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An Alternative Perspective on IP Management. Empirical Evidence from MNCs' Practices in China

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Abstract

Introduction

The intellectual property rights (IPR) appropriation from the company's perspective is, first of all, associated with coordinated actions on obtaining and enforcing of the respective intellectual property rights, such as patents, utility models, industrial designs, trademarks, copyright and trade secrets. In developed economies with strong intellectual property (IP) systems companies traditionally rely on registered IPRs.

Patents are regarded in general as the most valuable IPRs. Nevertheless, a single patent does not provide the holder with an unlimited right to use the technology, and does not exclude the risk of competitors inventing around the patent. To address these uncertainties of single patent rights, companies deploy various strategies with regard to obtaining and enforcing patents such as building patent fences, defensive blockages, defensive thickets, strategic patenting etc.

The patent protection is limited to 20 years from its filing date, whereas the trademark protection may last forever. A strong branding can, for example, have a positive influence on sales revenue and market value. Firms may file trademark litigation when they are targeted by patent enforcement.

However, not every national IP system and not every IP related law can guarantee an optimal appropriation level of the intangible assets a company may desire. The imperfections of an IP environment, especially in emerging economies, should encourage the companies' skilled managers to seek for additional and/or alternative ways to enhance the appropriation of their intangible assets. Such ways can be described as *management approaches* – strategies developed by managers in order to prevent the abuse of their companies' IP rights or enhance their obtaining and enforcement via legal means.

Previous research provides some evidence that companies' management may deploy some *approaches* to deal with IP system imperfections and further enhance IP appropriation. Such approaches known from the previous research can be divided into two categories: either aimed to *prevent* the IP infringement, or to *enhance* the conventional IP appropriation via rights obtaining and enforcement. The existing literature on the “enhancing” approaches in weak IP systems is scarce and provides some insights mainly in the trademark enforcement area however not focusing on a certain IP right.

The current controversies of China's emerging IP system that serves as a research context for this dissertation, combined with its ascending patent surge and high attractiveness of its market, suggest a challenging environment which motivates managers to develop and deploy various approaches to attain an optimal level of IP appropriation.

The assumptions of this dissertation are, therefore, that (1) management at multi-national companies (MNCs) that are actively protecting their IPR, should have advanced old or create new approaches toward IPR appropriation in response to challenges and opportunities caused by China's new leap in advancing its IP system and (2) there could be perspective areas where such approaches could be created and deployed.

Research concept, methods and data

The present dissertation gives an alternative perspective on the IP management by focusing on the *management approaches* aimed to enhance the conventional IPR appropriation as well as *potential areas* where such approaches could be developed and implemented. It uses pragmatic approach, meaning that different methods or combination of methods were deployed at different stages of the research depending on the available knowledge from the previous studies and opportunities for the data collection.

This dissertation is based on the unique data provided by seven multi-national companies with a long-term experience of production, R&D and sales in China. All the data were collected by me in a close cooperation with companies' IP and R&D managers, patent and trademark attorneys and engineers.

An exploratory qualitative approach was chosen for the first article of the present dissertation. This work investigates management approaches in four IP appropriation domains: patent rights obtaining, patent rights enforcement, trademark rights obtaining and trademark right enforcement. This study deploys the multiple case study research method and uses an inductive logic.

The purpose of the following two studies was to get deeper insights in one IP appropriation domain – patent rights obtaining. The findings of the first article suggested that the management attempts to enhance the patent rights obtaining, via improving the *patent awareness* of the engineers. This became the research topic of the second article of the present dissertation. While making the literature research and conducting the preliminary qualitative research, it became obvious that besides patent awareness there is another dimension that shapes the patenting behavior of the engineers – the *patenting motivation*. Therefore the third study was undertaken to shed some light on this phenomenon.

The data for both studies were collected at multi-national engineering company's R&D centers in China via survey (a structured questionnaire). I used multiple hierarchical regression method for the second study and a combination of methods (factor analysis, one-way repeated ANOVA and robust multiple hierarchical regression) for the third one.

Results

MNCs skillful managers develop and deploy various and complex approaches to enhance their IP appropriation. Findings of the first article reveal eleven management techniques that differ in the application area (i.e. internal or external) and context (either aimed to improve IP awareness or to establish cooperation on the IP protection issues). The discussion also shows the applicability of some explored management approaches for other industries and their double role to also prevent infringement.

The findings of the second study suggest that management can influence engineers' patent awareness. Invention disclosure experience, use of patent literature, supervisory encouragement and patent trainings show a significant impact on the engineers' patent awareness, whereas the effect of patent attorney consultancy is probably mitigated by invention disclosure experience. The discussion suggests a potential effect the managerial factors may have on the individual ones.

The third article of the dissertation revealed a complex nature of engineers' patenting motivation. The study explored four types of patenting motivation: *recognition and reward*, *reputation and promotion*, *making a contribution* and *interest and sense of achievement*. The results of multiple hierarchical regression show a positive impact of working climate on "making a contribution" and "interest and sense of achievement" motivation factors, but no influence of patent awareness and management encouragement on any of the motivation factors.

Implications

The results of this doctoral thesis have some managerial implications. First, the management approaches revealed in the first study can be adopted in a wider range of industries. Furthermore, these strategies provide such benefits as saving of enforcement costs, exchange the experience with other experts from the industry and influence the further development of the country's IP regime. Local IP management and its cultural competence play a crucial role in the success of these management approaches. Financial considerations must be taken into account.

Second, management has many ways to influence engineers' patenting behavior. As shown in the second paper of this dissertation the managerial and individual factors show high significant positive correlations. This means, that managers could potentially influence the engineers' attitude toward using patent literature or make them put some extra efforts to transform their ideas into patentable inventions.

Finally, the third study of the dissertation revealed a complex nature of the patenting motivation of the corporate R&D engineers. Same as general working motivation, patenting motivation should vary as a function of different factors in the working environment. R&D management should learn to understand and manage the patenting motivation effectively to achieve their internal targets on patent disclosures and through that enhance their companies' competitive advantage.

Abstract (Deutsch)

Einleitung

Die Appropriation der geistigen Eigentumsrechte (IPR) ist aus der Sicht des Unternehmens vor allem mit koordinierten Maßnahmen zur Erlangung und Durchsetzung der jeweiligen IPRs wie Patente, Gebrauchsmuster, Industriedesigns, Marken, Urheberrechte und Geschäftsgeheimnisse verbunden. In entwickelten Volkswirtschaften mit starken IP-Systemen setzen Unternehmen traditionell auf registrierte IPRs.

Patente gelten im Allgemeinen als die wertvollsten IPRs. Dennoch stellt ein einziges Patent dem Inhaber kein unbegrenztes Recht zur Nutzung der Technologie zur Verfügung und schließt das Risiko, dass Wettbewerber das Patent umgehen, nicht aus. Um diesen Unsicherheiten einzelner Patentrechte zu begegnen, setzen Unternehmen verschiedene Strategien ein, um Patente zu erwerben und durchzusetzen, wie zum Beispiel die Erstellung von Patentschirmen, defensive Blockaden, defensive Patent-„Dickichte“, strategische Patentierung usw.

Der Patentschutz ist auf 20 Jahre ab dem Anmeldetag beschränkt, während der Markenschutz grundsätzlich für immer bestehen kann. Ein starkes Branding kann zum Beispiel den Firmenumsatz und Marktwert positiv beeinflussen. Im Falle einer Patentverletzungsklage kann eine Markenschutzklage eine potentielle Gegenmaßnahme darstellen.

Allerdings kann nicht jedes nationale IP-System und nicht jedes IP-rechtliche Gesetz eine optimale Appropriation der immateriellen Vermögenswerte, die ein Unternehmen wünscht, garantieren. Die Unzulänglichkeiten eines IP-Umfelds, vor allem in Schwellenländern, sollten die Führungskräfte der Unternehmen dazu ermutigen, zusätzliche und / oder alternative Wege zur Verbesserung der Appropriation ihrer immateriellen Vermögenswerte zu suchen. Solche Wege können als *Managementansätze* beschrieben werden - Strategien, die von Managern entwickelt wurden, um den Missbrauch der IP-Rechte ihrer Unternehmen zu verhindern oder ihre Erlangung und Vollstreckung durch rechtliche Mittel zu verbessern.

Bisherige Studien zeigen, dass das Management von Unternehmen einige Ansätze verwenden kann, um mit den Unvollkommenheiten eines IP-Systems umzugehen und die IP-Appropriation weiter zu verbessern. Solche Ansätze, die aus der bisherigen Forschung bekannt sind, lassen sich in zwei Kategorien unterteilen: entweder die Verhinderung der IP-Verletzung oder die

Verbesserung der konventionellen IP-Appropriation durch Erlangen und Durchsetzung der IPRs. Derzeit gibt es nur wenig Literatur die "Verbesserungsansätze" in schwachen IP-Systemen behandelt. Sie bietet einige Einblicke vor allem im Bereich der Marken-Durchsetzung, ist jedoch nicht auf ein bestimmtes IP-Recht konzentriert.

Die derzeitigen Kontroversen des sich entwickelnden IP-Systems Chinas, das als Forschungskontext für diese Dissertation dient, kombiniert mit seinem stark steigenden Patentaufkommen und der hohen Attraktivität seines Marktes, deuten auf ein herausforderndes Umfeld hin, das die Führungskräfte dazu motiviert, verschiedene Ansätze zu entwickeln und einzusetzen, um ein optimales Niveau der IP-Appropriation zu erreichen.

Die Annahmen dieser Dissertation sind daher, dass (1) das Management bei multinationalen Unternehmen (MNCs), die ihre IPRs aktiv schützen, als Reaktion auf Herausforderungen und Chancen, die durch Veränderungen des IP-Systems in China entstehen, alte Ansätze weiterentwickelt oder neue Ansätze in Bezug auf IPR-Appropriation, geschaffen hat und; (2) es neue potentielle Bereiche geben könnte, in denen solche Ansätze geschaffen und eingesetzt werden.

Forschungskonzept, Methodik und Daten

Die vorliegende Dissertation gibt eine alternative Perspektive auf das IP-Management an, indem sie sich auf die Managementansätze, die darauf abzielen, die konventionelle IP-Appropriation zu verbessern, sowie auf mögliche Bereiche, in denen solche Ansätze entwickelt und umgesetzt werden könnten, konzentriert. Es verwendet einen pragmatischen Ansatz, was bedeutet, dass unterschiedliche Methoden oder Kombinationen von Methoden in verschiedenen Stadien der Forschung in Abhängigkeit von den verfügbaren Kenntnissen aus den bisherigen Studien und Möglichkeiten für die Datenerfassung eingesetzt wurden.

Diese Dissertation basiert auf den Daten welche in sieben multinationalen Unternehmen mit langjähriger Erfahrung in der Produktion, in F&E und Vertrieb in China erhoben wurden. Alle Daten wurden von mir in enger Zusammenarbeit mit IP- und F&E-Managern, Patent- und Markenrechtsanwälten sowie Ingenieuren der Firmen zusammengetragen.

Für den ersten Artikel der vorliegenden Dissertation wurde ein exploratorischer qualitativer Ansatz gewählt. Diese Arbeit untersucht Managementansätze in vier IP-Appropriationsdomänen: Patentrechtserlangung, Patentrechtsdurchsetzung, Markenrechtserlangung und Markenrechtsdurchsetzung. Diese Studie nutzt die qualitative Forschungsmethode und verwendet eine induktive Logik.

Der Zweck der folgenden zwei Studien war es, einen tieferen Einblick in die IP-Appropriationsdomäne Patentrechtserlangung zu bekommen. Die Ergebnisse des ersten Artikels legten nahe, dass das Management versucht, die Patentrechteappropriation zu verbessern,

indem es das Patentbewusstsein der Ingenieure verbessert. Dies wurde zum Forschungsthema des zweiten Artikels der vorliegenden Dissertation. Während der Durchführung der Literaturforschung und der vorläufigen qualitativen Forschung, zeigte es sich, dass es neben dem Patentbewusstsein auch eine andere Dimension gibt, die das Patentierungsverhalten der Ingenieure prägt - die Patentierungsmotivation. Deshalb wurde die dritte Studie durchgeführt, um dieses Phänomen zu beleuchten.

Die Daten für beide Studien wurden bei den F&E-Zentren eines multinationalen Ingenieurunternehmens in China durch eine Umfrage (ein strukturierter Fragebogen) gesammelt. Ich habe die mehrfache hierarchische Regressionsmethode für die zweite Studie und eine Kombination von Methoden (Faktoranalyse, wiederholte Einweg-ANOVA und robuste multiple hierarchische Regression) für die dritte verwendet.

Ergebnisse

Erfahrene Manager von MNCs entwickeln und implementieren verschiedene, komplexe Ansätze zur Verbesserung ihrer IP-Appropriation. Die Ergebnisse des ersten Artikels zeigen elf Managementtechniken, die sich im Anwendungsbereich unterscheiden (d.h. intern oder extern) und im Kontext (entweder zur Verbesserung des IP-Bewusstseins oder zur Etablierung der Zusammenarbeit im Bereich IP-Schutz). Die Diskussion zeigt auch die Anwendbarkeit einiger untersuchter Managementansätze für andere Branchen und ihre Doppelrolle, gleichzeitig IP-Verletzung zu verhindern.

Die Ergebnisse der zweiten Studie deuten darauf hin, dass das Management das Patentbewusstsein der Ingenieure beeinflussen kann. Die Erfindungsmeldungserfahrung, die Verwendung von Patentliteratur, die Unterstützung seitens Vorgesetzter und die Patentschulungen zeigen eine erhebliche Auswirkung auf das Patentbewusstsein der Ingenieure, während die Wirkung der Patentanwaltsberatung vermutlich durch die Erfindungsmeldungserfahrung abgeschwächt wird. Die Diskussion deutet auf einen potenziellen Effekt hin, den die Managementfaktoren auf die individuellen Faktoren haben können.

Der dritte Artikel der Dissertation zeigte eine komplexe Art der Patentierungsmotivation der Ingenieure. Die Studie untersuchte vier Arten von Patentierungsmotivation: „Anerkennung und Belohnung“, „Reputation und Förderung“, „Leisten eines Beitrags“ und „Interesse und Erfolgserlebnis“. Die Ergebnisse der multiplen hierarchischen Regression zeigen eine positive Auswirkung des Arbeitsklimas auf die Motivationsfaktoren „Leisten eines Beitrags“ und „Interesse und Erfolgserlebnis“, aber keinen Einfluss von Patentbewusstsein und Managementunterstützung auf die vier Motivationsfaktoren.

Implikationen

Die Ergebnisse dieser Dissertation haben einige Implikationen fürs Management. Erstens können die Managementansätze, die in der ersten Studie aufgedeckt wurden, in einem breiteren

Spektrum von Industrien implementiert werden. Darüber hinaus bieten diese Strategien Vorteile wie die Einsparung von Durchsetzungskosten, Erfahrungsaustausch mit anderen Experten aus der Branche und die Auswirkung auf die Weiterentwicklung des IP-Systems des Landes. Das lokale IP-Management und seine kulturelle Kompetenz spielen eine entscheidende Rolle für den Erfolg dieser Managementansätze. Finanzielle Überlegungen sind zu berücksichtigen.

Zweitens hat das Management viele Möglichkeiten, das Patentierungsverhalten der Ingenieure zu beeinflussen. Wie im zweiten Artikel dieser Dissertation gezeigt wurde, zeigen die Management- und individuellen Faktoren hohe signifikante positive Korrelationen. Das bedeutet, dass die Manager die Haltung der Ingenieure zur Verwendung von Patentliteratur potenziell beeinflussen könnten oder sie dazu veranlassen, ihre Ideen in patentierbare Erfindungen umzusetzen.

Schließlich zeigte die dritte Studie dieser Dissertation eine komplexe Art der Patentierungsmotivation der F&E Ingenieure in Unternehmen. Wie auch die allgemeine Arbeitsmotivation sollte die Patentierungsmotivation in Abhängigkeit von verschiedenen Faktoren der Arbeitsumgebung variieren. Das F&E-Management sollte lernen, die Patentierungsmotivation effektiv zu verstehen und zu managen, um seine internen Ziele betreffend Patentanmeldungen zu erreichen und damit den Wettbewerbsvorteil seiner Unternehmen zu verbessern.

