itself. The steps of making these assets come into existence are difficult. Spender (1996) illustrates this transition, turning knowledge from being tacit to becoming explicit, and then the next, even more difficult step, is how to protect those assets. As highlighted by Foray (2004), intellectual assets are inherently difficult to control, non-rival and cumulative. The US law proposal in itself, not until recent years, trying to make it mandatory to disclose basic information as ownership to such an important asset as patents, illustrates how difficult it is for the society to acknowledge intellectual assets and handle them as tradable and valuable goods, such as real estate, where there is no uncertainty of who the actual owner is. It also indicates how difficult it is for companies and organization operating within the patent space to make a change, as the patent system has had very few structural changes throughout the years.

6.2 Ownership is Key

If intangible assets are the greatest value drivers in a knowledge economy, shouldn't there be a properly structured system in place where every single asset is clearly attributed to an accurate owner, and that it is possible to know what everyone owns? This can be illustrated with the construction of a building, the foundation is the core building block and without a proper foundation it is impossible to further build upon. In the same sense, if the most basic and core aspects of the patent are not in place and the patent system as such is not reliable, then how can patent owners leverage the potential value of their patents?

Both Petrusson (2004) and De Soto (2000) agree that the only way for an asset to become capital is to have a functional system that recognizes the asset as owned and thereby controlled by an entity or individual. De Soto especially emphasizes the point of trusted ownership being the key for an asset to become capital, since willingness to invest comes when one is able to capitalize on the investment. The same is suggested by McClure (2008) who states that the right to control IP is a very important factor to extract commercial value, maybe even more important than the intellect itself. The current USPTO director Michelle Lee, together with IBM and Hewlett-Packard, conclude that being able to attribute ownership to patents enables the IP marketplace to reach optimal efficiency. Looking at the basic economic theory, not having optimal efficiency is a market failure.

6.3 Asymmetry is Failure

This study has already presented the indications that the patent system currently is not entirely transparent when it comes to patent ownership, and that non-transparency creates asymmetry when buyers and sellers cannot be matched efficiently (Haltom, 2011). This is further supported by Bloomfield & O'Hara (1999) with their conclusions on market efficiency being increased when disclosing information such as market parties. In this sense, the IP market does in fact currently constitute a market failure in accordance with theory provided by Haltom (2011). Chien (2012) identifies several reasons why companies intentionally develop strategies where asymmetry is created. She brings up the issue that there are companies deliberately withholding information in order to create strategic advantages. Intellectual Ventures serves as a great example of how insufficient their patent information is in public databases due to deliberate asymmetry. The patent system is built so that the patent owners can choose how transparent they want to be, and thus they can skew information since others cannot know which technology fields they might target with their portfolio. Thus, from an assertion perspective it aims to make it more difficult for other patent holders to clear their rights and prepare when they are targeted with a lawsuit. What gained attention from the proposal initiated by the USPTO and the Congress was that it was to a large extent driven in an effort to decrease this patent troll activity, however there needs to be incentives for all participants in the patent market. Even though patent trolls do intensively litigate and limit the operating company's operations, proposing new regulations primarily based on their actions does not create a functioning patent system.

It is important to bear in mind that the secrecy behavior is not limited to PAEs but includes companies not wanting to disclose their R&D strategy and technology roadmaps, which the five case studies identified. Insufficient transparency creates barriers for companies to identify key patent holders in different markets and technology areas. Hence companies face challenges to early on during the innovation process establish awareness of the marketplace and identify where risk might emerge in the future.

Deliberate asymmetry is likely one of the most significant reasons why IP cannot become a more liquid asset. Chien (2012) supports this through stating that accessible ownership information is mandatory in order for patents to function in the way they are supposed to, e.g. in terms of facilitating risk mitigation and patents transactions and signaling value.

