

Typology of the patent troll business

Tim Pohlmann¹ and Marieke Opitz²

¹Innovation Economics, Berlin University of Technology, Mueller-Breslau-Strasse 15, VWS 2, 10623 Berlin, Germany. tim.pohlmann@tu-berlin.de

²Department of Technology and Innovation Management, University of Marburg, Marburg, Germany. opitz@wiwi.uni-marburg.de

Patent trolls have many faces, since the media uses this expression in various ways. The patent troll phenomenon thus seems to be an ambiguous term that is discussed in several directions. This paper reveals that a patent troll as such has no distinct shape or appearance. Our analysis redeems a troll classification solely from firms' market position, such as being nonpracticing, and shows that a patent troll business can only be defined by the respective practice to enforce intellectual property rights (IPR). Using 10 case studies, of which five are treated in detail, the analysis reveals a distinct typology of IPR enforcement mechanisms and suggests a framework to assess the troll business and its effects. This paper furthermore identifies the nature of troll behavior to be: (a) a practice to enforce IP rights enabling repayments for earlier innovation investments and (b) a strategy that may create costs to affected industries. The differentiated troll analysis reveals negative but also positive effects of the troll business on incentives to innovate.

1. Introduction

Technological change and market pace have drastically increased during the past decades. This can especially be observed in the field of information and communication technologies (ICT) where product lifecycles decrease and technology develops to be more complex (Blind and Gauch, 2008). Simultaneously, firms increasingly file patents as a key strategic mean to compete in ICT markets (Benassi and Di Minin, 2009). This development is a challenge for the patent systems, and the growing lack of transparency creates legal uncertainty for numerous firms. During the past years, analysis have provided evidence for a strong concentration of patent files which in some technological fields even yields patent thickets, a web of overlapping patents that protect similar innovations (Shapiro, 2001). ICT technologies are often subject to a fragmented ownership of intellectual property. This allows firms to peruse new

strategies to generate revenue from IPR. In this context, popular litigation cases have revealed a special bargaining position for nonpractising entities (NPEs) to enforce their rights (Merges, 2009). Two manufacturers which infringe each other's patents often settle and negotiate cross-licensing agreements. However, an entity that does not produce or sell products, and thus not infringes patented technologies, and will not cross license (Lemley, 2007). NPEs new way of enforcing IPR has brought up the rather negative term of 'patent troll'.

A patent troll is a person or entity who acquires ownership of a patent without the intention of actually using it to produce a product, and in many cases did not engage in developing the technology (McDonough, 2006; Ohly, 2008). In most cases, trolls are not inventors who pursue their own research, offer it for sale, or provide early licenses. They rather defend their rights against infringements. These entities – opportunistically or on purpose – profit

from payments by companies that inadvertently infringe on the trolls' intellectual property rights (Henkel and Reitzig, 2008). There is the fear that these in most cases small entities use courts as a mechanism to extract economic rents from large companies (Ball and Kesan, 2009; Bessen et al., 2011). The term: 'patent troll' is legally not established. It is a negative synonym used for nonmanufacturing entities (NPE) and was popularized by the Intel Manager Peter Detkin in 2001, who used the term to describe TechSearch and their lawyers during a patent litigation case. Other related expressions are patent marketer, patent dealer, and patent shark or are pictured by a comparison like David vs Goliath (Niro and Greenspoon, 2007; Chien, 2009). However, several literature sources criticize these negative associations and demand for a more specific classification of patent trolls (Geradin et al., 2011). This paper sheds light on patent troll practices and establishes a typology of the patent troll business.

Most contributions in the literature stereotype the troll business to certain characteristics: being non-practicing, or strategically wait and hide to receive higher royalties. This paper analyzes and evaluates 10 use cases to reveal new insights on characteristics of patent trolls that go beyond broad classifications. In our approach, we establish a typology of IPR enforcement mechanisms. We systematically select 10 use cases that illustrate different facets of IPR enforcement connected to troll behavior, and identify types of practices. We then more precisely delimit troll strategies from other IPR enforcement mechanism and assess whether the troll business can be beneficial or harmful for manufacturers, innovators, and industries. Due to our precise analysis of patent troll strategies, we are able to stipulate troll behavior and its effects. On the one hand, we find evidence that trolls' practices can be adverse for whole industries and slow down innovation processes. On the other hand however, we reveal that in some cases, the troll business constitutes a mechanism to disrupt unbalanced market constellations and thus supports innovation. We claim that the assessment of patent troll activities and its impacts are often subject to complex licensing agreements or competitive market rivalry and have to be evaluated in more detail. Our 10 use cases provide new insights on patent troll activities to better understand and assess the role of patent trolls in technology markets.

The paper is structured as follows: first, we give a review of the literature and reveal implications on trolls' business models. Second, we analyze contributions from the current research and derive our research questions. In our empirical analysis, we present our methodology and describe five in-depth

case studies to frame our typology. We scale five further cases to our typology and discuss different troll strategies and its effect on innovation incentives. We end the paper in a conclusion to deduce our policy recommendations and discuss practical implications.

2. The business model: patent troll

The troll business seems to follow a defined structure: evaluate, purchase, and secure patents; hide until the market for a certain technology develops and the patents become economically indispensable; and finally turn patents against manufacturers to obtain high royalty fees (Steiner and Guth, 2005). Trolls are usually solely interested in the exclusion right, not in the underlying knowledge (Fischer and Henkel, 2009). Patent trolls appear when the targeted product has already become a key or basic technology, and irreversible investments have been made by the unaware infringer. In this lock-in situation, firms are often not able to invent around or even stop using the technology. From an infringer's perspective, the costs of not using the patented technology are (a) cost of the loss of future profits and (b) cost of investing in alternative technologies. These costs increase along phases of technology implementation. In most cases, affected companies already infringed the IPR when the troll raises its claims. Trolls avoid the established rationales of understanding firms' patent-based cooperation of either exclusion or cross-licensing to coexist (Henkel and Reitzig, 2008). Hence, they seem to be in a position to negotiate licensing fees that are grossly out of alignment with their contribution to the alleged infringer's product or service. Troll's special bargaining power tends to result in opportunistic behavior so that the troll claims excessive compensation (Sag and Rohde, 2006). However, the troll business is also attached to many risks. When patent trolls acquire patents from auctions, firm bankruptcy cases, or small private inventors, the value and validity of these patents is not always obvious. It is thus difficult to foresee whether a patent would hold in a court decision or not. Especially in the United States, litigation cases are expensive for all the involved parties. Loosing such cases yields significant financial losses (Bessen et al., 2011). The market for patents is thus subject to unpredictable outcomes. Especially in ICT industries where patents are often closely related to multiple products, it is often unclear to which extend patent claims are infringed or not (Bessen and Meurer, 2008).

Today's patent trolls seem to place their bets on corporate carelessness or monitoring deficiency i.e.

to perform a patent search and have better information at an earlier stage about patents likely to be issued. In industries where patenting is difficult to oversee, it is in some cases more cost-efficient for manufacturers to not pursue patent searches and try to stay under the radar (Luman and Dodson, 2006). However, with multiple overlapping patents, and in a system in which patent applications are secret and patents slow to issue, there is a major threat of hold-up problems for manufacturing companies (Shapiro, 2001).

In the context of standardization, strategic patent behavior has also led to contentions. The litigation case of Rambus, the company that was associated first with the so-called 'patent ambush' behavior, raised the attention of antitrust authorities and reinforced the political discussion about IP regulations concerning standards (Tansey et al., 2005; Hovenkamp, 2008; Bessen and Levinson, 2009; Devlin, 2009). Patent ambush accrues when companies that participate in standard setting withhold information of essential IPR and in hindsight assert standard implementers for infringement.