Publication and submission record

The article “IPR Protection and Management Approaches. Insights from the MNCs’ Practices in the Automotive Industry in China” is entirely my own work. It was presented at the DRUID15 Conference “The Relevance of Innovation” in Rome, Italy in June 2015 where it won Steven Klepper Award for the Best Young Scholar Paper. It was also presented earlier at the research colloquium of the Chair of Innovation Economics at the TU Berlin in April 2014.

The article “Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation” is entirely my own work. It was presented at the DRUID Academy Winter Conference in Bordeaux, France in January 2016. It was also presented earlier at the research colloquium of the Chair of Innovation Economics at the TU Berlin in July 2015.

The article “What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC” is entirely my own work. It was presented at the research colloquium of the Chair of Innovation Economics at the TU Berlin in February 2017.

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Starting my PhD journey back in October 2012 I neither thought it would bring me so many exciting experiences nor that it would let me work with so many wonderful people together. Oh yes, I haven't thought it would last so long either...))

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Contents

- Abstract i
- Abstract (Deutsch) iv
- Publication and submission record viii
- Acknowledgements ix
- 0. Introduction 1
 - 0.1. IP appropriation from company’s perspective 1
 - 0.2. Role of management in IPR appropriation 2
 - 0.3. China’s emerging IP system as a research context 4
 - 0.4. Research concept and data 6
 - 0.5. Contribution: What to learn from this dissertation 7
 - 0.6. References 9
- 1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China 17
 - 1.1. Introduction 18
 - 1.2. Conceptual framework: IP protection strategies 19
 - 1.2.1. The relevance of patent and trademark protection for companies in different IP systems 19
 - 1.2.2. Use of management approaches in IPR protection 21
 - 1.3. Methods 22
 - 1.3.1. Sampling of the cases 22
 - 1.3.2. Data Collection 23
 - 1.3.3. Analysis Strategy and Technique 24
 - 1.4. Research Findings 24
 - 1.4.1. Internal awareness strategies 25
 - 1.4.2. Internal cooperation strategies 27
 - 1.4.3. External awareness strategies 28
 - 1.4.4. External cooperation strategies 29
 - 1.5. Discussion and Conclusion 30
 - 1.5.1. Results and managerial implications 30
 - 1.6. Study limitations and further research recommendations 32
 - 1.7. References 34
- Appendix 1. IP management at the analyzed cases 37
- Appendix 2. Conventional IP protection at the analyzed cases 38
- 2. Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation 42
 - 2.1. Introduction 43

2.2. Theoretical background and hypotheses.....	44
2.2.1. Patent awareness in different research contexts.....	44
2.2.2. Definition of patent awareness of an R&D engineer in a company’s context.....	45
2.2.3. Hypotheses.....	45
2.3. Methodology.....	47
2.3.1. Empirical sample, survey instrument and data collection.....	47
2.3.2. Variables, measures and method.....	48
2.4. Empirical analysis.....	50
2.4.1. Descriptive statistics and correlation.....	50
2.4.2. Regression.....	51
2.5. Discussion.....	52
2.6. Limitations and further research.....	53
2.7. References.....	54
3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC.....	58
3.1. Introduction.....	59
3.2. Self-determination theory of motivation.....	60
3.3. Patenting motivation of individuals.....	62
3.4. Empirical sample, survey instrument and data collection.....	64
3.5. Empirical analysis.....	65
3.5.1. Factor analysis and ANOVA.....	65
3.5.2. Multiple hierarchical regression.....	67
3.6. Discussion.....	68
3.7. Limitations and further research.....	71
3.8. References.....	72
Appendix 1. Variables, measures and descriptive statistics.....	75
4. Conclusion.....	77
4.1. Summary.....	77
4.2. Main results.....	77
4.3. Management implications.....	79
4.4. Limitations and further research.....	80
4.5. References.....	82

0. Introduction

0.1. IP appropriation from company's perspective

In developed economies with strong IP systems companies traditionally rely on registered IPRs like invention, utility model and design patents as well as trademarks. The violation of rights provided by the formal protection means is to a high degree precluded by the strong IP appropriation regime.

Patent rights appropriation

Patents are regarded in general as the most valuable and hard to obtain IPRs (Gollin, 2008, p.172). Nevertheless, a single patent may not be examined properly due to time constraints or lack of identified prior art, does not provide the holder with an indefinite right to use the technology, and does not exclude the risk of competitors inventing around the patent (Somaya, 2012; Mansfield, Schwarz, & Wagner, 1981). To address these uncertainties of single patent rights, companies deploy various strategies with regard to obtaining and enforcing patents. Somaya (2012) provided an integrative overview of the research literature related to these practices. The traditional motive of companies to protect their products from imitation and, hence, secure their competitive advantages implies such actions as building patent fences (Cohen, Goto, Nagata, Nelson, & Walsh, 2002; Gollin, 2008), offensive blockage (Blind, Edler, Frietsch, & Schmoch, 2006; Cohen et al. 2002; Pitkethly, 2001), or persistent investigation of and enforcement against imitations (Polidoro & Toh, 2011) characterized by little likelihood of a suit settlement (Somaya, 2003). Besides, to defend against the patents held by third parties companies resort to defensive blockages (Arundel, van Paal, & Soete, 1995; Blind et al., 2006; Cohen et al. 2002; Duguet & Kabla, 1998), defensive thickets (Rubinfeld & Maness, 2005), strategic patenting (Blind, Cremers, & Mueller, 2009; Torrisi, Gambardella, Giuri, Harhoff, Hoisl, & Mariani, 2016), or use the defensive patent portfolios to file a countersuit and subsequently reach a settlement agreement when accused for an infringement (Somaya, 2003) etc.

Trademark rights appropriation

The patent protection is limited to 20 years from its filing date, whereas the trademark protection may last forever. A strong branding can, for example, keep customers' loyalty to the product even if it stopped being exclusive due to the expiration of the related patents. Findings of previous research show a positive influence of trademarks on sales revenue (Doern, 1999, p. 72;

Seethamraju, 2003), profit (Griffiths, Jensen, & Webster, 2011) and market value (Bosworth & Rogers, 2001; Greenhalgh & Rogers, 2007; Seethamraju, 2003). Protecting their trademarks' exclusivity, companies may regularly file an opposition against new trademark applications similar to their own (von Graevenitz, 2007). Graham and Somaya (2004) suggest that firms may file trademark litigation when they are targeted by patent enforcement.

IPR appropriation in weak IP regimes

Despite of weak IP systems in the developing economies, foreign firms have, nevertheless, a propensity to protect their IPRs in a conventional way – via rights obtaining and enforcement (Chow, 2002; Liang & Xue, 2010; Love, Helmers, & Eberhardt, 2016; Wu & Liu, 2004; Yang & Clarke, 2005; Yang et al. 2008). In particular, the motivation of MNCs to obtain patent rights in weak appropriation regimes can be explained by market considerations (Liang & Xue, 2010), e.g. competitive threat from other foreign firms (Hu, 2010).

Generally the research on MNCs' IP management in the weak IP appropriation regimes is fragmented and is represented by a limited number of studies. In China, on which the present dissertation focuses, Keupp, Friesike, and von Zedtwitz (2012) revealed a different strategic character of MNC's patenting activities and defined four archetypes of firms' patenting strategies depending on their expectations about the future of the appropriability regime, use of patents as a signaling mechanism and degree of geographic differentiation of their IP policy. A recent quantitative study of Wolfram, Schuster, and Brem (2014) confirms the findings of Keupp et al. (2012) on various strategic patenting behaviors of multinationals in emerging economies. Wang (1998) analyzed some cases of patent litigation involving foreign parties. Clarke (1999) discusses the pros and cons of civil litigation and administrative enforcement for foreign firms. Veer (2013) gives an example of successful judicial actions of a German engineering company toward patent infringement in China. The most comprehensive overview of patent litigation suits filed by foreign companies using five years data (2006-2011) is recently provided by Love et al. (2016).

Some insights on trademark application and enforcement practices of foreign firms can be found in the literature on anti-counterfeiting or brand protection strategies (Yang, 2003; Yang, Sonmez, & Bosworth, 2004). MNCs with high managerial confidence in the IP system tend to obtain trademark rights and successfully practice the administrative and judicial actions against trademark infringement in China (Yang et al. 2008).

0.2. Role of management in IPR appropriation

Some previous studies point out effects of internal factors on IP management of the companies. Pitkethly (2001) argued that thorough and sophisticated managerial planning and actions are essential for successful corporate IP strategies. Actions and expertise of patent attorneys as well as “optimal cross-functional coordination between technical and legal experts” (Somaya, 2012: p.1101) are said to have an impact on corporate patenting performance (Somaya, 2012; Somaya, Williamson, & Zhang, 2007).

Management approaches

Previous research provides some evidence that companies' management may deploy some *approaches* to deal with IP system imperfections and further enhance IP appropriation. Such approaches known from the previous research can be divided into two categories: either aimed to *prevent* the IP infringement, or to *enhance* the conventional IP appropriation via rights obtaining and enforcement.

Prevention of infringement

The existing research reveals a great deal of management approaches that *prevent* IPR infringement both in strong and weak appropriability regimes. Companies may provide training to their customers to demonstrate the advantages of buying the original product (Keupp et al., 2010; Yang, 2003); label the products to enable customers to distinct them from fakes (Chaudhry & Walsh, 1996; Jacobs, Samli, & Jedlik, 2001; Yang et al., 2004; Yang et al., 2008); warn their distributors about counterfeits in the market (Jacobs et al., 2001; Yang et al., 2008); or monitor the manufacturing and distribution networks (Yang., 2003; Yang et al., 2004). The findings of Yang and Frixell (2009) suggest that the right brand positioning is associated with lower volumes of respective counterfeit goods.

Enhancing IP appropriation by using management "know-how"

A limited number of studies revealed some examples of management approaches aimed to *enhance* IPR appropriation in strong IP systems such as lobbying (Kesan & Galo, 2009), approaching particular tribunals or courts (Moore, 2003; Somaya & McDaniel, 2012), and building a reputation to be successful in trademark opposition (von Graevenitz, 2007) and trademark or patent litigation (Li, Wu, Chen, & Ji, 2013). Another few studies discuss the role of companies' internal managers in patent related activities (Somaya, Williamson, & Zhang, 2007; Tietze, Granstrand, & Herstatt, 2006) and outsourcing of patent prosecution and enforcement (Reitzig & Wagner, 2010).

Existing literature on these "enhancing" approaches in weak IP systems is scarce and provides some insights mainly in the trademark enforcement area however not focusing on a certain IP right (Jacobs et al., 2001; Keupp et al. 2010; Yang et al., 2004; Yang et al., 2008). To the best of my knowledge, no separate study on management approaches in the IP rights obtaining and enforcement has been carried out until now. Furthermore, previous studies on such IP strategies are based on data collected from 2000 to 2006, but the changes that have occurred in China's IP system in the last years should have influenced corporate IP management and lead to its sophistication.

The assumptions of this dissertation are, therefore, that (1) management at MNCs that are actively protecting their IPR, should have advanced old or create new approaches toward enhancing the IPR appropriation in response to challenges and opportunities caused by China's

new leap in advancing its IP system (see the next section) and (2) there could be perspective areas where such approaches could be created and deployed.

0.3. China's emerging IP system as a research context

Though the concept of IPR roots back more than a century in the Chinese history (Yang, 2003), the formation of the current national intellectual property system (IP system) started just three decades ago when China entered WIPO and promulgated its first IP laws. The adoption and later amendments of these laws did not, however, secure a proper IPR protection. Cultural legacies (Alford, 1995) and "bureaucratic organization of the state" (Dimitrov 2009, p.21) hindered the emergence of an effective IPR enforcement in the earlier stages of China's IP regime.

The progress and shortcoming of China's IPR appropriation regime

However since China entered the World Trade Organization, the IPR appropriation regime has been gradually improving (Li & Yu, 2015; Shao, 2014; Tian, 2009; Yu, 2011). The willingness of the central government to attract more advanced technologies to China led to a stronger IP legislation in the beginning of the 21st century. Scientific development has become a major theme of China's 11th Five Year Plan period from 2006 to 2010 (Nuerenberg & Wang, 2012) announcing the country's new leap in "building an innovation-oriented nation" (The State Council of People's Republic of China, 2006).

IPRs have a positive impact on innovations in emerging economies (Chen & Puttitanun, 2004). Hence the improvement of the IPR appropriation regime was a logical step of the Chinese government, which upgraded the IP strategy of the country to the national level, by issuing the "Outline of the National IP Strategy" in 2008, and subsequently conducted a number of improvement measures from further amendments of the IP legislative base to public IP awareness events and special anti-counterfeiting enforcement campaigns (China International Business Review, 2012).

The statistic records show a growing confidence of foreign companies in China's IP system. The number of annual non-resident patent applications in the country more than tripled in 2015 compared to 2002, the first full year of China's WTO membership (WIPO Statistical Country Profiles). The annual number of IP litigation cases involving foreign parties grew from just 71 in 2002 to 1321 in 2011 (Chen, 2011). On the other hand local Chinese companies have been showing an increasing interest in obtaining their own IPRs in China (Dang & Motohashi, 2015) as well as internationally (Wunsch-Vincent, Kashcheeva, & Zhou, 2015). In 2011 China overtook the US to become the country filing the largest number of patent applications annually (Hu, Zhang, & Zhao, 2017).

Domestic and international IPR experts' opinions presented in the special supplement on IPR protection of China International Business Review (2012) have regarded China's intellectual property (IP) legislation base as comparable to that of developed countries and confirmed the

0. Introduction

substantial progress achieved in the area of IPR enforcement in the country. Nevertheless, the mentioned experts emphasized that the level of IPR infringement remains high and some of the improvement measures still have not achieved a sustainable effect.

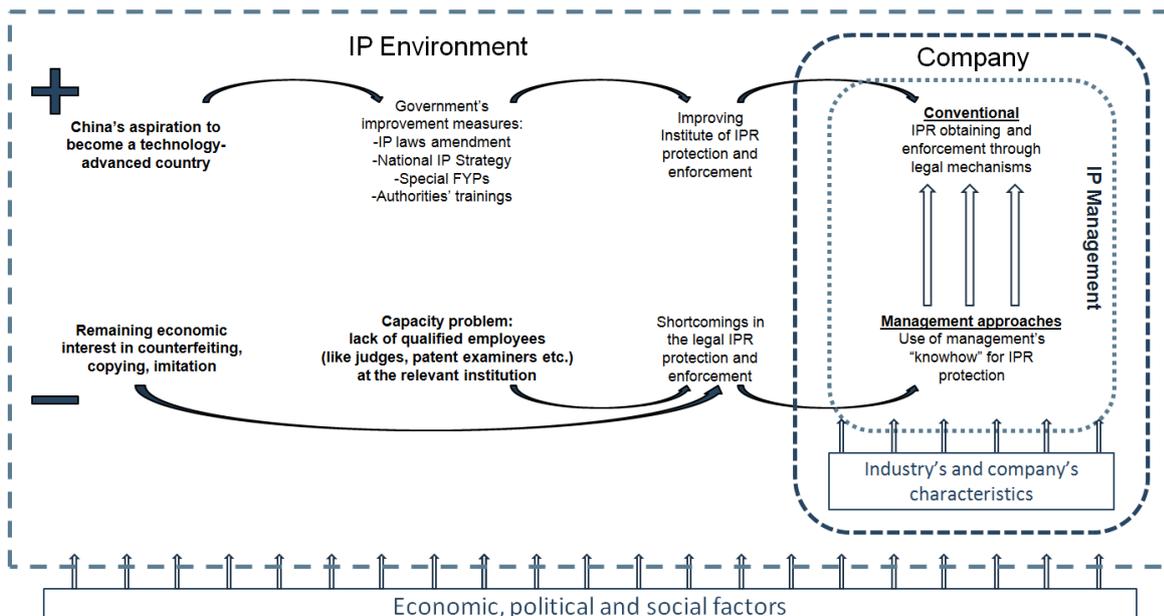
According to Dimitrov (2009), a law goes through three stages in its life cycle: promulgation (when it is put on paper in the absence of an enforcement institution), the institutionalization (when a law comes to be practiced and enforced predictably) and internalization (self-enforcing due to voluntary compliance). The events mentioned above suggest that China is in the stage of active institutionalization of the IP legislation to support the country's technological progress and moving up the value chain. Hence, China, in terms of IPR, should no more be seen as a typical developing country, characterized by weak IP legislation and absence of effective IP enforcement. The country's IP system is now emerging towards a strong IP appropriation regime comparable with that of developed countries.