6.4 Practice what You Preach

The App Association together with The Coalition of Patent Fairness and The Software Alliance, acknowledge that the system is built for rewarding those investing resources in innovation by giving them a limited time of monopoly, but also allowing their innovation to teach others and laying the ground for future innovation. The cumulative nature of knowledge assets creates a need for disclosure, thus preventing the inventors from having to reinvent the wheel and making the system efficient in order to avoid market failures as mentioned above.

Interestingly, only one of companies that contributed with comments, GlaxoSmithKline (GSK), was not convinced that there actually is a problem with the current inaccuracy of ownership information. They instead proposed that the USPTO should examine the extent of this alleged inaccuracy and what the impact of those inaccuracies is, which this study has also identified. Although there are many indications of that this is a problem, there is no quantitative evidence of the costs and gains from transparency.

It is important to emphasize that the USPTO is not intentionally providing inaccurate and misleading data, they are strongly dependent on the data provided to them from the patent owners, i.e. if the companies chose not to give notice to their reassignments, then the USPTO's database will automatically be incorrect. Thus, a significant portion of the responsibility for accurate databases lies in the hands of the patents holders and their commitment to correctly report and provide accurate ownership information. When Microsoft initiated their commitment to transparency and made their full patent list public, they emphasized the importance of other companies following their actions, stating that all stakeholders of the patent system share the responsibility to improve it.

The irony here is that almost all companies commented that they believe transparency is a highly important issue, but should this not be mirrored in their actions? How come only Microsoft, and partly Qualcomm and Intellectual Ventures, have published their portfolios? In Qualcomm's case, does it have to take a billion dollar settlement concerning anticompetitive actions and lack of transparency for a company to reveal their patents? It is peculiar that no one of the strong believers in transparency, such as Hewlett-Packard and IBM have followed the footsteps of Microsoft. Although Microsoft and Intellectual Ventures claim that they uploaded their patents as an effort to be more transparent, they have done little to further encourage others and raise awareness of transparency. It is not impossible that their main intent was from a pure business perspective such as increased marketing or encouraging their competitors to reveal their patents. These three companies have despite the publication of the patents not taken any action to make sure that their records with the USPTO are completely correct, as this study has identified that all three of them have discrepancy between public and private portfolio due to several different reasons.

This complex structure of responsibility ties well with the framework developed by Petrusson (2004), where the administrative arena (USPTO), the judicial arena (US Congress, Courts etc.) and the business arena are all dependent of each other in order to achieve a functioning patent infrastructure where the true value of patents is unveiled and possible to leverage.

6.5 What is the Right Approach?

Even though the USPTO decided to withdraw the proposal, they are still working towards increasing transparency in different ways. The America Invents Act is still in action and more proposals will continue to emerge from the USPTO and the US Congress. However, as Petrusson (2004) emphasizes, the business arena is an international arena and the current Director of the USPTO, Michelle Lee stated that transparency is indeed international in scope. With the administrative and judicial arena being national, the business arena faces

multiple obstacles and issues worldwide. Solving the ownership transparency issue in the US does not solve all the problems in the business arena. However, it is a step in the right direction, not least because the US is such a patent intense nation with a significant amount of activity according to research performed by WIPO (2014). The question is then if the problem should be solved solely within the business arena, i.e. through actions taken by the companies instead of the patent offices and legislators? The identified problem with companies is that no one wants to take the first step, since the incentives depend on network effects. Even though Microsoft did try to promote their actions within transparency and encourage others to join, no other company than Intellectual Ventures followed, partly, in their footsteps. It requires the participation and action of multiple large companies in order to make an impact on the patent market.