Patent extortion will remain a viable strategy in technologically crowded industries when trolls choose patents on inventions that can be invented around rather easily before infringement, but are sufficiently sophisticated to be upheld in court and create significant midterm switching costs for manufacturers after infringement (Henkel and Reitzig, 2007). There also has been a discussion in the US media if universities are patent trolls. Universities are nonpracticing-entities that share some characteristics with trolls (McDonough, 2006). Though, the differences are, that (a) the universities do not hide their patents, and (b) most universities offer fair license agreements to provide valuable know-how and increase technology transfer (Lemley, 2007).

3. Literature on patent trolls

The troll business has been studied in several articles (Golden, 2007; Lemley, 2007; Magliocca, 2007) but provided little empirical evidence on troll-type behavior (Lerner, 2006; Reitzig et al., 2010). However, empirical studies have revealed various troll cases and its sustainability to policy changes (Henkel and Reitzig, 2007; Reitzig et al., 2007, 2010). Data on patent troll practices is often scarce since most infringement cases involving patent trolls do not reach court. The infringer rather settles the dispute by paying royalty fees, being afraid of high legal costs and lengthy litigation (Fischer and Henkel, 2009). Reitzig et al. (2007) pick up on the

patent troll phenomenon and examine it from a theoretical perspective, encompassing legal, managerial, and economic aspects. The main finding is that the unrealistic high compensation through court ruling is the central stipulation for trolls to operate cost-efficient. Nevertheless, first empirical analyses have revealed that the increase in litigation cases was not necessarily caused by NPEs (Bessen and Meurer, 2008). Chien (2009) gives evidence that NPEs only caused a minority of patent suits: 17% of high-tech patent suits in the examined period. However, they often name multiple defendants, and sometimes rather than sue, are sued, for declaratory judgment. Furthermore, financial losses for convicted infringers were significantly high and thus constituted major cases of patent litigation (Bessen et al., 2011). A key finding in the study of PricewaterhouseCoopers is that damage awards for patent trolls are in average twice as high as those for practicing entities. Nevertheless, NPEs have only been successful in 29% of the cases versus 41% for practicing entities (Levko et al., 2009). Fischer and Henkel (2009) investigate a data set of 565 patents acquired by known patent trolls between 1997 and 2007, and compared them to 1,130 patents acquired by practicing firms. They disprove the common belief that patent trolls focus only on minor technologies. Trolls' patents are of significantly higher quality than those in the control groups. This finding provides evidence that the patent troll business method is sustainable in the long run and cannot be terminated by lifting minimum patent quality (Fischer and Henkel, 2009). Reitzig et al. (2010) further find evidence for a transition of the troll business. The number of patent trolls that acquire or in-license patents decreases, while the number of trolls becoming professional patent exploiters increases. The patent database of infringement litigation information from the Stanford Law School's Intellectual Property Litigation Clearinghouse (IPLC) was evaluated in the article of Shrestha (2010). The analysis tests some of the arguments made in favor and against patent trolls and determines whether these firms have a positive or negative effect on innovation. However, the study does not reveal a conclusive result. Patent trolls may contribute to legal uncertainty for innovating manufacturers since unforeseeable royalty payments are often multiple of what the victim, as a legitimate licensee, would have been willing to pay ex-ante (Reitzig et al., 2007). A basic problem is the asymmetric information between trolls and unintentional infringers; companies often do not even know the troll's IPR exists. For the last decades, R&D multinationals have been building up patent thickets of often rather incremental inventions. Nevertheless, these means of

protection itself may contribute to a thicket of dense patent files. It is a challenge to overlook the overlapping claims of patent rights requiring that those seeking to commercialize new technology obtain licenses from multiple patentees (Shapiro, 2001).

While some empirical findings have shown that also single inventors who sell their patents do not necessarily benefit from patent trolls (Bessen et al., 2011; Tucker, 2011), NPEs and their supporters claim that patent trolls enhance innovation and market competition by providing capital to independent inventors and creating an efficient market for technology (Geradin et al., 2011). A well-functioning patent system relies on a working system of IPR enforcement. From the perspective of small inventors, patent filing is no mean to protect products from infringement when the enforcement of rights is financially too risky. In many cases, enforcement of patents is only applicable when firms have access to a considerable amount of financial resources. Markets for patents are thus a solution to sell rights or license rights of enforcement to third parties with higher financial capabilities (Rubin, 2007; Schmalensee, 2009; Shrestha, 2010; Tarantino, 2010). Policy makers have given remarkable regard to this topic (e.g. U.S. Federal Trade Commission, 2003; Lemley, 2007) and discuss suggestions for patent reforms based on legal implications and empirical findings.

Current literature contributions are yet far from conclusive in consistently defining patent trolls' strategies and in estimating potential threads or benefits that accrue from patent trolls' practices. Arguments in the literature are often two minded, and there is a lack of articles, which consider and compare different perspectives of manufacturing companies, single inventors, and NPEs. Furthermore, empirical analyses have only focused on outcomes of patent troll litigation cases without sufficiently investigating a counterfactual scenario or analyzing cases that have not reached courts (Chien, 2009; Levko et al., 2009; Bessen et al., 2011). Comparing litigation cases or enforcement practices of manufacturers and non-manufacturers is not sufficient to measure the effects of patent troll practices. In addition, complex market structures have to be analyzed in more detail, especially when considering a dense web of patents and licensing agreements among multiple entities. In this paper, we therefore seek to shed light on different IPR enforcement practices to more precisely delimit patent troll strategies from other business models. We therefore raise the question:

1. Which IPR enforcement strategies define the patent troll business and delimit trolls' behavior from other IPR enforcement practices?

In regard to current literature findings on possible impacts of patent trolls, we seek to investigate in more detail how troll behavior has influenced other market participants. We also seek to analyze patent troll cases that have not reached courts yet. Our goal is to compare and analyze different market structures and enforcement practices of troll cases to answer the following research question:

2. Which troll practices determine positive or negative impacts in regard to financial losses, incentives to innovate, and a level playing field for market participants?

4. Methodology

We use a qualitative data analysis approach since our research goal is to understand underlying relationships of current theory and quantitative literature findings (Mintzberg, 1979). The case study research design was chosen to obtain a detailed picture of patent troll behavior. Qualitative case studies are a suitable approach to explore patterns of specific processes (Creswell, 1994; Stake, 1995). Furthermore, the case study approach is an appropriate research tool when boundaries between phenomena are not conclusive yet (Yin, 2009). In order to precisely study distinct mechanisms of a troll's strategy to enforce IPR, we chose 10 cases from the public media but also from nonpublic interviews to illustrate a comprehensive picture of the troll phenomenon. Eisenhardt (1989) suggests 10 cases to be an adequate number for a research setting, while less than four cases are often unconvincing, and more than 10 cases increase complexity. We systematically added cases as long as the incremental improvement of information was high enough to answer our research question.

Even though we seek to identify yet not analyzed troll-specific strategies, the choice of cases was done in regard to theory-based descriptions of troll behavior. To investigate transparent and observable strategies of patent trolls, we chose cases that present extreme situations and polar types of troll practices. Furthermore, we chose cases from different industries with involved firms of different size and market share (see Tables 2 and 3). We use this heterogenic population of cases to better answer our research question and to be able generalize our findings. As to Eisenhardt (1989) a heterogenic research sample of use cases is beneficial if specific processes are analyzed and the research seeks to account for extraneous variation.