The advancing IP legislation is accompanied by mixed trends in the enforcement area due to the contradiction between the central government's policies and remaining strong interests on local level in benefiting from copying and imitation. The remaining high volumes of IP abuses (Dimitrov, 2009; Yang and Clarke, 2005; Yu, 2011) and relatively low IP awareness in the country (Feng, 2014; Kshetri, 2009) also result in the limited capacities of qualified employees at the enforcement authorities capable to handle IP related issues on a high professional level.

Need for special management approaches to enhance the IP appropriation in China

This stage of China's IP system offers an especially interesting context for a study of corporate IP management and its special approaches (see Graph 1).

Graph 1. China's IP environment and MNCs' IP management



On the one hand, the improving IP appropriation regime in China should have motivated companies to rely more on conventional means of IPR protection. On the other hand, shortcomings in IPR appropriation via legal means due to above mentioned factors should have resulted in further use and, perhaps, advancement of management approaches aiming to either prevent IP abuse or strengthen the conventional IP appropriation.

0.4. Research concept and data

The present dissertation gives an alternative perspective on the IP management by focusing on the *management approaches* aimed to enhance the conventional IPR appropriation as well as *potential areas* where such approaches could be developed and implemented. It uses pragmatic approach, meaning that different methods or combination of methods were deployed at different stages of the research depending on the available knowledge from the previous studies and opportunities for the data collection.

According to Keupp et al. (2010) rich and enduring insights on how the strategies are carried out can be provided by “the close observation of managerial work”. The present dissertation uses unique data provided by seven multi-national companies with a long-term experience of production, R&D and sales in China. All the data were collected by me in a close cooperation with companies’ IP and R&D managers, patent and trademark attorneys and engineers.

An exploratory qualitative approach was chosen for the first article of the present dissertation “IPR Protection and Management Approaches. Insights from the MNCs’ Practices in the Automotive Industry in China”. This work investigates management approaches in four IP appropriation domains: patent rights obtaining, patent rights enforcement, trademark rights obtaining and trademark right enforcement.

This study deploys the multiple case study research method and uses an inductive logic, i.e. aims to generate a theory from data through a pattern analysis (Farquhar, 2012). Six cases promising rich information and insights on the research question were selected, out of which four are automobile original equipment manufacturers (OEMs) and two are automotive suppliers.

The data for the analysis were obtained from May to August 2013 from (1) semi-structured in-depth interviews with senior and middle managers responsible for IP protection related issues and activities of their companies in China (for interview guide see Appendix 1), (2) notes taken from internal documents provided by the interviewees during/after the interviews for a short review, (3) publicly available secondary data about the participating companies such as information from their official websites, annual reports, patents and trademarks applications data, articles in journals, magazines, newspapers and internet, YouTube videos etc. After the data collected from the above mentioned sources were analyzed and interpreted, short follow-up interviews were carried out via phone or e-mail in order to specify some details and/or fulfill the blanks in the data.

0. Introduction

The purpose of the following two studies was to get deeper insights in one IP appropriation domain – patent rights obtaining. The findings of the first article suggested that the management attempts to enhance the patent rights obtaining, via improving the *patent awareness* of the engineers. This became the research topic of the second article of the present dissertation “Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation”. While making the literature research and conducting the first interviews for a preliminary qualitative study aimed to develop a survey instrument, it became obvious that besides patent awareness there is another dimension that shapes the patenting behavior of the engineers – the *patenting motivation*. Therefore the third study “What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC” was undertaken to shed some light on this phenomenon.

The data for both studies were collected at multi-national engineering company’s three R&D centers in China. The company originates from Western Europe and specializes in drive, actuator and motion control technologies. Its global employee headcount is about 37,000. Company’s annual investments in R&D account for about 6% of the revenue and are considered as substantially higher than the average in the related industrial sector. China is considered at the company as important strategic market. The R&D headcount in China almost doubled in the last five years and several measures were undertaken so far to increase the local patent output.

The survey instrument is a structured questionnaire in Chinese (for English translation see Appendix 2); hence it covered only local employees of the company. The survey took place from April to May 2015. The total number of targeted R&D staff was 165 engineers excluding managers, administrative personnel and expats. For this reason two measures were undertaken to avoid a low response rate. First, the engineers were informed in advance on survey’s content, procedure and anonymity measures. Second, the management permitted to schedule appointments during working time to let the engineers fulfill the questionnaire. A survey supervisor was assigned at each R&D location to collect and send off the fulfilled questionnaires. 143 valid responses were received for the second article and 141 for the third article accounting for 86% and 85% response rate respectively.

0.5. Contribution: What to learn from this dissertation

This thesis contributes to knowledge on the corporate IP management by providing insights from the MNCs practices in China. Due to its interdisciplinary approach the present dissertation addresses several audiences, such as IP management, R&D management, knowledge management and employee motivation.

The IP management scholars are informed about various strategies the companies use to enhance their IP appropriation that go beyond the use of legal mechanisms provided by a certain IP system. The R&D management scholars benefit from the findings on the two dimensions of the R&D staff patenting behavior: patent awareness and patenting motivation. This thesis shows to

the knowledge management scholars how the sufficient knowledge in the area of patenting can be defined and what factors can affect it. The employee motivation scholars can get the insights on how the self-determination theory is applicable to the particular case of patenting motivation of the R&D employees.

Companies deploy various management approaches to deal with imperfections of a given IP regime

The first article of this dissertation has revealed 11 strategies, out of which 6 are applicable for both patent and trademark protection, 4 are implemented for both rights obtaining and enforcement domains and only 3 are exclusively applied in the trademark enforcement area. These findings extend the existing knowledge on IP strategies based on management approaches and provide an understanding on how such approaches are crafted and how they can support the conventional IP appropriation.

The existence of several management approaches for each explored IP protection domain shows the tendency of MNCs to catch up the controversial trends in China's IP environment, – to face, on the one hand, the remaining challenges of IP protection and use, and on the other hand, the opportunities occurring from the undergoing changes in the country's IP regime.

Companies apply management approaches not only internally, but tend to cooperate with other companies, authorities and end customers

To deal with high volumes of IP infringement effectively, companies need to have good market intelligence and spend their enforcement budget wisely. Companies participated in the multiple case study research for the first article provide external trainings to motivate their dealers, distributors or customers to report infringement. To make the external approaches more effective and, in particular, to share the high enforcement costs they participate in an industrial coalition. Using such coalition as a cooperation platform, they together address the growing interest of authorities in IPR protection by providing trainings to them, doing lobbying work and cooperating with them in the enforcement area.

IP awareness of the local employees, in particular engineers, is concerned by MNCs

The local staff of MNCs in the emerging economies may not always possess a strong IP knowledge, for example due to relatively low IP awareness in the society (Feng, 2014; Kshetri, 2009). To address this issue the companies¹ provide internal IP trainings, in particular patent trainings to their local engineers. The purpose of this approach is to improve knowledge on patents of R&D engineers and hence to increase the patent output from R&D activities and to ensure a better formal IP protection of new product solutions. The positive impact of patent

¹ Five of the six companies participated in the multiple case study research for the first article as well as the company which engineers participated in the survey for the second and third articles of this dissertation

trainings on improving of knowledge on patents and patenting was proved in the second article of the present dissertation.

There are further potential areas where effective management approaches could be created, deployed and explored

Patent awareness can be improved not only by patent trainings but also by a good supervisory encouragement. Besides, it is also affected by individual factors, such as patenting experience and use of patent literature. This means, that managers could potentially develop some approaches to influence the engineers' attitude toward using patent literature or make them put some extra efforts to transform their ideas into patentable inventions.

Furthermore, this dissertation revealed a complex nature of another dimension of the engineers' patenting behavior – patenting motivation. Same as general working motivation, patenting motivation should vary as a function of different factors in the working environment, including “evaluation expectation, actual performance feedback, reward, autonomy, and the nature of the work itself” (Amabile, 1993: p.186). The findings of the third article suggest that engineers that perceive the working climate as positive, have higher intrinsic motivation toward patenting. This study is the first to explore patenting motivation of engineers in the corporate context. It provides a framework for the further learning and understanding of engineers patenting motivation by scholars and its effective management at the companies for the purpose of increasing the patent output and enhancing their competitive advantage.

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Appendix 1. Interview guide

Company:	
Interviewee:	Name / Position
Date:	
Duration:	(30-90 Min)

1. Introduction
 - a. Topic introduction: Changing IPR protection environment in China
 - b. Interviewee's experience with IPR protection
 - c. Company's experience with IPR protection (short historical overview until present)
 - i. Since when
 - ii. How many employees were/are responsible
2. Formal and complementary strategies
 - a. Applications of trademarks, patents, utility models
 - i. Trademarks: international brand / local brand (e.g. for low-end products); well-known trade mark status
 - ii. Designs
 - iii. Patents: importance (is the number of applications growing?), clear patent strategy?
 - b. Administrative enforcement through SAIC, Customs
 - i. Efficiency
 - ii. Possible problems
 - c. Judicial
 - i. Trademarks
 - ii. Designs
 - iii. Patents
 - d. Business model: in-house vs. outsourcing
3. Internal strategies/approaches
 - a. R&D-related (e.g. R&D segmentation, "de-facto secrecy")
 - b. Personnel-related
 - c. Customer-related

0. Introduction

8	Our company puts a great value on patents.	<input type="checkbox"/>				
9	Our company encourages the engineers to deepen their knowledge on patents.	<input type="checkbox"/>				
10	Our company provides the engineers with necessary resources to improve their knowledge on patents.	<input type="checkbox"/>				
11	In my department the colleagues share their patenting experience with each other.	<input type="checkbox"/>				
12	My direct supervisor supports me to extend my knowledge on patents.	<input type="checkbox"/>				
13	My direct supervisor actively helps me to extend my knowledge on patents.	<input type="checkbox"/>				
14	My direct supervisor gladly shares with me his/her understanding of patents.	<input type="checkbox"/>				
15	My direct supervisor provides me with sufficient time resources to improve my knowledge on patents.	<input type="checkbox"/>				
16	In general, I am able to conduct a patent search in my relevant technology area independently.	<input type="checkbox"/>				
17	I regularly read existing patents of my company.	<input type="checkbox"/>				
18	I regularly read existing patents of our competitors.	<input type="checkbox"/>				
19	I regularly analyze existing patents of my company.	<input type="checkbox"/>				
20	I regularly analyze existing patents of our competitors.	<input type="checkbox"/>				
21	I regularly use our company's patents for R&D projects.	<input type="checkbox"/>				
22	I regularly use our competitors' patents for R&D projects.	<input type="checkbox"/>				
23	Our company provides a good financial reward to the engineers for their patented inventions	<input type="checkbox"/>				
24	Engineers who patent their inventions are highly respected in our company.	<input type="checkbox"/>				
25	Engineers who patent their inventions receive a high degree of recognition in our company.	<input type="checkbox"/>				
26	Engineers with good patented inventions are a role model for other colleagues at our R&D center.	<input type="checkbox"/>				
27	Engineers with good patented inventions can get a career promotion in our company.	<input type="checkbox"/>				
28	My supervisor encourages the engineers to patent their innovative technical solutions.	<input type="checkbox"/>				
29	My supervisor supports the engineers if they need to write an invention report.	<input type="checkbox"/>				
30	The engineers in my department are provided with consultancy for writing an invention report by internal patent attorneys.	<input type="checkbox"/>				
31	The engineers in my department are given enough time capacity if they need to write an invention report.	<input type="checkbox"/>				
3. Please specify the importance for you of the following motivating factors to make efforts to patent an invention		5	4	3	2	1
		very important	important	uncertain	not important	totally unimportant
1	Financial reward	<input type="checkbox"/>				
2	Respect of my colleagues	<input type="checkbox"/>				
3	Recognition of the management	<input type="checkbox"/>				
4	Enhance my reputation at the company	<input type="checkbox"/>				
5	Enhance my influence at the company	<input type="checkbox"/>				
6	Gain better promotion opportunities	<input type="checkbox"/>				
7	Demonstrate my engineering skills	<input type="checkbox"/>				
8	Create a valuable output	<input type="checkbox"/>				
9	Protect innovative solutions	<input type="checkbox"/>				
10	Protect the benefits of the company	<input type="checkbox"/>				
11	Enhance the company's value	<input type="checkbox"/>				
12	Make a contribution for the company	<input type="checkbox"/>				
13	Enjoy the creation process of a patent	<input type="checkbox"/>				
14	The honor to sign a patent	<input type="checkbox"/>				
15	Interest in the creation of patents	<input type="checkbox"/>				
16	Sense of achievement	<input type="checkbox"/>				
17	Challenge to create a patent	<input type="checkbox"/>				

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

Abstract

Intellectual property (IP) systems and IP related laws do not always provide the optimal level of intellectual property rights (IPRs) protection that companies would like to achieve, especially in emerging economies. Previous research shed light on some companies' strategies aimed to achieve a better level of IP protection despite the drawbacks of IP systems. Yet little is known about the management approaches aimed to enhance the conventional protection, i.e. obtaining and enforcement of registrable IPRs such as patents and trademarks. The present study addresses this issue by investigating six cases of multinational corporations (MNCs) operating in the automotive industry in China. Findings reveal eleven management techniques that differ in the application area (i.e. internal or external) and context (either aimed to improve IP awareness or to settle cooperation on the IP protection issues). The discussion also shows the applicability of some explored management approaches for other industries and their double role to also prevent infringement.

Key words: intellectual property rights, patents, trademarks, protection, China, automotive industry

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

1.1. Introduction

The intellectual property protection from the company's perspective is, first of all, associated with coordinated actions on obtaining and enforcing of the respective intellectual property rights, such as patents, utility models, industrial designs, trademarks, copyright and trade secrets. However, not every national IP system and not every IP related law can guarantee an optimal protection level of the intangible assets a company may desire. The imperfections of an IP environment, especially in emerging economies, should have encouraged the companies' skilled managers to seek for additional and/or alternative ways to protect their intangible assets. Such ways can be described as *management approaches* – strategies developed by managers in order to prevent the abuse of their companies' IP rights or enhance their obtaining and enforcement via legal means.

Unfortunately only a few studies shed some light on these management practices where they are referred as “nonmarket strategies”, “management capabilities” (Somaya, 2012), “corporate actions” (Yang, Fryxel, & Sie, 2008) or “de facto protection strategies” (Keupp, Beckenbauer, & Gassmann, 2010). In particular, little knowledge is available on the management approaches aimed to support and strengthen the obtaining and enforcement of registrable IPRs such as patents and trademarks.

Having China's emerging IP system as a research context, the present study attempts to close this knowledge gap, i.e. to provide a theoretical understanding on how multinational corporations can enhance their patent and trademark protection in the domains of rights obtaining and enforcement using management approaches and to outline the strategic recommendations on how to apply such approaches to achieve a stronger IP protection in the emerging economies.

The controversies of China's emerging IP system (Serrano, 2016), combined with its ascending patent surge (Hu, Zhang, & Zhao, 2017) and high attractiveness of its market, suggest a challenging environment which motivates managers to develop and deploy various approaches to attain an optimal level of IP protection.