Having concluded that, first of all, the system is not fully transparent when it comes to ownership and second of all that this can cause issues in the administrative, judicial and business arena, the question is what can be done? Both Chesbrough (2006) and the commenting companies have stated that administrative and legal costs related to reassignments can often deter companies from reporting changes in ownership. A large portion of these costs come from companies having to spend time keeping accurate internal records, however companies already spend a significant amount of resources when it comes to other types of administration. Looking at accounting as an example where companies keep highly accurate information, on one hand because this is regulated by law, especially for public companies, but on the other hand because companies see the obvious financial benefits of being transparent. Being able to attract financiers, gain trustworthiness and through that maintain a high share price is important for companies since no one wants to invest in a black box. Therefore, the USPTO could on one hand, in order to increase the accuracy of their database, lower the cost in relation to patent registration system, mainly by making it as easy as possible to submit and change information concerning patents. Secondly, they could also introduce the system of attributing a numerical code to each entity, eliminating problems with spelling errors, company structures and indistinct company names. Finally, maybe more importantly, they need to raise awareness to companies and the public of what benefits the disclosure of patent ownership can yield, it is very likely that the companies will not take serious action until they either see incentives such as clear financial benefits or it becomes a demand from their stakeholders.

7 CONCLUSIONS

In this chapter the concluding remarks of the thesis are presented together with a general discussion of the thesis and suggestions for further research.

7.1 Key Insights

This study has investigated the current US patent system and based on the analysis three key insights are highlighted.

1. Are the public patent records currently inaccurate in regard to patent ownership?

First of all, the results of this study point in the direction of the patent system not being transparent when it comes to being able to attribute correct ownership to a patent. There is a significant lack of accurate ownership information, where the public portfolio of Intellectual Ventures serves as an astonishing example of how non-transparent the system can actually be. Less than 2.5% of their patents can be found in the public database when performing a search on "Intellectual Ventures".

2. What are the key reasons why patent ownership information is inaccurate?

Secondly, there appears to be three reasons to why the system is currently not transparent when it comes to patent ownership information; inconsistent data entry, lack of patent reassignment notice and finally complex corporate structures. Some of the reasons are due to human error, and a significant portion of them is due to poorly regulated infrastructure and insufficient regulations for patents. This lack of administrative structure can by some companies be used in a strategic way, with the purpose to hide their assets. Thus, lack of reassignment notice and complex corporate structures were identified as the most frequent source of inaccuracies. However, everyone is not aware of this lack of ownership transparency, which creates information asymmetry and people basing decisions and strategies on inaccurate data.

3. If updating the patent records with accurate ownership information would be mandatory, would this entail any impact to the industry and society?

Thirdly, the lack of ownership transparency creates asymmetry. The lack of accurate ownership information creates, for example, an obstacle for innovators to find owners to patents which they wish to license. In addition, the lack of transparency creates obstacles for patent holders in terms of risk management, since they do not know from where risks might emerge and the extent of the risks, when they are sued by a patent assertion entity where the ultimate owner is unknown. A major reason for the asymmetries and non-transparency is that companies have several strategic and financial incentives not to be transparent but no, or few, incentives to be transparent when it comes to ownership. Based on this, the study has found indications that there are benefits that would arise from accurate ownership information, such as facilitating risk management for patent owners. However, in order to show the actual impact mandatory updates of ownership information could have, case studies need to be performed looking at financial and strategic impact for the players in the patent field.

Based on the empirical investigation, it is evident that the responsibility for accurate patent ownership information lies in the hands of the patent holder's (business arena), the USPTO (administrative arena) as well as the US Congress and Courts (judicial arena). The reason for this is the link and interaction between the three arenas, what happens in one arena has impact on the others. Thus, in order to remedy current inaccuracies, all of these stakeholders and arena participants need to be involved and committed. The patent system is not performing to its fullest potential, which Petrusson (2004) explains through saying that IP as an asset class is still immature, due to its intangible nature. However, this study has also identified that in order for a change to be accepted, evidence of monetary cost and gains needs to be presented. This study has unveiled the complexity of ownership transparency and the errors which have lead to inaccuracy, thus the next step is to investigate the economic perspective of this and looking into specific cases where the lack of accurate ownership information caused problems for a patent owner.