In order to reveal insights from different perspectives on patent trolls, in-depth analysis of five

Table 1. Cases and interviews used in our analysis

Cases	Plaintiff	Defendant	Third party
Papst Licensing GmbH & Co. KG	Members of the board (Two interviews)	No interviews conducted	Noninvolved attorney (One interview)
Alliacense (TPL group)	Members of the board (One interview)	One affected company (One interview)	German association (One interview)
IP Com vs Nokia	Members of the board (Two interviews)	Attorney (One interview)	Noninvolved attorney (One interview)
Sisvel S.p.A.	Members of the board (One interview)	Attorney (One interview)	Noninvolved attorney (One interview)
EpicRealm	No interviews conducted	Attorney (One interview)	International Association (One interview)
Amazon Inc. vs Barnesandnoble LLC	No interviews conducted	No interviews conducted	Noninvolved attorney (One interview)
Excel Communications vs AT&T	No interviews conducted	No interviews conducted	Noninvolved researcher (One interview)
NTP vs RIM	No interviews conducted	No interviews conducted	Noninvolved attorney (Two interviews)
eBay Inc. vs MercExchange, L.L.C.	No interviews conducted	No interviews conducted	Noninvolved attorney (Two interviews)
HIPPO vs Panasonic	Affected company (One interview)	No interviews conducted	No interviews conducted

selected cases was conducted by interviewing multiple involved parties. The choice and performance of interviews, recording methods such as alignment and analysis followed an interpretative case study approach (Walsham, 1993). Interviews were held by a team of two investigators where one interviewer was responsible for the questions and one was taking notes. This enables the interviewer to focus on the questions, while the second investigator remains to have an observing and rather distant view (Eisenhardt, 1989). We followed a multiple investigator approach to gain complementary understandings. Different perspectives increase the likelihood of novel insights and convergence of observations from multiple interviewers enhances the confidence in the findings (Yin, 2009).

All 15 interviews were transcribed, and the use of information was permitted by all the participants. Since all cases are very specific and allow implications in several directions, a standard questionnaire was used but extended on a case by case basis. In order to take advantage of the uniqueness of each case, it is legitimate to add or change questions in theory building research. This enhances the understanding of individual cases and allows investigation in as much depth as feasible (Eisenhardt, 1989; Yin, 2009). If it was not possible to talk to both sides (plaintiff and defendant) other concerned parties were interviewed. For instance, we discussed with noninvolved attorneys and experts about possible

implications of cases that were public in the media. Thus, all cases build upon comprehensive sources of information (Table 1).

Using techniques and analyzing methods by Miles and Huberman (1994), we were able to compare, relate, and classify different statements and expert estimates. We were thus able to identify distinct patterns and themes to conduct the following case reports (Stake, 1995).

5. Case study analysis

The commercialization and enforcement of patents is a rather complex issue which, as one could observe over the last years, can be practiced in many ways. Patent owners who are trying to enforce their claims face several alternatives. Not every commercialization of patents, even by companies without innovating or manufacturing activities, is an example for typical patent-troll behavior. There is a clear need to differentiate between various ways of how patent owners proceed. Our five in-depth case studies outline distinct strategies and business activities of patent commercializing companies.

5.1. Case study: Papst Licensing GmbH & Co. KG

The first case describes the company Papst Licensing GmbH & Co. KG. Papst Licensing is a globally

operating patent licensing company which has dealt with property rights since 1993 and has since signed up more than 130 licensing agreements. The licensees include companies such as Sony, IBM, Toshiba, and many other big players. There are no outside investors involved yet. The firm is specialized on the sectors of electrical engineering and precision engineering. These industries are very suitable because products in these markets often use a variety of patented technologies. Papst Licensing describes its activities as the detection of patent infringement and thereby usually follows a common practice. The company has about 15 employees, including patent attorneys, lawyers, engineers, and economists. On the one hand, the company searches for patent auctions in insolvency registers or the press. On the other hand, it also approaches medium-sized companies that want to enforce their rights. Papst Licensing represents mostly German companies that operate internationally and where patents have already been infringed.

In a first step, Papst Licensing validates the legal characteristics of the patent. The patent has to be registered in a formally correct way and must not already belong to the so-called state of the art.¹ Afterwards, potentially infringing products are decomposed into components and tested in technical laboratories. Technical analysis is done by engineers; patent attorneys afterward ascertain a possible patent infringement. In an economic evaluation procedure, products are later examined for their market potential and the technology for its potential degree of standardization. Papst Licensing refers to this as 'infringement volume'. Papst Licensing works with external service providers, especially with patent law offices and market analysts in the respective countries.

After this thorough assessment, Papst Licensing buys the patents to have a stronger bargaining position in court. Papst Licensing takes over the risk of commercialization; although the original patent holder receives a cash sum that consists of fixed and variable components. Papst especially targets companies that are active in the United States, due to larger markets, and hence a higher infringement volume. After asking infringing firms for royalty payments, they are pressured with injunctions. About 10–20% of all cases are taken to court. The high court costs and the extent of triple damages in US courts are effective means of obtaining out of court settlements.

In the following, we describe the case of Papst Licensing versus Minebea Co. Ltd in more detail. Minebea is a Japanese manufacturer of miniature ball bearings, which for instance can be found in CPU fans. The company has been active in this field since 1968. It operates globally with more than 49 000 employees and has its own large R&D department.

Last year, it generated sales of 2.1 billion USD. Prior to the dispute with Minebea, Papst Licensing had sued several major manufacturers, including IBM and Western Digital, for patent infringement on computer hard drives. Western Digital, for example, has paid Papst Licensing 24 million USD for a license; the sum total of the licenses is estimated to range over 100 million USD. In response, Minebea, which serves these manufacturers as supplier of motors, sued Papst Licensing for violation and abuse of license agreements. Through Papst Licensing's long-time experience in patent evaluation and enforcement in US courts, the US District Court in Washington dismissed the action of Minebea after 10 years of hearings in 2006. During trials in the United States, Minebea was advocated by Welsh & Katz Ltd law firm. Minebea had to drop the claims of 500 million USD and had to pay Papst Licensing a compensation of 5 million Euros.

Papst Licensing interprets this as a lawful confirmation of both its business model and its licensing programs.

5.2. Case study: Alliacense [Technology Properties LTD (TPL) group]

The next case study describes the US company, Alliacense, which accused German end-producers in the electronic and electrical industry of patent infringement, mainly members of the ZVEI (Central Association of Electrical and Electronic Manufacturers Germany). Alliacense is a wholly owned subsidiary of the TPL Group, which has been active in developing, marketing, and licensing intellectual property rights since 1988. The TPL Group also includes the manufacturing company IntellaSys, founded in 2005, and develops and produces processor solutions. It is believed that the manufacturing subsidiary company was founded to counter accusations of the TPL Group being a patent troll.

Alliacense holds four IP portfolios and is responsible for the management of the license rights. The portfolios include technologies from the vast field of electronics. The patents are usually acquired through purchase or merger of the companies that have invented the technology. In the case known to us, Alliacense has used the Moore microprocessor patent (MMP) Portfolio which is one out of the four portfolios. The patents protect fundamental design techniques for improved performance of microprocessors that are used in products of many industries such as mobile phones, home appliances, and cars. The MMP portfolio includes seven US patents as well as their German and Japanese equivalents, which are valid until 2015.

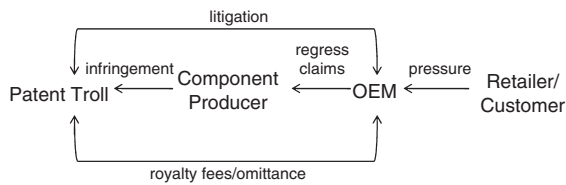


Figure 1. Troll strategy to enforce intellectual property rights (IPR) in the value chain.