Moreover, unlike previous studies, this research explicitly focuses on the practices of MNCs operating in the automotive industry. This choice promised rich findings for two reasons. First, the automotive companies usually have large portfolios of patents and trademarks – the protection of which this study investigates. Second, automotive companies potentially experience a high pressure from the growing local competition supported by the Chinese government for which the industry is of high strategic importance. China's 12th Five Year Plan mentions automotive industry among the nine key industries² that are historically crucial for the national economy as well as

² petrochemical, shipbuilding, automotive, iron and steel, non-ferrous metals, building materials, equipment manufacturing, light industry and textile

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

among the “new strategic emerging industries”³ that are supposed to become a high-tech booster of the Chinese economy in future. This rationale may have also induced the companies to find ways to maximize the appropriation of their intangible assets and hence, to strengthen their competitive positions.

I outline my study as follows: First, I develop a conceptual framework by (1) reviewing the relevance of patent and trademark protection for the companies and (2) providing an overview of management approaches in patent and trademark protection known from previous research. Next, I explain the methodology used for the research and then present the results of the analysis of the obtained data. Finally, I discuss implications of my findings and their limitations.

1.2. Conceptual framework: IP protection strategies

1.2.1. The relevance of patent and trademark protection for companies in different IP systems

In developed economies with strong IP systems companies traditionally rely on registered IPR like invention, utility model and design patents as well as trademarks. The violation of rights provided by the formal protection means is to a high degree precluded by the strong IP appropriation regime.

Patents are regarded in general as the most valuable and hard to obtain IPRs (Gollin, 2008, p.172). Nevertheless, a single patent may not be examined properly due to time constraints or lack of identified prior art, does not provide the holder with an indefinite right to use the technology, and does not exclude the risk of competitors inventing around the patent (Somaya, 2012; Mansfield, Schwarz, & Wagner, 1981). To address these uncertainties of single patent rights, companies deploy various strategies with regard to obtaining and enforcing patents. Somaya (2012) recently provided an integrative overview of the research literature related to these practices. The traditional motive of companies to protect their products from imitation and, hence, secure their competitive advantages implies such actions as building patent fences (Cohen, Goto, Nagata, Nelson, & Walsh, 2002; Gollin, 2008), offensive blockage (Blind, Edler, Frietsch, & Schmoch, 2006; Cohen et al. 2002; Pitkethly, 2001), or persistent investigation of and enforcement against imitations (Polidoro & Toh, 2011) characterized by little likelihood of a suit settlement (Somaya, 2003). Besides, to defend against the patents held by third parties companies resort to defensive blockages (Arundel, van Paal, & Soete, 1995; Blind et al., 2006; Cohen et al. 2002; Duguet & Kabla, 1998), defensive thickets (Rubinfeld & Maness, 2005), strategic patenting (Blind, Cremers, & Mueller, 2009; Torrisi, Gambardella, Giuri, Harhoff, Hoisl, & Mariani, 2016), or use the defensive patent portfolios to file a countersuit and subsequently reach a settlement agreement when accused for an infringement (Somaya, 2003) etc.

³ 7 following selected industries: energy saving and environmental protection, bio-industry, new energy, next generation IT, new materials, clean energy vehicle and high-end equipment manufacturing; for more details see Chapter 10 of the China's 12th Five Year Plan on Economic and Social Development

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

The patent protection is however limited to 20 years from its filing date, whereas the trademark protection may last forever. A strong branding can, for example, keep customers' loyalty to the product even if it stopped being exclusive due to the expiration of the related patents. Findings of previous research show a positive influence of trademarks on sales revenue (Doern, 1999, p. 72; Seethamraju, 2003), profit (Griffiths, Jensen, & Webster, 2011) and market value (Bosworth & Rogers, 2001; Greenhalgh & Rogers, 2007; Seethamraju, 2003). Protecting their trademarks' exclusivity, companies may regularly file an opposition against new trademark applications similar to their own (von Graevenitz, 2007). Graham and Somaya (2004) suggest that firms may file trademark litigation when they are targeted by patent enforcement.

Despite of weak IP systems in the developing economies, foreign firms have, nevertheless, a propensity to protect their IPRs in a conventional way – via rights obtaining and enforcement (Chow, 2002; Liang & Xue, 2010; Wu & Liu, 2004; Yang & Clarke, 2005; Yang et al. 2008). In particular, the motivation of MNCs to obtain patent rights in weak appropriation regimes can be explained by market considerations (Liang & Xue, 2010), e.g. competitive threat from other foreign firms (Hu, 2010).

Generally the research on MNCs' IP protection strategies in the weak IP appropriation regimes through legal mechanisms is fragmented and is represented by a limited number of studies. In China, on which the present study focuses, Keupp, Friesike, and von Zedtwitz (2012) revealed a different strategic character of MNC's patenting activities and defined four archetypes of firms' patenting strategies depending on their expectations about the future of the appropriability regime, use of patents as a signaling mechanism and degree of geographic differentiation of their IP policy. A recent quantitative study of Wolfram, Schuster, and Brem (2014) confirms the findings of Keupp et al. (2012) on various strategic patenting behaviors of multinationals in emerging economies. Wang (1998) analyzed some cases of patent litigation involving foreign parties. Clarke (1999) discusses the pros and cons of civil litigation and administrative enforcement for foreign firms. Veer (2013) gives an example of successful judicial actions of a German engineering company toward patent infringement in China. The most comprehensive overview of patent litigation suits filed by foreign companies using five years data (2006-2011) is recently provided by Love et al. (2016).

Some insights on trademark application and enforcement practices of foreign firms can be found in the literature on anti-counterfeiting or brand protection strategies. Some companies had to deal with the rejection of the trademark application of their internationally recognized brand in China and adopted the reapplication strategy characterized by a convincing demonstration of evidence proving their application validity to the relevant authorities (Yang, 2003; Yang, Sonmez, & Bosworth, 2004). MNCs with high managerial confidence in the IP system tend to obtain trademark rights and successfully practice the administrative and judicial actions against trademark infringement in China (Yang et al. 2008).

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

1.2.2. Use of management approaches in IPR protection

Besides traditional IP protection strategies related to rights obtaining and enforcement and keeping secrecy, previous research provides some evidence that companies may use strategies based on *management approaches* to deal with some system imperfections and further enhance IPR protection. Such approaches known from the previous research can be divided into two categories: either aimed to *prevent* the IP infringement, or to *enhance* the conventional IP protection via rights obtaining and enforcement.

The existing research reveals a great deal of management approaches that *prevent* IPR infringement both in strong and weak appropriability regimes. Companies may provide training to their customers to demonstrate the advantages of buying the original product (Keupp et al., 2010; Yang, 2003); label the products to enable customers to distinct them from fakes (Chaudhry & Walsh, 1996; Jacobs, Samli, & Jedlik, 2001; Yang et al., 2004; Yang et al., 2008); warn their distributors about counterfeits in the market (Jacobs et al., 2001; Yang et al., 2008); or monitor the manufacturing and distribution networks (Yang., 2003; Yang et al., 2004). The findings of Yang and Frixell (2009) suggest that the right brand positioning is associated with lower volumes of respective counterfeit goods.

As for the management approaches aimed to *enhance* conventional IPR protection via legal means, in strong IP systems a limited number of studies revealed some examples such as lobbying (Kesan & Galo, 2009), approaching particular tribunals or courts (Moore, 2003; Somaya & McDaniel, 2012), and building a reputation to be successful in trademark opposition (von Graevenitz, 2007) and trademark or patent litigation (Li, Wu, Chen, & Ji, 2013). Another few studies discuss the role of companies' internal managers in patent related activities (Somaya, Williamson, & Zhang, 2007; Tietze, Granstrand, & Herstatt, 2006) and outsourcing of patent prosecution and enforcement (Reitzig & Wagner, 2010).

Existing literature on these "enhancing" approaches in weak IP systems is scarce and provides some insights mainly in the trademark enforcement area (Jacobs et al., 2001; Yang et al., 2004; Yang et al., 2008). The findings of Keupp et al. (2010) suggest building effective networks with government authorities, such as Chinese legislators, local governments, administrative authorities and customers to enhance IP protection. However the mentioned authors did not focus on a certain IP right in their study. To the best of my knowledge, no separate study on management approaches in the IP rights obtaining and enforcement has been carried out until now. Furthermore, previous studies on such IP protection strategies are based on data collected from 2000 to 2006, but the changes that have occurred in China's IP system in the last years and its ascending patent surge (Kroll, 2016) should have influenced corporate IP protection strategies and management approaches for IP protection in particular. The assumption of this empirical research is, therefore, that managers at MNCs that are actively protecting their IPR, should have advanced old or create new approaches toward IPR protection in response to challenges and opportunities caused by China's new leap in advancing its IP system.

1.3. Methods

According to Keupp et al. (2010) rich and enduring insights on how the strategies are carried out can be provided by “the close observation of managerial work”, therefore, an exploratory qualitative approach is appropriate for identifying IP protection strategies. Edmondson and McManus (2007), Eisenhardt and Graebner (2007), Farquhar (2012) and Yin (2013) suggest to use a case study research strategy if the research is posing a “how” question in an unexplored research area and multiple cases for broader exploration of the research question and more robust theory building. A sample size of 4-10 cases is recommended by Yin for this purpose.

The present research uses an inductive logic, i.e. aims to generate a theory from data through a pattern analysis (Farquhar, 2012).

1.3.1. Sampling of the cases

For the purpose of the present study, six cases were selected, out of which four are automobile original equipment manufacturers (OEMs) and two are automotive suppliers. To derive this final sample I looked for cases promising rich information and insights on the research question (Yin, 2013). An important criterion for the selection was an active involvement of a company in IPR protection related activities in China. I regarded the membership in the Quality Brands Protection Committee⁴ (QBPC), a coalition of the foreign-invested enterprises in China dealing with IP protection related issues in the country) as a good sign of such involvement. I contacted the QBPC member-companies from the automotive industry using my private network and via administrative staff of the QBPC and sent them my research proposal. Nine managers from eight companies replied positively to my request. At six out of these eight companies, I managed to establish contacts with further managers who agreed to participate in my research and therefore enabled me to conduct the case studies at their companies. At the remaining two companies the further contacts refused to participate, therefore a case study research was not possible.

The six selected companies are MNCs with operations including production and R&D in many countries worldwide, originating from developed countries – USA, Japan and Western Europe. They all started their operations in China more than ten years ago and currently operate both, joint-ventures with a local partner as well as wholly owned subsidiaries. The present research covers only the IP strategies of the wholly owned subsidiaries of those companies in China. Nevertheless, the IP related matters of the joint-ventures were sometimes discussed during the interviews, if it was necessary for the purpose of the present study. The descriptive data about the cases is presented in the Table 1.

⁴ Quality Brands Protection Committee (QBPC) – a coalition of the FIEs in China dealing with the IP protection related issues in the country. Website: www.qbpc.org.cn

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

Table 1. Cases description

Company	Industry segment	Local operations
A	Automobile OEM	Sales, production (only via joint-venture), R&D, services
B		
C		
D		
E	Tier 1 automotive supplier	Sales, production, R&D, services
F		

1.3.2. Data Collection

The data for the analysis were obtained from (1) semi-structured in-depth interviews with senior and middle managers responsible for IP protection related issues and activities of their companies in China, (2) notes taken from internal documents provided by the interviewees during/after the interviews for a short review, (3) publicly available secondary data about the participating companies such as information from their official websites, annual reports, patents and trademarks applications data, articles in journals, magazines, newspapers and internet, YouTube videos etc.

In order to limit the bias, an approach of “using numerous and highly knowledgeable informants” (Eisenhardt et al. 2007) was applied; therefore the semi-structured in-depth interviews have been conducted with at least two experienced managers per company. All the interviewees had positions directly related to the IPR issues of their companies such as IP council, patents/trademark attorney, head of IP department, brand protection manager with an exception for only one contact whose main duty was product management. The majority of the interviewees were Chinese citizens working full time for the respective companies in China; three contacts were expatriates working full time in China; two managers were working in the companies’ home countries while being responsible for IP related issues in China and having frequent business trips there.

To address the confidentiality concerns the non-disclosure letters were sent to each respondent prior to the date of the interview. All interviews were conducted in the English language. They took place between June and September 2013 at the corporate offices of the contact persons in China, except for one manager who was interviewed at his company’s headquarters in Europe. Most of the interviews have been audiotaped and transcribed later. Only for three interviews the transcripts were created during the interview. The interview transcripts were reviewed and confirmed by the contact persons. One interview lasted 60 minutes on average.

For all interviews the same guideline has been used. The managers were asked about their companies’ experiences in the IP protection area in China, about the structure of the IP management of their companies in China, how the companies protect their IPR via legal means,

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

what available administrative and legal actions they take against the infringement of their IPRs, what kind of management approaches they use to further enhance the IPR protection. The interviews mainly reflect the ongoing situation related to the IP protection of the companies, nevertheless, the managers were also asked to describe how the IP protection strategies of their companies have been evolved over the past years and what changes they anticipate in future.

After the data collected from the above mentioned sources were analyzed and interpreted, short follow-up interviews were carried out via phone or e-mail in order to specify some details and/or fulfill the blanks in the data.

1.3.3. Analysis Strategy and Technique

All transcripts, notes, articles and other materials were coded using the inductive logic. As suggested by Corbin and Strauss (2008) the coding was conducted in three steps: (1) open coding where all the obtained data are simply labeled and disaggregated into units; (2) axial coding where the codes are rearranged in hierarchies and subcategories and (3) selective coding where the categories are integrated into few core categories. The first two steps were carried out using the software program for qualitative analysis ATLAS.ti. At the third step the categories were integrated in a table where a short description of each category to each case was established in order to observe replications, pattern matching and synthesis across the categories and cases. I present my findings for the observed strategies by providing a description to each of them supported by the relevant citations from the above mentioned interviews.

1.4. Research Findings

The analyzed data provided strong evidences for the assumptions that management at the participating companies has crafted a number of various strategies to support the legal protection of their companies' IPR. A number of different management approaches was revealed at each company that participated in the present research. The investigated management approaches depend on (1) the corporate IP management structure and (2) the companies' practices in the area of patent and trademark rights obtaining and enforcement in China that are presented in the Appendices 1 and 2 respectively. The summary on the explored strategies is presented in the Table 2. The names of the strategies were either directly taken from the interview data or given during the data analysis according to their meaning. Moreover, the strategies were grouped into four major categories according to their context and application area:

- internal awareness – management techniques aimed to improve IP awareness of the company's employees;
- external awareness – actions to improve IP awareness of the external bodies, such as authorities, dealers/distributors and customers;
- internal cooperation – cooperation on IP protection related issues with the internal departments;

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

- external cooperation – cooperation on IP protection related issues with external bodies, such as authorities, industrial coalitions, dealers/distributors and customers.

A detailed description and analysis for each of the revealed strategies is provided below.

1.4.1. Internal awareness strategies

IP trainings for engineers

The purpose of this strategy is to improve knowledge on patents of R&D engineers and hence to increase the patent output from R&D activities and to ensure a better formal IP protection of new product solutions. Patent awareness of local engineers is usually low, therefore the trainings are helpful to make them able to recognize a patentable invention in an R&D project they work on and submit an invention disclosure to the IP department or to identify an infringement in a competitor's product:

“We provide trainings to engineering staff at the R&D center: general information about IP, whom they should contact if they have a new idea. We also make trainings on how the engineers can transfer their daily work into a patent.” (Case B, head of IP)

“We have several training materials. First of all – the IP awareness training, it is the basic one. Another one is for patent search. For some employees we provide training about what the infringement is.” (Case E, patent attorney)

IP trainings for other employees

The same reason of a usually low IP awareness of local staff makes IP trainings with focus on trademarks a good strategy to enhance IP protection. One purpose is to make employees familiar with the company's trademarks and typical cases of trademark rights abuses by other companies. Keeping this information in mind, employees can recognize the infringement being, for example, at a trade fair.