7.2 General Discussion

This study has shown the true complexity of the patent system, thus the authors' faced several difficulties trying to collect empirical findings. First of all, companies are not willing to disclose the extent of their actual patent portfolio. The response from many companies was that this is confidential, even though it is essentially supposed to be public information, especially the granted patents. Therefore, the number of companies researched in this study was limited and the validity would have increased if more companies were studied.

Secondly, the study further faced issues of how non-user friendly the public databases are. It is difficult to comprehend how inaccurate and non-transparent the patent system really is at a first glance - it requires several searches and access to a company's actual patent portfolio to identify the issues. Therefore, the public is often unaware of the fact that these issues actually exist, as well as the consequences of insufficient transparency that this study has identified.

7.3 Suggestions for Further Research

From a business arena perspective, the data collected for this study was mainly public information and has only looked at the surface from a company perspective. It would therefore be interesting to perform more in-depth studies and look at the internal problems companies have with patent data and how they manage their patents, i.e. chose one company and try to unravel what specific reasons to inaccuracy that company has, how that has affected them and how they interact with the USPTO.

From an administrative arena perspective, a suggestion for further research could be to investigate the procedures of the USPTO and how they can be optimized in order to minimize the risks of human error. The different weaknesses of the US patent system have been briefly discussed in this study, however the study could further expand where each of weaknesses can be further analyzed with clear suggestions to how they can be improved. This study was limited to only research the US patent system; hence a continuation of the study could be to investigate if transparency is a common feature in other nations' patent offices. Is there any

country that has taken regulatory actions to improve transparency and if so, what are the results?

Further more, patents have been the only intellectual property right of this study, however trademarks are also an IPR which has an administrative arena. Thus an interesting continuation could be to study how transparent the trademark records and databases are. Trademarks have less impact on a company's technology roadmap, instead they are more important from a marketing and brand management perspective, therefore inaccuracy will have a different impact.

Finally, this study has aimed to identify the errors and affects of transparency. Thus a continuation would be to look into specific case studies of different companies, where the lack of accurate information has lead to certain cost and or gains, and quantify these to understand the financial impact on the lack of transparency.

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9 APPENDIX

Appendix 1: List of all organizations commenting (individual comments are excluded)

A. Intellectual Property Organizations and other Associations

1. ACT | the App Association
2. American Intellectual Property Law Association
3. Boston Patent Law Association
4. BSA | The Software Alliance
5. Chartered Institute of Patent Attorneys
6. Coalition for Patent Fairness
7. Electronic Frontier Foundation
8. Engine Advocacy
9. Innovation Alliance
10. Intellectual Property Owners Association
11. International Association for the Protection of Intellectual Property of Japan
12. Internet Association
13. Japan Intellectual Property Association
14. LES Japan
15. Medical Device Manufacturers Association
16. Minnesota Intellectual Property Law Association
17. National Venture Capital Association
18. New York Intellectual Property Law Association
19. Pharmaceutical Research and Manufacturers of America
20. Public Knowledge
21. San Francisco Intellectual Property Law Association
22. Software & Information Industry Association
23. Washington State Patent Law Association

B. Academic and Research Institutions

1. Association of American Universities, American Council on Education, Association of American Medical Colleges, Association of Public and Land-grant Universities, Association of University Technology Managers, Council on Governmental Relations
2. Boston University
3. University of California
4. Washington Alumni Research Foundation

C. Law Firms

1. Neifeld, Richard
2. Ollif, PLC
3. Schwegman Lundberg & Woessner, P.A.

D. Companies

1. Cook Group
2. Dell Inc. and Cisco Systems, Inc.
3. GlaxoSmithKline LLC
4. Hewlett-Packard Company
5. IBM Corporation
6. Intellectual Ventures
7. Microsoft
8. Novartis
9. Ocean Tomo
10. Oracle
11. Patentbooks, Inc.
12. Pfizer
13. Toyota
14. Wayfinder Digital