The accused German companies are small and large system manufacturers which install microprocessors into their devices. So far, Alliacense asked only those companies, which distributed their products on the American market to pay royalties. Alliacense specifically targets end-producers on downstream markets and not the microprocessor manufacturers directly. It proceeds cross-industry against infringers and communicates clearly that companies, which are the first to pay a license, get significant discounts compared to their competitors. The procedure of Alliacense can be illustrated by using a simplified sketch of a possible value chain (Figure 1).

The potential patent troll, in this case Alliacense, does not address the component manufacturer, whose microprocessors infringe the patent, but the system manufacturer (original equipment manufacturer, OEM), which implements these processors in its devices. The reason why Alliacense chooses this strategy could first be due to the fact that higher license fee payments can be demanded from an OEM because the processor is installed in a product of higher quality. In contrast, the built-in microprocessor itself usually has a smaller value. Alliacense also uses the potential pressure from retailers and customers, since OEMs are bound to deliver their products to a downstream market. If, due to patent infringements, OEMs are not able to supply, retailers may threaten them with terminating existing contracts.

Following a strategy by offering lower royalties to first movers, Alliacense is able to build up considerable pressure between competing market participants. Similar to a prisoner's dilemma cooperation – i.e. everyone not paying license fees – would be the best strategy for all patent infringing competitors. However due to risk aversion, pressure from retailers and strong incentives to be the first and get favorable licensing terms, one company might choose to free-ride to apply first for a license. In consequence, others are also urged to enter license agreements, especially if the first mover is an influential company. This way, Alliacense benefits from additional market pressures between competing potential licensees.

Alliacense's patents are of high quality and grounded on patent law. However, in some cases the scope of the patent claim does not affect the technology of the accused company. Since potential infringers are under great pressure, the license is in many cases paid without further analyses of patent claims. These reactions are subject to the conflicting interests of departments within a company. Given an infringement charge, the legal department usually considers more time to carefully check whether there are legal ways to bring down the patent or whether the patent is actually infringing by the company's technology. A company's sales division however fears the pressure of customers and is therefore interested in a quick solution by means of a payment.

If the OEM does not agree to royalty claims, Alliacense usually sues these companies in court. Some German companies are currently involved in litigation in the United States. Affected OEMs often try to make the component manufacturer recouse. Thus, on the one hand, transaction costs accrue for the OEM. On the other hand, some microprocessor manufacturers have already passed over to withdrawing guarantees on their products being free of third party rights. Based on these observations, it can be shown that for enforcing its IPR, Alliacense opportunistically makes use of market pressures and competition among competing infringers.

It is expected that Alliacense will also accuse OEMs on the German market. In a message from February 2, 2009, the German Patent Court in Munich confirmed the validity of a patent from the MMP portfolio. This suggests that Alliacense is planning to increase its presence on the German and European market.

5.3. Case study: IP Com

The next case study describes the Munich-based company IP Com, which describes itself as a patent management company.

IP Com GmbH & Co KG was founded in 2007 and currently has 10 employees. They are highly skilled economists, engineers, and legal academics. The company works with more than 10 outsourced firms and employs several engineers and research agencies to conduct detailed market and company inquiries. Funding source is the US investment company Fortress, which currently maintains 34 billion USD. It acts as a general partner in the GmbH & Co KG.

The business model of the company focuses on two groups of customers that IP Com can serve because of their particular market position. The

activities of the company are limited to the management of patents; implementation or research is not part of the business model. A future goal is to serve the customer group of small innovative inventors and entrepreneurs. Due to the lack of financial resources and experience, these small and medium enterprises (SMEs) cannot enforce patented innovations. The big players in the market normally innovate in-house and show little interest in small inventors. IP Com is trying to fill this gap and communicate promising innovations to manufacturing companies. In this case, licensees would be enlisted which have not yet infringed the relevant patent. The customer group of small inventors is not yet served, and it remains open whether this will be taken into account in the future business model. The second group of customers are large manufacturing companies, which are vertically integrated and often possess unused patent portfolios. Some big companies cannot use their patents as a result of specific market dependencies. Vertically integrated players often conduct so-called silent cross-licensing agreements, where IPR among other manufacturers is mutually used without paying royalties. Due to powerful market positions of large companies, these market-sharing strategies are not necessarily equally balanced. Being a non-innovating and nonproducing company, IP Com buys these unlicensed patents in order to enforce them profitably. Since IP Com is not active in the market, it is not vulnerable to attack or blackmail by them with market power. The ownership transfer of patents from vertically integrated companies to IP Com enables IP Com to take advantage of this independent market position.

In 2007, IP Com purchased a patent portfolio of the Bosch GmbH for an unknown amount. The portfolio has over 1000 patents in the mobile communication area. One fourth of these patents are essential to standardized wireless technologies like GSM, GPRS, or UMTS. These patents are essential to widely adopted standards in the industry and are used by almost all market participants in the mobile communication sector. The patents are all registered in Europe, and 50% of them in the most relevant markets such as in the United States, Japan, China, and Korea. Bosch developed this patent portfolio between 1983 and 2000 and was, in these early stages of mobile technology, seen as a pioneer in the field. Bosch was involved in the development of transmission standards and has participated in many standardization committees. For the development of these innovations, Bosch spent an estimated 8 billion EUR. Bosch was only active in the mobile industry until 2000, and then sold its mobile sector to Siemens AG. Bosch retained the patent portfolio,

since it was difficult to assess patents on their economic benefits at this time, and Siemens could not make an acceptable offer. Because Bosch had turned away from the mobile communication industry, it tried to exploit the unused patents and requested licenses. Nokia had used many of the innovations concerned. Bosch however was not able to get Nokia to pay license fees. Nokia threatened Bosch with counter lawsuits, and even with the reversal of computer chip orders. For Bosch, Nokia is an important customer and thus, Bosch had no economically lucrative way to enforce their patents. In 2007, it was decided to sell the portfolio, but Nokia was not interested in buying it at that time. It is believed that Nokia expected a sell to another market participant. During that time, Nokia held a market share of around 40% and was by far the strongest player in the market. This market power could have helped Nokia not pay any licenses, like with Bosch. The purchase by IP Com was a surprise to Nokia.

Since the acquisition of the patent portfolio, IP Com is enforcing these patents worldwide. The procedure follows a very professional strategy. In a first step, the patents are legally examined with the help of the attorney office Frohwitter Munich. The second step is an economic assessment. About 35 out of 160 patent families could be identified as essential patents to communication standards. Therefore, the whole market volume in the telecommunication sector reflects the value of these patents. Violation of the remaining patents is determined by using engineer consultants. The relevant mobile devices are set apart and examined very carefully in their individual components. The second phase is technical negotiation with the infringing companies. IP Com meets worldwide with the engineers of the companies to technically introduce the patents. All information about the patents in question is disclosed so that the affected companies have an accurate picture of the scope, duration, or even counter-patents. Usually, the technical negotiations do not exceed three to five meetings. From this point on, commercial negotiation begins. IP Com conducts previous thorough research in order to reveal all business activities of the respective company. This is done by the so-called research offices, mandated by IP Com, which claim to be reading up to 160 analysts' reports per week. The focus is to identify the future strategy of the infringing companies and thus observe their activities in each country accurately. Therefore, relevant markets are constantly monitored, to be able to enforce license payments effectively. If the commercial negotiations are not successful, IP Com has to assert its intellectual property rights by legal action. Probably

the best known litigation case in the media is Nokia versus IP Com.