Besides, the basic trainings on trademarks are provided to product managers to ensure that they report new product names that should be registered as trademarks to the relevant IP manager in good time, before the products are launched in the market. Such trainings are mainly provided to sales and marketing staff, though it can also be offered to all interested employees:

“We organize internal trainings for the employees 2-3 times a year at our corporate training centers. Human resources department also assists us to improve the brand protection awareness among the colleagues. Trainings are free for all interested employees.” (Case B, brand protection manager)

“We provide general IP training to different colleagues. This year we put more focus on sales and marketing colleagues. Sometimes they are not aware that they are infringing some copyright or trademark use. We provide them with the training 1-2 times a year.” (Case F, IP manager)

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

Table 2. Management approaches for the IP protection

Strategy	Cases	Description	Applicable for
Internal awareness	A-B, D-F	Provide trainings to engineers to improve their knowledge about patents in order to increase the number of patentable inventions and make the engineers able to recognize the infringement by the third parties	Patent application and enforcement
	A-F	Provide trainings to sales & marketing staff and other employees to improve their awareness on the IPR issues related to their work	Trademark application and enforcement
	A-F	Work with sales/after-sales and R&D departments closely to get the information on and evidence of infringement in time and get a better knowledge on the counterfeit products market	Patent and trademark enforcement
Internal cooperation	A-E	Work with sales/after-sales, R&D, product management departments closely to develop knowledge and workflow for recognizing the counterfeit products easily and fast	Trademark enforcement
	A-F	Work with legal and other related departments closely for better preparation of the enforcement cases to guarantee the success	Patent and trademark enforcement
	A-C, E-F	Teach dealers/distributors/customers how to recognize the counterfeit products and let them know how to report the infringement	Trademark enforcement
External awareness	A-F	Make the enforcement authorities be familiar with the company's brands and products, show them typical signs of the suspicious products and let them know how to contact you in case of detected infringement	Trademark enforcement
	A-F	Participate in the discussions and provide company's opinion on further improvement of the IP system via membership at / cooperation with IP related non-profit organizations (QBPC*, JETRO**, ECCO***, AmCham China****)	Patent and trademark application and enforcement
	A-C, E-F	Engage dealers/distributors/customers in providing you with information on infringement and collecting the evidence. Cases A-C: organize training for the end-customers together with the dealers.	Patent and trademark enforcement
External cooperation	A-F	Have regular contact with the related enforcement authorities, show them appreciation for the successfully enforced infringement cases and share with them the experience of the previous successful enforcement cases	Patent and trademark enforcement
	A-F	Work together with the industry partners/competitors on the enforcement cases to get more attention from the enforcement authorities, share the enforcement costs. Exchange with them the experience on IPR enforcement and take part together in lobbying activities	Patent and trademark application and enforcement
		Industrial coalition	

*Quality Brands Protection Committee

**Japan External Trade Organization

***European Chamber of Commerce in China

1.4.2. Internal cooperation strategies

This group of strategies goes further than just improving IP awareness of employees, but rather engages relevant departments in certain workflows related to patent and trademark enforcement:

“We have established a workflow coordinating the actions of relevant departments and business units... The IPR protection in China is included into the global process of the IPR protection of the company.” (Case B, brand protection manager)

Gaining information on infringement

Though IP managers highly rely on investigation companies in getting information on counterfeit production and distribution networks, sales/after-sales departments, as well as some other employees also may have good market insights and can be of a good help too:

“We have like peak seasons for different product lines. So if the after-sales start getting fakes, they report back to me. What I found earlier was that by the time we're getting the information the season was over and the [counterfeits] production stopped... Let me have an advance notice and we can be sort of in the market... so that we can do something more effective.” (Case A, anti-counterfeiting manager)

“To get the information about the infringers we have our own network. We have our sales people, marketing people and other employees. Whenever they find some information they can send it to us.” (Case E, trademark attorney)

Counterfeit product identification

Many of the IP managers responsible for the anti-counterfeiting measures have rather a legal than a technical background. Therefore, dealing with a “high quality” counterfeit, they are not always able to distinguish it from the original product and provide an investigation company or a relevant enforcement authority with a feedback on the suspicious goods quickly. Help from qualified colleagues from sales, product management or R&D department is necessary in this case:

“I am a lawyer. When a counterfeit is made very precisely, it's impossible for me to identify it since I'm not familiar with all the technical details of our products. Therefore I have contact persons in our sales and R&D to help me with this issue... Their quick response is often crucial. For example, in case of Customs enforcement you have only 3 days to confirm to the officer if the goods he detected are fake.” (Case E, brand protection manager)

Enforcement case selection and preparation

This strategy is usually applied for judicial enforcement. Considering the high costs of civil litigation, companies prefer to maximize their chances to win a lawsuit before filing a complaint.

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

Hence the involvement of other departments is often required to assess the success chances and accurately prepare the infringement evidence:

“We have regular communication with sales and legal departments. For a proper civil litigation preparation it is important to work together.” (Case D, head of IP)

“[W]e usually would like to be sure that we have good chances to win... We don't initiate a patent enforcement case if we don't have a very strong position or we have not reserved very strong evidences. Normally we get [relevant] information from the business unit that reported the infringement.” (Case E, patent attorney)

1.4.3. External awareness strategies

Trainings to dealers/distributors/customers

Though the primary purpose of such trainings is to show the potential bad consequences of buying and using counterfeits and hence to convince customers to buy original products, another good outcome is that dealers and customers may report an infringement lately if they recognize a counterfeit. This can give better market insights to the managers responsible for anti-counterfeiting:

“Dealers' trainings are expanding. We provide some knowledge about brand protection awareness. This year we have already made 18 trainings... they [dealers and customers] may provide us with additional market information that sometimes helps us to coordinate our enforcement actions.” (Case B, brand protection manager)

Trainings to authorities

Considering the high volume of counterfeit goods on the Chinese market, it may provide some advantages to make the enforcement authorities be familiar with the company's brands and products so that they can put closer attention to the suspicious goods labeled with the relevant brand during their enforcement activities.

“By attending QBPC meetings and also some other meetings we often... give the personal trainings to them [enforcement authorities], especially to the Customs so that they know our brand and could put our case on the “priority list” for the urgent cases.” (Case E, trademark attorney)

Lobbying

Participation in discussions and projects on IP related issues may influence the further development of the IP system and, therefore, bring some advantages for the companies' IPR protection such as improved legislation or better enforcement:

“Different enforcement agencies for the same problem may have a different attitude. Lobbying work always plays an important role in such cases.” (Case D, head of IP)

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

“We are... actively involved into the legislation improvement in the IP area. We have joint research projects with SIPO, Shanghai Court, Jiangsu Court and famous universities to give them a good knowledge and experience about the practices in our company’s home country, what the law there tells on a particular case.” (Case E, head of IP)

1.4.4. External cooperation strategies

Cooperation with dealers/distributors/customers

Whereas trainings to dealers or customers may suggest to them to report an infringement in case they found a counterfeit, the cooperation with them implies their deeper involvement into patent and trademark enforcement activities such as providing market information, helping to collect evidence or, in case of automobile OEMs (cases A-C), organization, of trainings to the end-customers:

“The dealers are very supportive. They know that the infringement has a big impact on their business. They like to transfer the information to us to ask for the protection... We also make the trainings together with our dealers. They invite the customers, - the car owners, to their place to receive the training on how to recognize the counterfeits. We show some videos and provide some brochures.” (Case C, brand protection manager)

“If the relationship with a customer is good we can ask him to provide us with some information on the infringement. In some cases we or even the external law firm cannot get to the product. But our customers can buy or get a sample because they have some relationship with the infringer.” (Case E, patent attorney)

Cooperation with authorities / “guanxi”

On the one hand, this strategy became possible due to the motivation of the authorities to gain more enforcement experience in order to follow the central government’s policies aimed to improve the IP environment in China:

“Whenever we have a big case, especially a criminal one, when the case is closed we organize an appreciation meeting with the police. We prepare a flag, a plate or a letter. In China the officials have a portfolio to review their work at the end of the year. So if they have an appreciation letter or a prize from a brand owner, it’s good thing for the review.” (Case C, brand protection manager)

On the other hand, networking that often refers to "guanxi"⁵, a distinctive nature of interpersonal relationships in the Chinese society, may help companies to have fewer issues during the enforcement procedures:

⁵“guanxi” means “relation” in Chinese

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

“Good relations with the authorities are important. Litigation cases, for example, can run smoothly if you have good relations.” (Case B, head of IP)

Industrial coalition

All six companies that participated in the study are members of QBPC and in particular of its Automotive Industry Working Group. The purpose of the participation in a coalition is to jointly address various IP protection issues to attract more attention from relevant authorities:

“QBPC provides a good platform to communicate with the enforcement agencies and multinational companies. When we approach the authorities as a single company, we sometimes do not get enough attention. If we go as a coalition, then our voice will be loud enough to be heard.” (Case E, head of IP)

Though it may be unusual in other countries to share IP related issues with other companies, the concept of a coalition may ally well with the local culture:

I think, generally this concept of QBPC group is also very accepted in the Chinese culture, - the idea of working together and of the common success. (Case A, senior IP manager)

It is a multi-faced strategy with a number of different advantages. On the one hand, it is a way to take enforcement actions together with other companies operating in the same industry that provides such benefits like cost savings and enforcement experience exchange. On the other hand, it is a platform for joint trainings of authorities and participation in lobbying activities:

“Active cooperation between OEMs for criminal investigation is crucial for our success... We run discussions on coordinated actions, share information etc. In the field of IPR protection we are not competitors, but partners.” (Case B, brand protection manager)

“It’s a way... to attract more attention from the authorities... Also when you make a case for one brand, it costs a lot. But for the joint cases we can share costs.” (Case C, brand protection manager)

“A good thing QBPC provides is trainings for the authorities. The best thing for us is the Automotive Industry Working Group... We work closely on information sharing, multi-brand actions etc. It would be harder without this platform.” (Case F, IP manager)

1.5. Discussion and Conclusion

1.5.1. Results and managerial implications

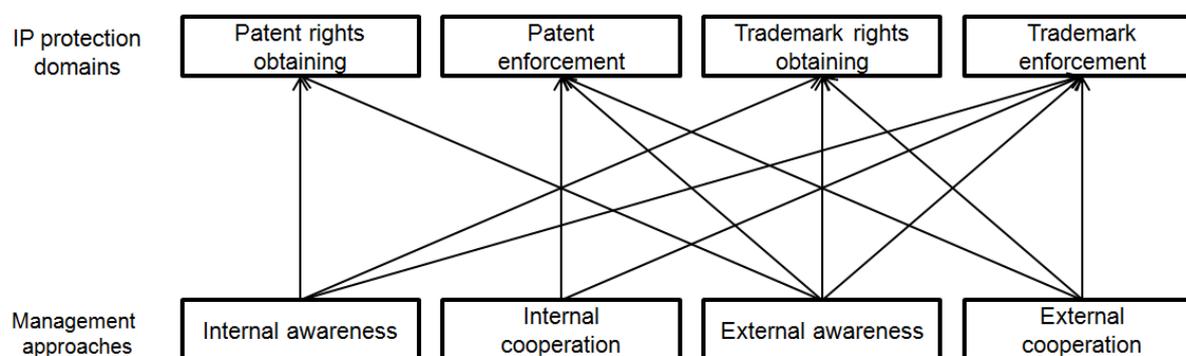
The present research has explored management approaches to enhance the patent and trademark protection in the context of China’s emerging IP environment. This study has revealed 11 strategies, out of which 6 are applicable for both patent and trademark protection, 4 are implemented for both rights obtaining and enforcement domains and only 3 are only applied in

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

the trademark enforcement area (see Table 2). These findings extend the existing knowledge on IP protection strategies based on management approaches and provide an understanding on how such approaches are crafted and how they can support the conventional IP protection measures.

The explored management approaches differ in (1) their application area – *internally* at the company or *externally*, - involving companies' distributors, dealers, customers and relevant authorities; and (2) the context of involvement of the bodies which they address – making them *aware* of the company's IPR or involving them into *cooperation* on the protection of the company's patents and trademarks. Graph 1 provides an overview of the applicability of different categories of the explored strategies in the four IP protection domains which were the focus of the present study.

Graph 1. Management approaches and conventional IP protection strategies



The existence of several management approaches for each explored IP protection domain shows the tendency of MNCs to catch up the controversial trends in China's IP environment, – to face, on the one hand, the remaining challenges of IP protection and use, and on the other hand, the opportunities occurring from the undergoing changes in the country's IP regime. To deal with high volumes of IP infringement effectively, companies need to have good market intelligence and spend their enforcement budget wisely. The former can be gained by motivating employees as well as dealers, distributors or customers to report infringement during IP trainings. The latter is possible by participating in an industrial coalition and, thus, sharing enforcement costs. The growing interest of authorities in IPR protection is addressed by providing trainings to them, doing lobbying work and cooperating with them in the enforcement area.

Moreover, several strategies in the automotive business investigated by the present study were previously observed by other researchers in other industries that has two important implications. First, this confirms the universality of such approaches among different industries. For example, the cooperation with authorities⁶ is known to be applied by an IT company (Yang et al., 2004) and

⁶ mentioned in the articles as "the government hand strategy" (Yang et al., 2004) and "external guanxi" (Keupp et al., 2010)

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

firms operating in the power and automation, pharmaceuticals and electronic industries (Keupp et al., 2010). Second, the research revealed a double role of some management approaches, such as trainings to engineers, other employees, distributors and customers. Keupp et al., 2010⁷, Yang et al., 2004⁸ and Yang et al., 2008⁹ interpreted these strategies as a measure to prevent infringement, whereas the companies participated in this research also use them to support the formal protection and enforcement of their IPRs.

Though this research is solely focused on the automotive industry, I claim that the explored strategies can be adopted in a wider range of industries. By implementing such strategies, firms can effectively protect their IPRs by registering and enforcing them in an IP regime where relevant laws' internalization has not happened yet. Moreover they may enjoy the cost benefits, getting other experts' experience and may even influence the future shape of the country's IP regime.

However there are some preconditions for the implementation of the explored management approaches. First is the local IP management. As suggested by Yang (2003) an assignment of a local IP manager could have a positive effect on IPR protection. As shown in Appendix 1, IP management is fully or partially localized at the six analyzed cases. Most of the strategies would be impossible to conduct efficiently without significant physical presence of an IP manager in China since many personal interactions as well as mobility within the country are expected.

Besides, the effectiveness of some management approaches highly depends on the cultural competence of the responsible managers, which conforms to the earlier findings of Keupp et al. (2010). The majority of the respondents interviewed for the present study are Chinese citizens for whom language or cultural barriers are not an issue. Such an advantage may significantly ease the building of effective internal and external networks.

Furthermore, financial considerations must be taken into account. Implementing and practicing these management approaches require a certain budget and human resources. It would be more reasonable to adopt time-consuming and costly strategies for large-size companies (Keupp et al., 2010) or companies with significant local operations in China.

1.6. Study limitations and further research recommendations

Commenting on the limitations of the present research, first of all, it needs to be pointed out that the findings depict only a limited sample of management approaches among all those that can possibly exist. The study is based on the experiences of six companies operating in the automotive industry which choice anticipated rich research results. Therefore, the management

⁷ mentioned in the article as "internal guanxi" and "educate the customer"

⁸ mentioned in the article as "consumer campaigns"

⁹ mentioned in the article as "public awareness" and "warning distributors"

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

approaches of other automotive companies as well as companies in other industries could not be investigated.

Given that it is probably not easy to conduct a company-level study on such a sensitive topic as IPR protection and this opportunity often depends on the researcher's network in the business world, the phenomenon of management approaches in the IPR protection remains relatively unexplored. Hence, the present study can set a threshold for several possible further research directions.

First, a separate detailed research on management approaches focused on a single IP protection domain could provide a deeper understanding of their phenomenon. For example, only two companies in the present research sample practice patent enforcement in China and developed a couple of management approaches in this domain. Therefore a study of companies known for more intensive patent enforcement activities would promise more interesting insights.

Second, it would be interesting to study management approaches in different countries and IP regimes. The present research focuses on operations in China, therefore the explored management approaches are proven to work in certain legal, economic and social settings specific for this country. Studies in other economies, emerging and developed ones, and comparative studies between them may further extend the knowledge on this topic and provide an understanding on which approaches are universal and which are unique to a certain country.

Third, the effect of certain management approaches on a firm's performance in a relevant IP protection area can be analyzed with the introduction of some quantitative measurements. For example, a study can be conducted to investigate the effect of IP trainings on the patent output, in particular, by comparing companies or R&D divisions within the same company where IP trainings were provided with the ones where they were not offered. A research on how the relevant management approaches influence the rate of successful litigation cases could be assessed in a similar way.