After the purchase of the patent portfolio, IP Com tried to agree on a royalty payment with Nokia. However, Nokia was not willing to pay, and IP Com had to enforce its patent rights. It is particularly interesting that for the first time, the amount of the royalty was negotiated in court. Courts often only decide on the patent infringement. For cost reasons, the license amount is usually negotiated out of court. The case with Nokia is currently being heard at the patent courts in Mannheim and Dusseldorf. For determining the amount of the license fee, there are two methods of calculation. First, IP Com can present a report prepared by Nokia themselves, by which one can calculate licenses due to the importance of the patents for the whole product. This report was commissioned by Nokia in an earlier case where Nokia was the plaintiff. This report states that one can demand 1–1.5% revenue share per essential patent. The calculation flattens toward the top because of the cumulative license. As to the report for four to five infringed essential patents, one can demand a revenue share of approximately 4–5%. In the Nokia case, one can thus calculate an amount of 12 billion EUR. But Nokia did not agree with its own calculation model and pleaded for distortion of competition. Second, the two patent courts will determine a FRAND² (fair, reasonable, and nondiscriminating) license. This form of royalty calculation is used particularly in industries and sectors with technology standards that are used by all market participants. A license determination can thus be uniformly established for essential patents on standards. 'Fair' is to ensure that the license does not support competitive dominance of a market participant. 'Reasonable' is aimed at a proportionate license, which especially considers the importance of the patent for the whole product. 'Nondiscriminatory' stands for equal treatment of each licensee. However, especially the term 'reasonable' is criticized to be a rather vague definition (Rysman and Simcoe, 2011).

The lawsuit will still be running for at least one or two years until an accurate determination of the license is complete. It costs several million USD per month. With a positive court decision, IP Com expects other infringing companies to accept the amount of a FRAND license, too.

5.4. Case study: Sisvel S.p.A.

Sisvel S.p.A. is an Italian-based company that started as a manufacturer of televisions in 1982 and has dealt with IPR since 1986. Sisvel also acts as a patent pool administrator, e.g. for the MPEG audio patent pool

and is currently planning a patent pool for long term evolution (LTE) technologies. Sisvel focuses on the entertainment industry and holds a portfolio of almost 500 patents. Major clients, including firms like Phillips, Apple, or Creative Labs, have outsourced their patent commercialization activities to Sisvel. The firm became famous for pushing the claims on a patent on a volume bar in TV sets, which visually increases according to the sound volume.

For several years, Sisvel manages patents protecting MP3 and MPEG4 technologies for companies such as France Telecom, Telediffusion De France, Philips Electronics, and the Institut für Rundfunktechnik (IRT). The following case shows how Sisvel proceeds to enforce and effectively license those patents. The case study particularly stresses the strategies used to commercialize patents and shows how licensees are being coerced to immediate release high royalty payments.

Just a few days prior to the CeBIT 2008 fair in Hanover, Sisvel S.p.A. sent requests for license payments to more than 40 exhibitors. Requests were up to a three-digit-million USD range and could therefore not be incurred immediately. Since IPR infringement is a crime in Germany, Sisvel was able to sue nearly 40 electronics manufacturers and their chief executive officers (CEOs). As a consequence, more than 200 constables confiscated products like MP3 players, DVD players with MP3 function, global positioning system or GPS devices and mobile phones at the CeBIT in 2008. The accused firms are large manufacturers like Sagem or Hyundai. Several of the affected firms are from Asian countries. In the course of this incident, the respective firms were termed as product pirates in the media, which, especially due to their Asian origin, damaged their image rigorously. Moreover, the prosecution not only accused the corporate body but also the responsible executives, since infringement is also a crime in German civil law.

According to German law, the patent infringement has to be ascertained first, and second, the license fees are set. The infringing firms were aware of the validity of the patents because of earlier paid royalties and the disclosure of the IPR portfolios of Sisvel. Thus, the trial was not even started, since the situation seemed to be clear. Due to public pressure and the accusation by the prosecutor of Lower Saxony, it came to a swift out of court settlement, which committed the offending companies to pay licensing fees. Patent infringement claims are usually not held in civil courts. The strategy of suing executives personally for up to 5 years imprisonment has to be examined with regard to the proportionality of the situation. Although the violation of property rights is

a crime, the civil prosecution has not yet investigated patent infringement claims. Accusing the violating companies at the time of the Hanover exhibition resulted in two important strategic advantages for Sisvel. First, it is very difficult to get an injunction in Asia, and court procedures are lengthy and complicated. The location advantage of Germany and the legal context are important foundations for the effective enforcement of property rights. Second, another advantage is the use of the press as a pressurizing medium. The CeBIT is the largest IT fair in the world, and the seizure of the stands imposed public pressure on the respective firms. The affected companies operate globally and have their own large R&D departments. The public accusation of being product pirates is therefore strongly damaging the firm's image. Starting a trail in a civil court and using the public pressure during the CeBIT created a strong negotiating position for Sisvel. They were thus able to force the infringing companies to pay licensing fees in a very effective and quick manner. Sisvel's activities to enforce their rights can be classified as so-called 'forum shopping', a strategy of litigants that choose a court in a most preferable country or district.

5.5. Case study: EpicRealm

The next case deals with the American-based company EpicRealm Licensing, which is a medium-sized company that can be considered as being a pioneer in dynamic content delivery for web pages. This technology was one of the first to permit up-to-the-second content delivery.

In 1996 and 1999, the US Patent and Trademark Office (USPTO) granted two web site patents filed by EpicRealm. The protected technology was a program code for the dynamic construction of web pages that was used by almost all companies that provided web sites that can produce custom responses to individual visitors or users. In the beginning of 2005, EpicRealm sued more than a dozen online players, including matchmaking sites such as eHarmony.com and Friendfinder.com, day planner specialist FranklinCovey, weight loss drug company Herbalife, and automobile-glass repair company SafeLite. All of these companies can be considered as being rather small, since EpicRealm feared attacking big players at first. But the SafeLite case had a surprising dimension, as Safelite is an 'Oracle e-Business Suite' customer. Oracle is a much bigger target, one with larger financial resources. The 'Oracle e-Business Suite' is used in conjunction with the delivery of dynamic web pages. EpicRealm did not accuse Oracle in the first place but attacked its customers that used the

technology without paying royalties. Oracle was not only under pressure because they were infringing a patent, but they were accused by their own customers. This created pressure, especially when taking into account Oracle's reputation and customer relationship. Oracle had to face reduced credibility, a damage that may cause immeasurable costs. The suits were filed in the US District Court of the Eastern District of Texas, which has a reputation for being friendlier toward patent holders.

EpicRealm's aggressive assertion caused substantial public harm by threatening the way in which most useful aspects of the web were provided to the public. PUBPAT, a legal group whose directors include free and open-source software advocates, heard about this case and tried to challenge these patents. In 2006, PUBPAT filed a request to the USPTO, which argued that the PTO was not aware of existing prior art technology when it granted the two patents to EpicRealm in 1996 and 1999. PUBPAT found that IBM also applied for a patent in 1995 that covers a method of fulfilling requests of a web browser. In the end, the PTO granted the request made by PUBPAT and reviewed the two patents held by EpicRealm. In theory, the reexamination process should have taken several months, but in reality it often takes years. Oracle feared losing customers during the time the case was not solved and might decide to pay the patent license right away next time since the costs of fighting trolls are not only monetary.

6. Typology: IPR enforcing companies

To make use of our detailed patent troll cases, we compare the different patent enforcement practices to existing theory implications. Eisenhardt (1989) suggests that results of case study research should be compared to the framework of current theory. This is done by defining a research construct and building evidence which measures the construct in each case. Therefore, we use our theory implications and qualitative findings to define and validate a typology. We follow an approach similar to Benassi and Di Minin (2009) who defined variables to compare patent brokers' business models. In their study, the extent of each variable concerning the value added or commitment in regard to the IP determines the position of each business model in their matrix design. Similar to this approach, we seek to classify IP enforcement strategies in regard to the value added, the commitment, and the relevance of the patent. Our literature review on patent troll businesses has revealed three main practices that identify these characteristics.

activities concerning the patent \ patent quality	nontrivial patent	trivial patent
innovative / manufacturing	technology blocker	trivial-technology blocker
innovative / nonmanufacturing	patent enforcer	trivial-patent enforcer
non-innovative / manufacturing	patent implementer	trivial-patent implementer
non-innovative / nonmanufacturing	patent troll	trivial-patent troll

Figure 2. Typology of intellectual property rights (IPR) enforcing companies.

First, the entity has not invented the technology itself (no value added); second, it has no intention to practice the patent (no commitment); and third, the enforced patent was of trivial invention (minor relevance). We make use of this rather broad classification and construct a matrix that defines the combinations of all the three situations. In the lines, the classification distinguishes between combinations of innovating/non-innovating and producing/nonproducing. The characteristic ‘producing’ implies the implementation of the technology or the intention to do so in the future. The characteristic ‘innovating’ stands for the conduction of research and development with regard to the patented technology. In the columns of our matrix, we distinguish between the enforcement of trivial and nontrivial patents. We condense two appearances that would qualify a patent to be trivial. First, we understand a trivial patent to be one of minor technological quality, which should have never been accepted by the regarded patent office, e.g. when prior art exists. Second, we also consider a patent to be trivial in a case where the patent might be of sufficient quality but where the scope of patent claims do not affect the infringers technology in question.

We believe that a classification only needs to take into account companies’ activities concerning the respective patent of observation. We thus assume that a manufacturer who owns a patent but does not intend to produce it, and therefore might even operate in a different market, has a comparable position to nonpracticing entities. Figure 2 illustrates combinations of IPR enforcement and uses attributes to name the identified strategies.

Attributes in italics reflect the motivation and reason for the company to enforce their IPR. As to the existing theory implications, we briefly describe

each type of IPR enforcement strategy, give examples, and relate our five detailed and our five perfunctory use cases.

The *technology-blocker* tries to defend its technologies from imitation. The manufacturing and innovating company’s main goal is to protect its market share and block its competitors. In most cases, these companies would probably prohibit the use of the protected technology (Teece, 2000). However, in some cases, when the technology is essential to a standardized technology, the company has to declare the patent to be licensed under FRAND³ terms (Rysman and Simcoe, 2011). Examples for these companies are usually medium sized or big companies such as IBM, Siemens, Nokia, Motorola, or small companies that operate in niche markets.

The *trivial technology-blocker* owns IPR on technologies which are already state of the art and therefore do not contain a new technological step. Such trivial patents are enforced in order to gain market share or protect entire markets. Since trivial patents may cover a wide range of constructive technologies, whole industries can be blocked or forced to pay royalty fees (Bessen and Meurer, 2008). In practice, there are several case examples of companies that tried to enforce trivial patents. The following cases are briefly presented in order to illustrate this type of IPR enforcement. The first case concerns the company Amazon.Com Inc., which filed the so-called ‘1-Click’ patent in 1999 at the USPTO. This patent protects the function of storing customer information for repeated online purchase. The direct competitor barnesandnoble.com llc used the same technique of customer data storage for the web-based purchase of books. Amazon moved for an injunction to omit the usage of the ‘1-Click’ technology. In parallel, the USPTO initiated a repeated evaluation of the patent but still grants it as valid. The European Patent Office, in contrast, reviewed the patent and rejected it in 2007.

Another case depicts the American telecommunications giant AT&T which received a patent in 1994 for billing systems that can be used in voice mail messages. The patent protects the function to differentiate between long-distance and short-distance calls and thereupon adjusting the billing. The competing company, Excel Communications, used the same accounting technique, and was sued for an injunction. However, the District Court of Delaware identified the patent as being invalid.

The *patent-enforcer* is an entity that does not want to produce the innovated technology but still economically enforces its IPR to compensate for efforts and investments in innovation. These companies

usually sell or license their IPR. A blocking strategy is usually not pursued since these nonpracticing entities do not operate in downstream markets (Lemley and Shapiro, 2007). Exemplary companies are Qualcomm or Inter Digital, which are entities with large R&D departments but little or no manufacturing activity. Individual inventors can also be classified as patent enforcers. These inventors have in most cases not the capacities to produce the invention themselves. Thus, inventors need to cooperate with manufacturing companies (Veer and Jell, 2012). Multinational firms in most cases only have in-house research and development departments and do not accept external contributions. In the case of the ‘HIPPO’ invention, a team of University researchers invented a clinical horse to cure serious back pain. The HIPPO inventors filed a patent cooperation treaty (PCT) patent application PCT/DE97/00255 in 1997 but failed to find sufficient investors to produce their invention. In 2007, Panasonic launched the ‘Core Trainer’ a product that apparently made use of the HIPPO technologies. HIPPO then pursued efforts to enforce their IPR (Ann, 2009).

Another case is about MercExchange, a company that tried to enforce a patent covering the ‘Buy it now’ function of eBay in 2003. MercExchange did not practice the patented invention itself, but the Virginia jury trail adjudged eBay to willfully infringe the patent. In the following verdict, the District Court however denied an injunction. In 2006, the Supreme Court of the United States determined that an injunction cannot automatically be issued when the infringement is proven. The outcome was especially addressed to nonpracticing entities and thus drastically decreased the leverage potential of an injunction to enforce IPR of nonpractitioners (Diessel, 2007).

A *trivial patent-enforcer* is in most cases a small innovative company or individual. The inventions are not current state of the art and do not contain a new technological step. In other cases, the IPR does not sufficiently affect the technology of the infringer. Nevertheless, granted patents can be enforced under the cloak of innovative technologies. The aim is mainly to receive royalties using the pressure of injunction. As the patents are not legally valid, judicial processes are usually avoided. The licensees are in most cases not aware of the patent quality, or simply not able to afford litigation financially (Bessen and Meurer, 2008).

A good example is the EpicRealm case which was discussed before. Another case is about NTP, a one-man company that became famous for suing the BlackBerry manufacturer RIM. However, the intended injunction on a technology that would have

	license recipient	initial licensee	infringer
leverage potential			
F/RAND IPR enforcement		license supplier	royalty claimant
extortive IPR enforcement		license extortionist	excessive royalty extortionist

Figure 3. Typology of patent trolls.

omitted the use of all BlackBerry smart phones in North America was not approved by the court. In later cases, NTP also sued Palm for infringement, but patents were reexamined by the PTO and identified prior art.

The *patent-implementer* uses the technology for its products without pursuing the effort of invention. For this purpose, companies can either purchase a license or buy the patent. Widely adopted technological standards such as GSM, UMTS, MPEG, or the Wi-Fi standard are protected by thousands of patents belonging to a various number of patent owners (Pohlmann and Blind, 2011). Most innovative products build upon these standards, and therefore even highly innovative firms may pay licenses to others.

The *trivial patent-implementer* is a company that buys trivial patents or pays royalties to trivial patent owners. These companies are not aware of the missing quality of these patents, or are simply not in the financial position to fight in litigation cases. In some cases, the plaintiff’s patents do not even affect the technology of the accused infringer. Affected companies lack the know-how and financial resources to prove these claims. It is in most cases cheaper and especially less risky to ‘blindly’ pay royalty fees.