Finally, a study on which management approaches might have a stronger effect or what a cumulative effect of a combination of these approaches might be can be carried out. A quantitative work of Yang et al. (2008) on anti-piracy effectiveness can be taken as a benchmark in this case.

The internationalization of business is accompanied with pressure on the strategic choices companies make tackling with different socio-economic and legal frameworks in different countries worldwide. The availability and effectiveness of legal instruments for the protection of intangible assets always depends on the IP regime of a country which may be not mature enough or be discriminatory. Hence, the phenomenon of corporate approaches aimed to increase IP appropriation using alternative resources encompasses a promising research field for the academics.

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

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Appendix 1. IP management at the analyzed cases

Table 3 summarizes the main characteristics of the IP management of the six cases. All the analyzed companies have at least one local employee in China responsible for IP issues. The rationale for the localization (at least partial) of the IP management was the changes in China's IP environment:

"I was among the first people in the company who said: "We need someone here in China to develop a mature IP response in the Chinese market". The approach to IPR in China has been

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

changing, and we needed someone who could personally guide it through the changes.” (Case A, senior IP manager)

Table 3. Organization of the IP management

Company	IP Management Staff	IP Management Functions	Outsourced services
A	foreign and local	localized*	
B	local	localized*	
C	foreign and local	centralized / localized for anti-counterfeiting	Prosecution, investigation, litigation
D	foreign and local	partly localized / fully localized for anti-counterfeiting	
E	local	localized*	
F	foreign and local	partly localized: approval at the HQ for many decisions required	

*means that most of the operative decisions are made by the local IP management in China

Companies A, B, D and E have local IP departments responsible for patent and trademark prosecution and litigation as well as separate managers or departments responsible for anti-counterfeiting (brand protection management) issues. Company C has a local brand protection management team, whereas other functions are carried out at the headquarters. Company F has one local IP manager responsible for all IP related issues who is strongly backed by the central IP department in the home country.

All six companies outsource the IP related services at external law firms and investigation companies. The former are used for IP prosecution, i.e. application, prolongation and cancellation of patents and trademarks and the civil litigation procedures. The latter investigate counterfeit (trademark infringement) cases, collect evidence and represent the companies during the administrative and criminal enforcement procedures.

Appendix 2. Conventional IP protection at the analyzed cases

Patents

The overview of the patent protection strategies via rights obtaining and enforcement practiced by the companies is provided in the Table 4.

The patent application behavior looks similar among all six analyzed cases. All companies set a high priority to the patent portfolio growth in China. Aside from secondary applications of patents already filed in the developed countries, the companies make big efforts to increase local filings coming from their R&D centers in China. The increasing respect to the IPR in China, growing IP awareness and patent filings of local competitors and government incentives were named by the managers as major reasons for building a strong local patent portfolio.

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

Table 4. Patent protection via rights obtaining and enforcement

Strategy	Cases	Description
Patent applications	A-F	Substantial portfolio growth over the last years; Increasing local filings; Higher weight of utility model and design patents in the patent portfolio in China; compare to developed countries.
Civil litigation	D	Only for design patents
	E	For all three kinds of patents
	A-C	Not practiced, direct negotiations with the infringer preferred
	F	Not practiced due to budget and capacity considerations
Administrative enforcement at IPO (design patents)	E	Several complaints each year
	A-D	Not considered
	F	Planned if infringement will be detected
Administrative enforcement at Customs (design patents)	D-E	Several complaints each year
	A-C	Not considered
	F	Under discussion

The peculiarity of the patenting behavior in China shared by the six cases is in that the utility model and design patents have higher importance and weight in the portfolio compared to the developed countries.

Not that similar picture was observed in the patent enforcement area. The civil litigation of all three kinds of patents is practiced only by company E, an automotive supplier. Company D, an OEM, enforces only design patents via the judicial procedure. The non-practicing of the civil litigation was explained by the responsible managers at the OEM companies A, B and C as a kind of tradition in the automobile industry to solve such conflicts via direct negotiations with the infringing company and keeping the civil litigation option as a last resort. Company F, another automotive supplier does not betake to the judicial enforcement due to budget and capacity considerations.

Besides civil litigation, which is a common way for solving patent conflicts in the developed countries, the Chinese legal system offers two other ways of enforcing patents. First is an administrative complaint before the local Intellectual Property Office (IPO). Though legally it is allowed to file a claim on all three types of patents – inventions, utility models and designs, practically only the design patents complaints can be considered due to the lack of qualification of the IPO's officials.

For similar reasons as in case with the civil litigation, OEMs do not practice administrative enforcement either. As for the automotive suppliers, companies F and E, the first one is using this option regularly, whereas for the second one it was not possible until recently since the company's products were not protected by design patents. Nevertheless, company E will take an administrative complaint for recently obtained design patents into consideration in case of detected infringement.

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

Another way that concerns only design patents is the administrative enforcement at Customs with which the design patent owner should register them at this authority. Only companies D and E use this way to protect their designs, whereas company F was discussing this option for the previously mentioned design patents in the period when the follow-up interview with its IP manager was conducted.

Trademarks

Table 5 presents the companies' practices for trademark application and enforcement.

Table 5. Trademark protection via rights obtaining and enforcement

Strategy	Cases	Description
Trademark applications	A-F	Diversified portfolio of global and local trademarks
Trademark opposition at TRAB	A-F	The new trademark applications at the STMO are regularly monitored. If an infringing new trademark is detected, the complaint is filed.
Administrative enforcement at AIC and TSB (case value <50.000RMB)	A-F	The most frequent way of trademark enforcement. Up to 100 cases per year
Criminal enforcement at PSB (case value >50.000RMB)	A-F	1-20 cases per year on average
Administrative enforcement at Customs	A-F	1-15 cases per year on average
Civil litigation	A-F	1-7 cases per year on average

Unlike the patent protection related area, the companies demonstrate the similarity in all trademark protection related practices. The trademark portfolios consist of global trademarks as well as local ones – registered only in China.

In order to prevent some local Chinese companies' attempts to speculate on their famous brand names by registering confusingly similar trademarks, all the six companies regularly monitor new trademark applications at the State Trademark Office (STMO) and file an opposition before its Trademark Review and Adjudication Board (TRAB).

The administrative enforcement has been remaining the most frequent and common way to punish trademark infringers among the six companies. The advantages of this practice are a relatively simple and fast enforcement procedure and low costs. However, the penalties issued by the Administration of Industry and Commerce (AIC) are not high enough to stop infringers from further production and distribution of the counterfeit goods after they've been punished once.

The criminal enforcement at the Public Security Bureau (PSB) is regularly practiced at the selected companies and was regarded by the managers as more efficient compared to the administrative one since infringers, if considered guilty by the criminal court, are sentenced to imprisonment.

1. IPR Protection and Management Approaches. Insights from the MNCs' Practices in the Automotive Industry in China

The trademark civil litigation practices vary among the cases. Companies A, B and F file at most one lawsuit per year, whereas cases C, D and E select a number of targets annually. Except for company B, all other five admitted a growing attention to this way of enforcement due to the improved courts decisions.

Besides, all companies have registered their major trademarks at the Customs to prevent the shipments with counterfeit goods abroad. When a suspicious shipment is detected by a customs official, the responsible manager is contacted in order to confirm if the goods are illegal copies. Up to 20 cases per year were reported by the interviewed managers.

2. Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation

Abstract

A sufficient patent awareness can be considered as a precondition of an efficient use of the benefits patents provide to companies. Hence, if a company would like to fully exploit the advantages of patent protection for its inventions, it should make sure that patent awareness of relevant employees, particularly engineers, is adequate. Though patent awareness related topics have been discussed in the previous studies on a country and organizational level, the patent awareness of individuals remains understudied. Furthermore, no study explores what individual and external factors affect patent awareness of R&D engineers in the corporate context. The present study attempts to close this knowledge gap by investigating patent awareness of local engineers at R&D centers in China of a European-based multi-national company (MNC) especially focusing on two individual (invention disclosure experience and use of patent literature) and three managerial (supervisory encouragement, patent trainings and patent attorney consultancy) factors. The findings suggest that invention disclosure experience, use of patent literature, supervisory encouragement and patent trainings have a significant impact on the engineers' patent awareness, whereas the effect of patent attorney consultancy is probably mitigated by invention disclosure experience. Besides, the discussion shows a potential effect the managerial factors may have on the individual ones.

Key words: patent awareness, management approaches

2.1. Introduction

Patents play an important role in corporate intellectual property (IP) strategies being regarded in general as the most valuable and hard to obtain intellectual property rights (IPRs) (Gollin, 2008: p.172). Though the existing research on companies' patenting behavior can be considered relatively rich and diversified, little is known about what companies' internal conditions, procedures or efforts lead to a desirable patent output.

According to Pitkethly (2010, 2012), a precondition of an efficient use of the IP system and the benefits it provides is sufficient IP awareness and "there is a continuous need to promote IP awareness not just to firms but also within firms" (Pitkethly, 2010: p. 8). In other words, if a company would like to fully exploit the advantages of patent protection for its inventions, it should make sure that *patent awareness* of relevant employees, particularly engineers, is adequate.

Though patent awareness related topics have been discussed in the previous studies (Baldini, 2011; Chang & Chang, 2010; Figueiredo Moutinho, Fontes, & Godinho, 2007; Hynynen, 2013; Pitkethly, 2010; Pitkethly, 2012), the patent awareness of individuals remains understudied. Furthermore, no study explores what individual and external factors affect patent awareness of R&D engineers in the corporate context. The present study attempts to close this knowledge gap by investigating patent awareness of local engineers at R&D centers in China of a European-based MNC.

Despite that larger companies are considered more IP aware compared to small and medium size enterprises (Doern, 1997; Pitkethly, 2010), their local staff in the emerging economies may not always possess a strong knowledge of patents, for example due to relatively low IP awareness in the society (Feng, 2014; Kshetri, 2009). A low patent awareness among the local R&D staff may become a serious preclusion for a high patent productivity, since having little understanding of patents and their characteristics, the engineers may be simply unable to recognize a patentable invention in their work or may consider the idea of patenting their invention as unimportant. Hence, exploring the patent awareness of the engineers in the context of MNC's R&D laboratories in an emerging economy is a reasonable choice.

I outline my study as follows: first I review the existing research on patent awareness. Next, I provide a definition of the patent awareness of an engineer based on the previous studies and develop the hypotheses. Then I explain the methodology used for the research and then present the results of the analysis of the obtained data. Finally, I discuss my findings, their limitations and further research directions.

2.2. Theoretical background and hypotheses

2.2.1. Patent awareness in different research contexts

The patent awareness related issues have already been discussed in the previous research which mostly does not address the patent awareness separately, but discusses it under a general term of IP awareness.

Most of the studies focus on the IP awareness related issues in context of companies and general public. Viana and Maicher (2015) analyze different existing tools for improving IP literacy offered by IP offices and public organizations in Europe and South-east Asia and derive recommendations on improving of these tools. Van Pottelsberghe de la Potterie, Vandecandelaere, and de Bethune (2008) provide some broad policy recommendations aiming at improving the IP awareness and more effective use of the IP system in Belgium. Hynynen (2013) discusses the lack of IP awareness among SMEs in Finland and the relevance of the IP awareness for the business success. He strengthens in this regard the role of IP education and IP promotion services. The role of IP education is also emphasized by Kelli & Pisuke (2008) who explored the experience of Estonian universities in teaching specialized IP courses to students and by Kakonge (2014) in context of Africa's emerging economies where wrong assumptions of IPR among the general public is a common issue.

So far, Pitkethly's (2012) research based on the UK IP Awareness survey (Pitkethly, 2010) is the most comprehensive study regarding the topic providing definitions, components and measures of the IP awareness. His findings suggest that there is a need to promote IP awareness not only to the companies, but also within the companies, i.e. to the companies' employees.

The existing literature on patent awareness of individuals is scarce being limited to some discussion of patent awareness in context of patenting behavior, such as studies of Figueiredo Moutinho et al. (2007) and Baldini (2011). Stajano (1999) strengthens the role of professional support in improving IP awareness in academia. Chang and Chang (2010) investigate the influence of patent knowledge on some aspects of patenting behavior of software engineers in Taiwan. To date, their study is the only one addressing the patent awareness of an engineer in the corporate context. However, neither this nor other studies provide a comprehensive definition and measures of the patent awareness of an individual. Furthermore, the research on what factors or actions may affect the patent awareness is also limited to a few examples such as providing IP trainings to the employees (Keupp, Beckenbauer, & Gassmann, 2010; Potekhina, 2015). As the study of Pitkethly (2012) suggests the importance of promotion of IP awareness within the companies, the phenomenon of patent awareness of the engineers should be better investigated and understood.

2.2.2. Definition of patent awareness of an R&D engineer in a company's context

Scientific literature provides some definitions of the patent awareness in different contexts.

Chang and Chang (2010) define software engineers' knowledge on patents as "understanding of the difference between copyright and patent and understanding the information and value of patents". The studies on the patenting activities of academic researchers link the patent awareness with the ability to recognize the patenting opportunity (Baldini, 2011) and to the researchers' familiarity with the internal IP policies (Figueiredo Moutinho et al., 2007).

Beyond the context of an individual, Pitkethly (2012) provides a comprehensive definition of intellectual property rights awareness on the organizational level which consists of two types: the value awareness and the effective awareness. The value awareness relates to the awareness of benefits the IP system offers to its users whereas effective awareness implies adequate knowledge on how the IP system functions in order to use it effectively. Both types of awareness by Pitkethly have similarities to the definitions of Chang and Chang (2010), Baldini (2011) and Figueiredo Moutinho et al. (2007). Though value awareness in case of an individual may overlap with the phenomenon of patenting motivation in some studies (see e.g. Figueiredo Moutinho et al., 2007; Owen-Smith & Powell, 2001), it could also be interpreted as engineer's awareness of the benefits the patents provide to his employer.

Considering all the above mentioned definitions as relevant for the present study and given that the R&D staff of a company is not exposed to the IP system directly, but rather deals with the internal corporate rules related to patenting, the definition of patent awareness of an R&D engineer working in a corporate environment could be given as follows:

- Sufficient knowledge on functions and use of patents;
- Ability to recognize the patenting opportunity and knowing the criteria an invention should meet to be patented;
- Familiarity with the internal patenting processes;
- Awareness of benefits patents provide to the company.

2.2.3. Hypotheses

This chapter formulates several hypotheses on what individual and external factors affect the patent awareness of the engineers.

Individual factors: Patent-related working experience

Talking about individual factors affecting engineers' patent awareness it would be logical to assume that those engineers who deal more with patents in their daily working routine should have more knowledge and understanding on them. In this regard, the study of Figueiredo

2. Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation

Moutinho et al. (2007) stresses the importance of researchers' filing experience in eliminating barriers to patenting: non-patenting researchers overestimated patenting difficulties compared to their colleagues with the patenting experience. Thus, the patenting experience can be considered as improving the patent awareness.

Furthermore, Chang and Chang (2010) demonstrate that the use of patent literature at work by software engineers eased searching, reading and applying for patents. Blackman (1995) promotes a more active use of patent information by companies and suggests that patent information can be used to find out if the idea is new and to give guidance for drafting a strong patent application. In other words, regular use of patent literature can result in better understanding of patents and their use.

Hence, I define patent-related working experience as (1) patent filing experience and (2) using patent literature in the daily R&D work and predict:

H1a: Patent filing experience relates to patent awareness positively

H1b: Use of patent literature relates to patent awareness positively

External factors: Role of management capabilities

Hall and Ziedonis (2001) emphasize the role of management capabilities in R&D processes. Company's R&D managers and patent experts should be able to influence engineers' patent awareness by providing them with needed support and consultancy in the patent-related tasks.

According to the expectancy theory, actions of the rational individuals are determined by the likelihood of a certain desired outcome (Petrock & Gamboa, 1976). In case of an R&D engineer this outcome is to a great extent defined by the responsible R&D manager, i.e. his/her supervisor. R&D managers influence the performance of the engineers by giving orientation, providing support and defining the priorities for the engineers' working tasks. The role of supervisor's appreciation can be found in the study of Bercovitz and Feldman (2008) on the organizational change in academia.