In validation of our research construct, we need to be more precise for the last category of patent trolls. Therefore, we add further variables to distinguish characteristics of nonmanufacturing and non-innovating firms. As to Eisenhardt (1989), emergent relationships between research constructs and use cases have to be taken into account in order to constantly validate theory and evidence from the empirical investigation. We thus classify patent trolls in a subtypology (Figure 3). Several literature studies distinguish situations where the licensee has formerly infringed a patent compared to situations where the licensee has offered an initial license (Reitzig et al., 2007; Ball and Kesan, 2009; Chien, 2009). Furthermore, articles in the literature discusses fair royalty payments and situations where licenses exceed a reasonable amount (Lemley and Shapiro, 2007; Rysman

Table 2. Comparing the case study results of the in-depth case analysis

	Papst Licensing	Alliacense (TPL group)	IP Com	Sisvel S.p.A.	EpicRealm
Technology	Electric engineering	Micro electrics	Telecommunication	Coding	Internet processing
Industry	Electric	Electric	Telecommunication	Television and video compression	Web interfaces
Size	Small	Medium sized	Small	Medium-Sized	Small–medium-sized
Main Business	Licensing	Licensing	Licensing	Licensing	Web page design
Third Party Investment	YES	YES	YES	YES	NO
Initial License Offer	YES & NO	NO	NO	YES & NO	NO
F/RAND License Offer	YES & NO	YES & NO	YES	YES	NO
Enforcement Strategies:					
Hide and attack strategy	YES	YES	NO	YES & NO	YES
Discriminate license fees	YES	YES	NO	NO	YES
Exploit legal uncertainty	YES	YES	YES	YES	YES
Forum shopping	YES	YES	YES & NO	YES	NO
Use media attention	NO	NO	YES & NO	YES	NO
Damaging reputation	/	YES	/	YES	YES
Sue downstream Markets	/	YES	/	YES	YES
Sue CEOs	/	/	/	YES	/

In cases where we qualify the action as ‘YES & NO’, the IPR enforcing company has perused both strategies. In cases where we denote ‘/’ we have no information that confirm or disprove these strategies.

and Simcoe, 2011; Geradin et al., 2011). We thus differentiate IPR enforcement strategies as to extortive compared to F/RAND royalty enforcement and by the licensor offering and initial license or asking royalties from infringement.

Tables 2 and 3 illustrate our five in-depth case studies and our five broadly analyzed case studies by comparing industry, technology, size, investment origin, and the IPR enforcing strategies that apply to each case. Cross-case study comparisons in a tabulated format are a valid tool to identify cross-case patterns (Yin, 2009). As to our case analysis, we identify distinct IPR enforcement strategies such as following hide and attack strategies, performing discrimination of license fees among competitors, exploiting an infringer’s legal uncertainty, conducting forum shopping by suing infringers in certain courts or countries, using the media attention as a mean of pressure or damaging an infringer’s reputation, and suing downstream firms or responsible CEOs instead of component manufacturers (Tables 2 and 3).

We learned from the case studies that even though the so-called ‘patent trolls’ may be categorized as being nonmanufacturing and non-innovating, activities in enforcing their IPR differ from case to case. Our case studies further show that the pursued

approaches to enforce IPR may differ among the patents of one company. We may therefore categorize the different enforcing activities of one firm to several classifications in our typology (Figure 3).

We first differentiate two types of licensees, one that has already infringed and one that can choose to buy a license. The latter case of a *license supplier* has yet been discussed very sparsely in literature, and there is little knowledge about how reasonable such situations are in practice (Veer and Jell, 2012). Learning from our five cases, we can at least conclude that IP Com and Papst Licensing pursue businesses where they offer and license innovative IPR to manufacturers ex ante.

Especially in the context of standard setting, we provide evidence that trolls can extort companies to pay royalties even though they have not infringed the patent yet (license extortionist). When technological standards are widely adopted, companies have to implement standardized technology in order to ensure interoperability among other products or applications (Tansey et al., 2005; Hovenkamp, 2008; Bensen and Levinson, 2009).

Most troll definitions not only characterize a troll by being non-innovative and nonpracticing but also link the troll behavior to a wait-and-observe tactic. Thereby, the troll hides until the patented technology

Table 3. Comparing the case study results

	Amazon Inc.	AT&T	NTP	MercExchange	HIPPO
Technology	Internet application	Billing system	Mobile messaging	Internet application	Medical Engineering
Industry	Web shop	Telecommunications	Mobile telecommunication	Auction web Shop	Health care
Size	Large	Large	Small	Small	Small
Main business	Online sale	Telecom.-Net provider	Licensing	Online sale	Medical Products
Third party investment	NO	NO	NO	NO	NO
Initial license offer	NO	NO	NO	NO	YES
F/RAND license offer	NO	NO	NO	NO	YES
Enforcement strategies:					
Hide and attack strategy	YES	YES	YES	YES	NO
Discriminate license fees	NO	NO	NO	NO	NO
Exploit legal uncertainty	YES	YES	YES	YES	NO
Forum shopping	NO	NO	NO	NO	NO
Use media attention	YES	YES	YES	YES	NO
Damaging reputation	/	/	YES	/	NO
Sue downstream Markets	YES	YES	YES	YES	YES
Sue CEOs	/	/	/	/	/

In cases where we qualify the action as 'YES & NO', the IPR enforcing company has perused both strategies. In cases where we denote '/' we have no information that confirm or disprove these strategies.

is implemented or even standardized, and then appears to claim royalties (Henkel and Reitzig, 2007). Nevertheless, the use cases of IP Com and Sisvel show that in many cases, these patents are known by all market participants and are in practice since several years. These patents are often essential to technological standards and therefore licensed under F/RAND conditions (Salant, 2007; Rysman and Simcoe, 2011). In our typology, we classify companies that practice ex post IPR enforcement of known patents as *royalty claimants*.

The Alliacense and Papst cases provide evidence of acquiring and enforcing IPR ex post technology adoption to demand higher royalty fees. The Sisvel and EpicRealm cases further reveal specific strategies how patent trolls are able to use public media and infringer's fear of bad reputation to extort excessive payments. Especially, the cases of Sisvel and Papst Licensing revealed a common practice called 'forum shopping', where the plaintiff strategically chooses a certain court in a certain country or district that might allow a more favorable judgment. The Alliacense case illustrated tactics such as first mover pricing discounts or suing OEMs in civil courts to increase the pressure and boost royalty amounts for infringers. This behavior classifies the companies of our cases as *excessive royalty extortionists*.

7. Effects of patent trolls

Certain market constellation may prevent IPR enforcement of patent owning companies or individuals (see the Bosch case, SMEs in the Papst case, and SMEs in the Alliacense case). These companies may have no means to exert pressure on infringers even though royalty payments are legally violated. The use cases of Papst Licenses, Alliacense, IP Com, and Sisvel have shown that the patent troll business can be a practice enabling repayments for earlier innovation investments from enforced patents. Our cases show that patent trolls may burst uneven market constellations, as in some cases, initial inventors and IPR owners have offered to license or even sell their patents to infringing manufacturing companies but were either too small or too dependent, e.g. a supplier that relies on the manufacturer's orders, to enforce their IPR. If selling the patent to a third party would not be an option, IPR owners may expect lower revenues from patent rights in future investment decisions due to a lack of financial return. This may decrease incentives to innovate and prevent a socially optimal level of innovation activities (Diessel, 2007). Patent trolls who buy unlicensed patents provide an active market for technology and may thus increase the value of IPR-stimulating

incentives for innovators. Even though firms have no means of enforcing their own IPR, selling these patents to trolls would be an indirect mechanism to generate returns from earlier investments.

As to our typology, we believe all trivial patent cases to have negative effects on incentives to innovate and do not guarantee a level playing field for market participants. Even though patents may be of good quality, inappropriate patent claims may harm affected companies who are not aware that their technologies are not infringing. These information asymmetries especially apply to small and medium-sized companies, which have insufficient financial resources to screen the patent landscape or precisely analyze their technologies.

Our use cases show that good quality patents which are verifiably infringed should in most cases be enforced to sustain incentives to innovate. However, we especially consider the case of patent holders which are nonproducing and non-innovating and assess effects as to our four categories of patent trolls. We reject the common belief that these firms by default decrease incentives to invest in innovation even though they are not innovative or practice the patent themselves. When comparing our use cases to our typology, we find evidence that depending on the timing of enforcement (before or after infringement) and the fairness on the licensing fee, only one category of nonproducers and non-innovators may always cause negative effects on innovation incentives. We have called these firms excessive royalty extortionists, since they extort licenses due to their leverage potential. Practices of these firms lead to excessive royalty fees or lengthy litigation. However, we provide evidence that firms which offer their IPR ex ante technology implementation to be licensed ex post, but do not exploit their market position, might also increase incentives to innovate. IPR owners who are not able to enforce their IPR can sell their patents to new interconnected markets, for instance to patent trolls. This allows enforcement by NPEs where royalty rates are only dependent on the patent quality and claims but independent from other market dependencies.

The analysis of our five use cases and the typology of patent trolls can be used to answer both of our research questions. We conclude that the patent troll business can be a solution to enforce unlicensed IPR. In line with the literature, we find that the existence of nonpracticing entities in competing technology markets may disrupt anticompetitive behavior and thus even increase innovative contributions (Diessel, 2007; Schmalensee, 2009; Tarantino, 2010; Geradin et al., 2011). Especially in the case of Bosch, IPR is now licensed that has been used since decades

without any payment of royalties. Cross-licensing solutions have to be seen critical in cases of asymmetric market dependencies. Patent trolls may thus even cure the system of effective enforcement of IPR and thus increase incentives to innovate for weak or dependent market participants (e.g. Bosch, HIPPO, SMEs in the Papst Licensing case, SMEs in the Alliacense case). Without the possibility to enforce IPR, these companies might undervalue returns from IPR which might even prevent future investments in R&D (Diessel, 2007).

We also show that patent trolls may create additional costs, e.g. evaluation, negotiation, and litigation costs, compared to cross-license agreements. These costs are often rediscounted by higher royalty fees. Even though patent trolls generate these costs, we still believe that some cases have proven the patent troll business to be beneficial for the patent system and IPR enforcement possibilities. Other literature contributions further stress that the influence of vertical integration on royalty rates is ambiguous. Manufacturing firms may have the same means to request excessive royalties, for instance to new market entrants or vertically to nonintegrated firms (Layne-Farrar and Schmidt, 2010).

However, we also find reversely evidence for our second research question and find proof from our cases that patent trolls' strategies to enforce IPR may also lead to excessive royalty fees and increasing negotiation costs. We identified opportunistic strategies such as running an infringers' image through the media (Sisvel, EpicRealm), forum shopping (Sisvel, Alliacense, Papst Licensing, IP COM), license fee discrimination for first movers, pressure by accusing OEMs, retailers, consumers, and executives (Alliacense, Sisvel), and the move to sue disproportionate injunctions (Sisvel, Alliacense, Papst Licensing, IPCom). These methods combined with an uncertainty about the patent scope and patent quality often yielded excessive royalties, lengthy negotiation, and costly litigation. However, most of these strategies just exploit failures of the patent system such as heterogenic legislation among countries, non-transparency of the patent system, filing of trivial patents, unjustified broad patent claims, unjustified injunctions, and a general legal uncertainty due to a legislation that draws on proportionality principles.

8. Conclusion

This paper is the first to provide very detailed evidence of specific patent troll strategies to enforce IPR. We are able to precisely exemplify patent trolls'

practices following the procedure of identifying valuable patents, verifying infringement, conducting technological tests, estimating the market share to then pursuing an optimal enforcement. We thus find evidence for a new professional business model that might still incorporate risks (Bessen and Meurer, 2008) but minimizes the failure margin by a diverse set of enforcement strategies.

This paper constructs a distinct typology of IPR-enforcing companies and in particular of patent trolls. Future cases in the context of IPR infringement can be classified by applying our framework and typology. Policymakers, business leaders, and innovators are hence able to assess the troll business and anticipate its possible effects. Even though we only analyzed 10 patent troll cases, we believe that our empirical results are generalizable and contribute new insights to findings in the literature. We are further able to differentiate possible effects of the patent troll business, which might still be diverse but easier to assess when applying our classification.

The phenomenon of patent trolls is often considered as being overrated, but has still caused significant litigation cases and financial losses and therefore drawn the attention of economic research (Bessen et al., 2011). However, we believe that most troll cases are not public, and the fear of being accused of patent infringement might influence firms' innovation activities in every investment decision. This might be caused by the existence of patent trolls and common knowledge about their practices, but the origins of fearing unintentional infringement are subject to failures in the patent system itself. Legal uncertainty is especially caused by too low obstacles of successfully patenting multiple incremental inventions (Bessen and Meurer, 2008). Therefore, we urge patent authorities not only to increase the quality of patent files but also to more precisely delimit broad patent claims. We show that patents of good quality may also harm affected companies who are not aware that their technologies are outside the accused patent claims. These information asymmetries especially apply to small and medium-sized companies, which do not have sufficient financial resources to screen the patent landscape. These cases are often not public, and small companies have no means and lobby to push this topic. USA-based SMEs are able to apply court fee reductions to decrease legal costs. We support these regulations to balance legal power among firms and further suggest efforts to increasing transparency and ensuring legal certainty. While a sufficient quality of patent files is a fundamental requirement, efficient IPR enforcement also postulates an essential factor for a working patent system that should particularly create incen-

tives to innovate and not to opportunistically block the market with a dense web of patent files. We are not able to give solutions for patent thickets or the increasing number of patent wars resulting in multiple litigation cases. The contribution of this paper is rather to shed light on effects of patent trolls and their practices, showing that they might have negative effects but may also cure failures of the patent system.

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Notes

1. In some cases patents are filed and accepted by patent office even though non-detected prior documents exist. Especially in the field of ICT, most court decisions that drop the claims of infringed patents are due to existing prior art (Bessen and Meurer, 2008).
2. As a member of the European Telecommunications Standards Institute ('ETSI'), Bosch took part in the GSM and UMTS (WCDMA) standard setting processes

and therefore granted irrevocable licenses under FRAND conditions. IP Com confirmed to the EU Commission to take over Bosch's previous commitment to grant irrevocable licenses on FRAND terms.

3. Fair, reasonable, and nondiscriminatory.

Tim Pohlmann is a post-doctoral research fellow at the TU Berlin, Department of Innovation Economics and an associate research fellow at CERN, Mines ParisTech. Tim investigates IPR strategies of participating organizations in ICT standard bodies. He particularly focuses on coordination mechanism such as patent pools and standards consortia that accrue around standardization. In this context, he also analyzes the interplay of IPR and standard dynamics. Further topics of his research include IP Strategies in Technology Markets, Industry Alliances, and Strategic Licensing Mechanisms for Cumulative Innovations.

Marieke Opitz was a research fellow at the University of Marburg, specializing in the field of technology and innovation management.