Besides, available time resources, as shown in empirical evidence, have an important influence on employees' perception of priority: if time resources provided for a certain task are not sufficient, the task will have lower priority in employee's daily activities (Nijhof, Krabbendam, & Looise, 2002).

Thus, if the supervisor appreciates, supports and provides sufficient time to the engineer to improve his knowledge on patents, an engineer should be more eager to do it. Therefore, I predict:

H2: Supervisors' encouragement relates to the patent awareness of engineers positively.

2. Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation

Hall and Ziedonis (2001) as well as Somaya, Williamson and Zhang (2007) suggest that internal patent attorneys play an important role in managing R&D processes. Pitkethly (2012) stresses the role of an “IP advice” in improving patent awareness which in the corporate context is most logically provided by company’s IP expert or patent attorney.

Besides, several studies discuss the relevance of providing such “IP advices” in form of education and trainings in order to strengthen the IP awareness of the employees (ETAN Expert Working Group, 1999; Keupp et al., 2010; Ozkul, 2008; Yang, 2003). The study of Potekhina (2015) provides the evidence of patent trainings provided by internal IP experts to the local engineers in China to enhance their patent awareness. Hence I predict:

H3: *Availability and use of in-house patent consultancy services relate to patent awareness of engineers positively.*

2.3. Methodology

2.3.1. Empirical sample, survey instrument and data collection

The data for this study were collected at multi-national engineering company’s three R&D centers in China. The company originates from Western Europe and specializes in drive, actuator and motion control technologies. Its global employee headcount is about 37,000. Company’s annual investments in R&D account for about 6% of the revenue and are considered as substantially higher than the average in the related industrial sector. China is considered at the company as important strategic market. The R&D headcount in China almost doubled in the last five years and several measures were undertaken so far to increase the local patent output.

The survey instrument is a structured questionnaire in Chinese; hence it covered only local employees of the company. The development of the instrument started in April, 2014 with a preliminary qualitative study initiated by the company for which a small sample of company’s in-house patent professionals, engineers and R&D managers was interviewed. Based on the data obtained from the interviews combined with findings in scientific literature (see Section 2 of the study), the initial version of the questionnaire was drafted in December, 2014. It was then further tested with 23 volunteers among engineers in three subsequent steps as suggested by Fowler (1995): focus group discussion, cognitive interviews and field test. Following the results of each step, the survey design was adjusted. The whole test procedure was carried out in close cooperation with company’s R&D managers and patent professionals.

The survey took place from April to May 2015. The total number of targeted R&D staff was 165 engineers excluding managers, administrative personnel and expats. For this reason two measures were undertaken to avoid a low response rate. First, the engineers were informed in advance on survey’s content, procedure and anonymity measures. Second, the management permitted to schedule appointments during working time to let the engineers fulfill the

2. Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation

questionnaire. A survey supervisor was assigned at each R&D location to collect and send off the fulfilled questionnaires. 143 responses were received accounting for 86% response rate.

2.3.2. Variables, measures and method

Table 1 provides a summary of all variables and measures including reliability statistics for the composite variables.

I controlled for age, education and working experience at the company. For the ethical considerations, the specific age and length of working experience at the company were not asked in the questionnaire, but rather put into categories.

The dependent variable for this study is perceived patent awareness of an R&D engineer. The measures relevant for the variable were developed based on the definition of the patent awareness presented in the section 2.2 of this study.

Based on the hypotheses, two groups of predictor variables were applied. The first group of individual factors supports the hypotheses H1a and H1b in the section 2.3 and is represented by two variables. The variable *InvDisc* depicts the patent filing experience. For an employed engineer this is associated with an internal procedure of submitting an invention disclosure, based on which a patent application is later filed by the company. The variable *PatLit* is a composite of measures associated with the use of patent literature by an engineer in the daily working routine.

The second group of management factors represents the hypotheses H2 and H3. Supervisory encouragement consists of four items measuring the support and engagement of the engineer's direct supervisor in improving one's knowledge and understanding of patents. Availability and use of in-house patent consultancy services are represented by two dummy variables. *PatTrain* reflects whether an engineer has attained patent trainings provided by the internal patent attorney, whereas *PatAtt* shows whether an engineer had an individual consultation from a patent attorney regarding patent matters.

Three of the variables mentioned above, *PatAwar*, *PatLit* and *SupEnc* are composites of several items. Principal component factor analysis was used to assess the validity of these constructs, i.e. to test whether the items in the construct load onto a single factor. After running factor analysis the constructs were tested for reliability and showed Chronbach's alpha of >0.8 (see Table 1).

Hierarchical multiple regression method was used to test the hypotheses. The first model reveals the impact of control variables on patent awareness. The predictors associated with individual factors are entered in the second model and the ones referred to management factors in the third model. The significance level of $p < 0.05$ is adopted to test the hypotheses.

2. Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation

Table 1. Variables and measures

Variable/ Construct	Description/Items	Coding
Control variables		
Age	---	1 = ≤30; 0 = >30.
Education	---	0 = no higher education; 1 = bachelor; 2 = master; 3 = Ph.D.
WorExp	Working experience at the company, years	1 = >1; 2 = 1-2; 3 = 3-4; 4 = ≤5.
Dependent variable		
	Patent awareness (Chronbach's $\alpha = 0,831$):	
PatAwar	I know what kind of technical solutions may become a patent.	Mean of the items scores on 5-point Likert scale
	I know the difference between an invention patent, a utility model and a design patent.	
	In general, I am able to understand the claim section of a patent without external help.	
	I know the necessary criteria of an invention to apply for a patent.	
	I know how to submit an invention disclosure in our company.	
	I know which patents are in the products I am working with.	
	I know what benefits the patents provide to my company.	
Predictor variables: individual factors		
InvDisc	Experience of submitting an invention disclosure	1= at least one patent disclosure submitted; 0 = no patent disclosures submitted
	Use of patent literature in R&D work (Chronbach's $\alpha = 0,922$):	
PatLit	In general, I am able to conduct a patent search in my relevant technology area independently.	Mean of the items scores on 5-point Likert scale
	I regularly read existing patents of my company.	
	I regularly read existing patents of our competitors.	
	I regularly analyze existing patents of my company.	
	I regularly analyze existing patents of our competitors.	
	I regularly use our company's patents for R&D projects.	
	I regularly use our competitors' patents for R&D projects.	
Predictor variables: external (management) factors		
	Supervisor encouragement (Chronbach's $\alpha = 0,920$):	
SupEnc	My direct supervisor supports me to extend my knowledge on patents.	Mean of the items scores on 5-point Likert scale
	My direct supervisor actively helps me to extend my knowledge on patents.	
	My direct supervisor gladly shares with me his/her knowledge on patents.	
	My direct supervisor provides me with sufficient time resources to improve my knowledge on patents.	
PatTrain	Attendance of patent trainings provided by the internal patent attorney	1 = at least one training attended; 0 = no trainings attended
PatAtt	Experience of internal patent attorney consultancy	1 = experience; 0 = no experience;

2.4. Empirical analysis

2.4.1. Descriptive statistics and correlation

The descriptive statistics and correlation are shown in the Table 2. The means of invention disclosure experience, patent training attendance and use of patent attorney consultancy can also be interpreted as percentage of employees with the related experience. Only 28% of employees have ever submitted an invention disclosure. This conforms to the objective company data on the invention disclosures in China. This relatively low percentage is explained by the fact, that until recent years, the main task of the local engineers was not inventing new products, but rather to adapt the existing ones to Chinese market. Patent training experience accounted for 63%. Though the trainings are not compulsory for the engineers, many of them have been willing to attend to be better prepared to handle advanced R&D projects that require deeper patent knowledge¹⁰. The percentage of engineers having patent attorney consultancy is only 20%. Such consultancy often takes place when an engineer requires some help for submitting of invention disclosure. This fact is reflected by high significant correlation between Inv Disc and PatAtt variables.

Table 2. Descriptive statistics and correlations

	Mean	S. D.	N	Age	Educ.	WorExp	InvDisc	PatLit	SupEnc	PatTrain	PatAtt	PatAwar
Age	0,67	0,47	143	1								
Education	1,50	0,69	143	0,144	1							
WorExp	3,21	0,77	141	0,183*	-0,236**	1						
InvDisc	0,28	0,45	143	0,138	0,155	-0,087	1					
PatLit	2,60	0,69	141	0,123	0,195*	-0,150	0,199*	1				
SupEnc	3,31	0,83	143	0,240**	0,081	0,001	0,268**	0,479***	1			
PatTrain	0,63	0,48	140	0,104	0,136	0,139	0,247**	0,128	0,293***	1		
PatAtt	0,20	0,40	139	0,163	0,054	0,044	0,434***	0,317***	0,289**	0,278**	1	
PatAwar	3,39	0,57	142	0,196*	0,166*	0,040	0,374***	0,557***	0,593***	0,358***	0,352***	1

***. Correlation is significant at the 0.001 level.

**. Correlation is significant at the 0.01 level.

*. Correlation is significant at the 0.05 level.

PatLit variable has a mean of 2.6 showing a modest use of patent by the engineers in their work. The average supervisors' encouragement is also moderate (3.31). PatAwar variable shows slightly above average level at 3.39 indicating that less than a half of the engineers possess a good to strong patent awareness.

The outcome variable has high correlation with all five predictors at the 0.001 significance. This preliminary test demonstrates that the patent awareness and selected individual and management factors are highly associated.

¹⁰ Few years ago the company started to advance its R&D strategy in China by giving more responsibility to the local R&D labs.

2. Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation

Most of correlations between dependent variables are significant at 0.01 or 0.001 (except for PatLit with InvDisc and PatTrain), which draws the attention to the multicollinearity. Though the correlations between variables do not exceed 0.8, it still might be an issue if variable inflation factor (VIF) is greater than 10 (Bowerman & O'Connel, 1990; Myers, 1990) and tolerance is below 0.1 (Field, 2014). The collinearity diagnostics showed that VIFs are smaller than 1.489 and tolerances greater than 0.672. As all the predictors are within the thresholds I retain them for further analysis.

2.4.2. Regression

Table 3 presents the results of multiple hierarchical regressions about the influence of individual and management factors on the patent awareness of engineers. Standardized regression coefficients (β), standard error and significance value are presented for each predictor. The summary for each model is shown at the bottom of the table. Little variations in the perceived patent awareness can be seen in the Model 1 where only control variables are entered (R^2 of 6%, no variables significant at <0.05 level). Hence, age, education and length of working experience have no significant impact on the patent awareness in the sample.

Table 3. Hierarchical regression modeling for patent awareness.

Variable	Model 1			Model 2			Model 3		
	β	Std. Error	Sig.	β	Std. Error	Sig.	β	Std. Error	Sig.
(Constant)		0,259	0,000		0,258	0,000		0,253	0,000
Age	0,165	0,106	0,061	0,064	0,086	0,370	0,009	0,080	0,895
Education	0,153	0,073	0,086	0,050	0,059	0,490	0,046	0,055	0,490
WorExp	0,046	0,066	0,605	0,140	0,053	0,054	0,094	0,050	0,164
InvDisc				0,268	0,088	0,000	0,169	0,089	0,018
PatLit				0,507	0,058	0,000	0,343	0,061	0,000
SupEnc							0,326	0,051	0,000
PatTrain							0,150	0,080	0,029
PatAtt							0,026	0,102	0,718
R^2		0,060			0,409			0,524	
ΔR^2		0,060			0,367			0,101	
Adjusted R^2		0,038			0,386			0,494	
Std. Error		0,559			0,447			0,406	
Sig. F Change		0,043			0,000			0,000	

Model 2, with the entry of individual factors, shows increase of almost 37% in R^2 , whereas overall significance of the model rises and standard error drops from 0.559 to 0.447. Both predictors, invention disclosure experience and use of patent literature, have positive beta coefficient significant at <0.001 which provides support for H1a and H1b.

2. Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation

Entering supervisor's encouragement, patent training and patent attorney consultancy in the Model 3 results in the increase of R^2 to 52.4% showing a change of above 10%. In addition, standard error of the model becomes more deflated compared to the previous one. This model shows how the management factors contribute to the patent awareness of the engineers. Supervisory encouragement proves to have a positive effect on patent awareness ($p < 0.001$) which confirms H2. Patent trainings are also effective at the 0.05 significance. This partly confirms H3. As for patent attorney consultancy, if individual factors are excluded from the model it shows a positive beta of 0.159 at the level of $p = 0.029$. In the Model 3 the variable loses its power. It can be explained by high significant correlations of PatAtt with InvDisc and PatLit variables. Besides, the small sample size precludes the possibility to detect small effects in the regression model.

2.5. Discussion

The present study has focused on analysis of the effects of individual and management factors on patent awareness of R&D engineers in China in a context of a multi-national engineering company. This research supports H1a, H1b, H2 and partly H3. This study contributes to the literature on the phenomenon of patent awareness and is so far the first one defining its measures for individuals based on both, existing literature and empirical evidence.

Among five different factors the effect of which on the patent awareness was examined, four proved to have a significant positive effect: invention disclosure experience, use of patent literature, supervisory encouragement and patent trainings provided by in-house patent professional. This confirms the findings from the previous research. The engineers who already filed a patent are better "patent-aware" than their colleagues without such experience. This is in line with the findings of Figueiredo Moutinho et al. (2007) that show positive effect of patenting experience on patent knowledge among academic researchers. Following Blackman's (1995) suggestion to the companies to use the patent information more actively, the present research shows a strong positive effect of use of patent literature on the patent awareness among engineers. The present study extends the findings of Hall and Ziedonis (2001) on the role of management capabilities in the R&D processes, by showing that supervisory support positively influences patent awareness among R&D employees. Finally, patent trainings proved to have an impact on improving of knowledge on patents and patenting as it was earlier suggested in various studies (ETAN Expert Working Group, 1999; Keupp et al., 2010; Ozkul, 2008; Pitkethly, 2012; Potekhina, 2015; Yang, 2003).

As for patent attorney consultancy (PatAtt), it shows a significant effect on the patent awareness, if the regression is calculated without including the individual factors. When all the factors come into play, the effect becomes insignificant (as shown in the Model 3, Table 3). The feedback from R&D management of the company on this phenomenon was that the patent attorney consultancy often takes place when an engineer submits an invention disclosure (which is confirmed by the

2. Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation

correlation of 0.434 between the variables significant at 0.001 level). Probably for this reason the effect of the patent attorney consultancy is diminished in the Model 3.

The findings of the study should also be viewed in the societal and cultural context the data was obtained in. For example, a modest mean value of PatAwar variable (3.39; see Table 3) reflects the situation of relatively low IP awareness in the Chinese society (Kshetri, 2009). Besides, the strong effect of supervisory encouragement can be explained by the traditional respect to hierarchy in Chinese culture (Fang, 1999).

Furthermore, some managerial implications could be drawn out of the present research. As shown in the Table 2 the managerial and individual factors show high significant positive correlations (except for the pair PatTrain and PatLit). This means, that managers could potentially influence the engineers' attitude toward using patent literature or make them put some extra efforts to transform their ideas into patentable inventions. It is anyway the managerial responsibility to provide time and other necessary resources to enable the engineers to perform certain tasks.

2.6. Limitations and further research

Discussing the limitations of the present study, it should be pointed out that the findings are based on a limited sample taken from three Chinese R&D units of a single multi-national corporation. Therefore the study depicts the experiences in a limited socio-cultural context. Furthermore, since the phenomenon of the patent awareness of an individual has been poorly addressed in the previous research, it was possible to depict only a limited number of possible individual and managerial factors influencing this object. Thus, the present study can set a threshold for several possible further research directions.

First, qualitative studies can be undertaken to explore further factors affecting the engineers' patent awareness. A pragmatic research approach could also be appropriate to subsequently confirm the hypotheses emerged from the qualitative research.

Second, it would be interesting to study patent awareness of the individuals exposed to different socio-cultural and working contexts. The present research focuses on experiences of Chinese R&D engineers working for a European-based MNC. Studies in other countries and organizations, and comparative studies between them (e.g. corporate context vs. academia) may further extend the knowledge on this topic and provide a more profound understanding of its dimensions.

Finally, the patent awareness represents only one of the domains of the individuals' patenting behavior. The existing literature suggests that the patenting behavior is also shaped by the individual motives (Baldini, 2011; Figueiredo Moutinho et al., 2007; Mathew & Chakraborty, 2012; Veer & Jell, 2012). Therefore, it would make sense to investigate the interaction of patent

2. Exploring Patent Awareness of Engineers. Evidence from Chinese R&D Units of a Multi-National Corporation

awareness and patenting motivation of the individuals to have a deeper insight into the nature of this phenomenon.

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3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

Abstract

Corporate R&D engineers, being usually the initiators of a patent, are important contributors to the patenting performance of their employers. Hence, patenting motives of R&D engineers encompass an interesting and promising research field. However, the literature on patenting motivation of the engineers in the corporate context is scarce. I apply self-determination theory on human motivation (SDT) to investigate patenting motives of a sample of local R&D engineers in China employed by a European-based multi-national corporation. Factor analysis reveals four groups of motives: “reward and recognition”, “reputation and promotion”, “making a contribution” and “interest and sense of achievement”. The results of multiple hierarchical regression show the influence of working climate on “making a contribution” and “interest and sense of achievement” motivation factors. Implications for patent management are discussed.

Key words: patenting motivation, R&D management, self-determination theory

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

3.1. Introduction

As intellectual property has been playing a more and more important role in companies' commercial success through recent decades, use of patent as a strategic tool within corporate strategies has become a common practice. The extant research revealed that patterns of companies' patenting behavior are affected by different underlying motives.

The traditional motive to patent is the protection of own invention from imitation (Blind, Edler, Frietsch, & Schmoch, 2006; Shane, 2001). In a number of company-level studies this motive was ranked as the most important among the others (Arundel, van de Paal, & Soete, 1995; Blind et al., 2006; Duguet & Kabla, 1998; Cohen, Goto, Nagata, Nelson, & Walsh, 2002). Other motives, often named "strategic" (Blind et al., 2006; Blind, Cremers, & Mueller, 2009; Torrisi, Gambardella, Giuri, Harhoff, Hoisl, & Mariani, 2016), include blocking competitors (Rahn, 1994), reputation and image (Coen et al., 2002; Schalk, Täger, & Brander, 1999), using patents as internal performance indicator (Arundel et al., 1995; Blind et al., 2006), negotiation lever (Duguet & Kabla, 1998; OECD, 2003), access to capital market (OECD, 2003) and some others.

The presence and relative value of a certain motive is said to depend on different external factors, such as industry sector (Cohen et al, 2002), company size (Teece, 1986), past experience with patents (OECD, 2003) and others. The study of Veer and Jell (2012) evidences that the relative importance of a certain patenting motive also depends on whether the applicant is a large company, small enterprise, university or an individual inventor.

Other studies have pointed out effects of internal factors on patenting behavior of the companies. Pitkethly (2001) argued that thorough and sophisticated managerial planning and actions are essential for successful corporate patent strategies. Actions and expertise of patent attorneys as well as "optimal cross-functional coordination between technical and legal experts" (Somaya, 2012: p.1101) are said to have an impact on corporate patenting performance (Somaya, 2012; Somaya, Williamson, & Zhang, 2007). Besides, human resources are generally considered as an important factor in generating and preserving company's intellectual capital (Olander, Hurmelinna-Laukkanen, & Heilmann, 2015).

Considering that internal factors influence companies' patenting behavior, it is logical to assume that corporate R&D engineers, being usually the initial source of a patent, should also be considered as important contributors to the patenting performance of their employers. Same as companies patenting motives define their patent strategies, the individual perceptions of R&D engineers toward patenting should affect their patenting performance. Hence, patenting motives of R&D engineers encompass an interesting and promising research field.

Particularly in MNCs' (multi-national corporations') R&D laboratories in the developing economies, where engineers often only adapt existing products to the local market requirements, patenting is not considered as an inherent task of an engineer in the corporate context. However, the recent

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

patenting surge in China (Hu, Zhang, & Zhao, 2017), which serves as a context for the present study, motivates the international companies to reconsider their local R&D strategies and make efforts to improve their local patent productivity. One of such strategies may be to enhance the patenting motivation of the local engineers.

Unfortunately, the literature on patenting motivation of the individuals exposed to the organizational context is scarce. The individual inventors whose motives were investigated by Veer and Jell (2012) interact with the IP system directly, unlike their colleagues employed by organizations. Thus, they are driven by similar motives as enterprises. Studies of Baldini's (2011), Figueiredo Moutinho, Fontes, and Godinho (2007), Hussler and Penin (2012) and Owen-Smith & Powell (2001) shed some light on the patenting motives of inventors in academic and public sector research organizations. So far, the study of Mathew and Chakraborty (2012) on aspirations of Indian inventors is the only one known to me that investigates patenting motives of R&D engineers in private sector.

Given that the motivation of individuals can vary depending on the social and cultural environment the individuals are exposed to (Ryan & Deci, 2000a; 2000b), my study attempts to deepen and extend the theoretical understanding of the nature of patenting motivation of the individuals in the corporate context. Following the approach of Mathew and Chakraborty (2012) I apply self-determination theory on human motivation (Deci & Ryan, 1985) to investigate patenting motives of a sample of local R&D engineers in China employed by a European-based multinational corporation (MNC).

I outline our study as follows: first I provide a brief overview of the self-determination theory of human motivation and its application in the working environment. Next, I review the extant research on patenting motivation of individuals in an organizational context. Further I explain the methodology used for the research and then present the results of the analysis of the obtained data. Finally, I discuss my findings, their limitations and further research directions.

3.2. Self-determination theory of motivation

SDT is known as an approach in psychology science to human motivation which studies individuals' "inherent growth tendencies and innate psychological needs" (Ryan & Deci, 2000a; p. 68). The phenomenon of motivation is not seen as an indiscrete unit by self-determination theorists, but rather depending on the person's perception of an activity or task. In other words, the behavior can be motivated either *intrinsically* or *extrinsically*.

Intrinsic motivation reflects the innate propensity of human nature to explore, to learn, exercise and extend one's own abilities (Ryan & Deci, 2000a). A behavior can be defined as intrinsically motivated if an individual is "doing an activity for its own sake" (Deci & Vansteenkiste, 2004; p. 28), i.e. if the reasons of involvement in an activity are: seeking for enjoyment, satisfaction of interest or curiosity, self-expression or a personal challenge (Amabile, 1993).

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

In contrast with intrinsic motivation, the term *extrinsic* motivation refers to the involvement into an activity in order to acquire a separable outcome which is not in the activity itself (Ryan & Deci, 2000a). Such outcomes typically refer to gaining valuable possessions or attaining a socially attractive image of self (Kasser & Ryan, 1996).

The extrinsic motivation can differ in its relative autonomy (Ryan & Connell, 1989; Vallerand, 1997). Deci and Ryan (2000) introduced a self-determination continuum where the extrinsic motivation types vary between amotivation and intrinsic motivation in the extent to which their regulation is autonomous.

Within the mentioned continuum, the motivation for the least autonomous behaviors is referred to as *externally regulated*. In this case, an individual is involved into an activity in order to attain a desired outcome or to avoid a punishment meaning that her behavior is controlled externally.

Introjected regulation is the next form of extrinsic motivation. Whereas the external regulation implies the control administered by others, the introjection refers to the ego-involvement, meaning an activity performance for attaining an ego endorsement (e.g. pride) or avoiding internal punishment (e.g. guilt).

The third, more autonomous type of extrinsic motivation is *identified regulation*. Here the individuals show a higher commitment to the behavior as they accept, i.e. internalize their value. Simply explained, they assign a personal importance to the performed activity.

The most autonomous or internalized form of extrinsic motivation is *integrated regulation*. Though the reason for the involvement is still not the activity itself (as in case of intrinsic motivation), the external regulation is in congruence or harmony with person's values and identity (Pelletier, Tuson & Haddad, 1997; Ryan, 1995).

According to Deci and Vansteenkiste (2004), the intrinsic motivation is driven by three essential psychological needs: competence, relatedness (Baumeister & Leary, 1995), and autonomy. The need for competence refers to humans' innate desire to be effective when performing an activity (White 1963). The need for relatedness concerns the tendency to feel connected, to interact with and to take care of other people (Baumeister & Leary, 1995). At last, the need for autonomy refers to humans' propensity "to be causal agents, to experience volition, to act in accord with their integrated sense of self [...] and to endorse their actions at the highest level of reflective capacity" (Deci & Vansteenkiste, 2004: p. 25; see also deCharms, 1968).

It is said that environments that are showing support for these needs facilitate the intrinsically motivated behavior, whereas the opposite is also true (Deci & Vansteenkiste, 2004; Ryan & Deci, 2000a; 2000b). Many studies have also demonstrated the influence of external support for competence, relatedness and autonomy on the internalization of extrinsic motivation (Ryan & Deci, 2000a; 2000b).

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

At the work place, people can be motivated both intrinsically and extrinsically, though these two types of motivation can affect the individual feelings about the work, readiness to do the work and the quality of its outcome in very different ways (Amabile, 1993).

Extant research in psychology and business has demonstrated the motivation to be a function of different factors in the work environment such as evaluation expectation, reward, performance feedback, autonomy, and/or the nature of the work itself (Amabile 1993). On the other hand, the individual differences also affect the nature of motivation toward a certain activity (Deci & Ryan, 1985; Hackam & Oldham, 1976; Amabile, Hill, Hennessey, and Tighe, 1994)

Intrinsic and extrinsic motivations can also interact with each other. The research of Amabile (1993) on the motivational synergy in the working environment proposed that “certain types of extrinsic motivation can combine synergistically with intrinsic motivation, particularly when the initial levels of intrinsic motivation are high” (Amabile, 1993: p. 185). She proposes two mechanisms for this synergy: “*extrinsics in service of intrinsics*” and “*the motivation-work cycle match*”.

The first mechanism implies that an extrinsic factor can positively contribute to intrinsic motivation given that it supports the individual’s sense of competence without undermining her sense of self-determination, e.g. a constructive, non-threatening, and work-focused performance feedback.

The motivation-work cycle match suggests that different stages of a complex task require different forms of motivation. The creative activities within the task may be driven by intrinsic motivation whereas more routine work (e.g. writing a report) may require an extrinsic trigger (e.g. deadline to submit the report).

SDT has already been applied in the research on individuals’ patenting motivation by Mathew and Chakraborty (2012). We follow this approach in our study. Patent generation by an R&D engineer is a complex task covering a set of various activities from the first idea formulation to writing and submitting an invention disclosure. Therefore, applying the SDT approach to the case of patenting motivation of the individuals, I expect to find a number of different motives varying in the degree of their internalization.

3.3. Patenting motivation of individuals

Though the literature on patenting motivation of the individual is scarce, it nevertheless demonstrates a variety of motives shaping the patenting behavior. The major body of the extant research concerns the patenting motives of academic scientists.

Research findings on scientists’ behavior regarding patenting in universities and public sector research organizations suggest this whole process to depend to some extent on academics’ willingness to disclose their inventions (Bercovitz & Feldman, 2008; Figueiredo Moutinho et al., 2007; Siegel, Waldman, & Link, 2002; Thursby, Jensen, and Thursby, 2001). In other words,

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

patenting performance of these institutions is affected by scientists' individual *perceptions* and *attitudes* regarding the involvement in patenting activities (Bercovitz & Feldman, 2003; Coutinho, Balbachevsky, Holzhaecker, Patrao, Vencio, Silva, Lucatelli, Reis, Marin, 2003; Figueiredo Moutinho et al., 2007; Thursby & Thursby, 2002; Owen-Smith & Powell, 2001).

Owen-Smith & Powell (2001) argued that the scientists' propensity to participate in patenting activities is associated with their perceptions of the expected benefits and constraints. In particular, their research demonstrates that the perception of constraints may offset the academics' motivation to become involved in patenting.

Following Owen-Smith and Powell (2001), Figueiredo Moutinho et al. (2007) explored Portuguese researchers' perceptions regarding patenting by considering three major categories of such beliefs: role of patenting in knowledge protection and dissemination; its influence on the scope and pursuit of research strategies and expected tangible and intangible outcomes such as monetary rewards, reputation and career advancement. Their findings suggest that personal benefits (the last of three categories) have a moderate impact on the patenting behavior, whereas there was some divergence among different socio-demographic groups about the professional aspects (first and second categories).

Baldini's (2011) study of academics' patenting motivation at Italian universities suggests four groups of patenting motives revealed by factor analysis. First one, "support-to-research" encompasses such motives as more research grants and funds and more equipment for research laboratories. The second, "knowledge exchange" refers to stimuli for research, external knowledge exchange and economic and technological development. The third and fourth groups of motives are associated with personal tangible (earnings) and intangible (prestige, visibility, reputation) benefits. The analysis showed that the major motivations were prestige and reputation considerations as well as knowledge exchange. Earnings were perceived by the researchers as the least important motive.

Hussler and Penin (2012) distinguished between two motivations of academic researchers: proactive and reactive. The first one refers to an enthusiastic attitude of the scientists toward patenting and their belief in entrepreneurial university. The second one concerns the patenting behavior caused by positive and negative external factors such as successful technology transfer experience thanks to a patent or patent litigation. Their findings demonstrated that positive outcome of patenting in the past reinforces the patenting behavior, whereas the dominance of either first or second type of motivation was not observed.

The study of aspirations of Indian inventors by Mathew and Chakraborty (2012) is the only research known to us that goes beyond the public institutions and explores the patenting motivation of engineers from private sector along with the academic researchers. To the best of my knowledge, their work is also the first and so far the only one to define the patenting motives

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

of the individuals using SDT. This study reveals three groups of motives: wealth and fame as a typical extrinsic motivator, pragmatism (problem-solving orientation) as an intrinsic motivator and societal concern (contributing to the society's knowledge) as a somewhat extrinsic altruistic motive. Wealth and fame appeared to be more important motives to younger engineers than to their older colleagues. Academic researchers put a greater value on societal concerns compared to the engineers from IT, Pharma and non-IT sectors.

Though the study of Mathew and Chakraborty is so far the only one using the SDT approach to individuals' patenting motivation, other findings of the previous research reviewed in this section also stay in line with the SDT framework. The expected tangible and intangible benefits (Baldini, 2011; Figueiredo Moutinho et al., 2007) or threat of patent litigation (Hussler & Penin, 2012) can be viewed as typical extrinsic motivators with low degree of internalization (*external* and *introjected* regulation within SDT). Knowledge protection (Figueiredo Moutinho et al., 2007), knowledge exchange (Baldini, 2011; Hussler & Penin, 2012) or seeking support for research (Baldini, 2011) show a certain degree of identification of patenting with researchers' values and hence demonstrate a higher autonomy (*identified* and *integrated* regulation within SDT). Finally, the enthusiastic attitude of the scientists toward patenting (Hussler and Penin, 2012) can be described in terms of SDT as an involvement in the activity for its own sake (intrinsic motivation).

Same as the studies in psychology and business showed the motivation to be affected by some external factors (Amabile, 1993), influence of the environment on individuals' patenting motivation was revealed in the above mentioned literature. Figueiredo Moutinho et al. (2007) argue that organizational support in terms of infrastructures and competences can facilitate patenting in academia. Baldini (2011) suggests that "researches exposed to different contexts are not uniformly driven by the same motivations" (Baldini, 2011: p. 116). The study of Mathew and Chakraborty (2012) also showed the influence of the professional sector on inventors' motivations.

Given that the patenting motivations of the engineers from the private sector and those of their colleagues in academia are not alike, I find it reasonable to undertake a study solely focused on the patenting motives of inventors exposed to the corporate context. As shown in this section, the SDT approach is appropriate for such investigation. In my study I attempt to find different motives varying in the degree of their autonomy as well as the influence of some factors (internal or external) on them. Since little investigation on engineers' patenting motivation has been undertaken so far, my study does not state any hypothesis, but rather has a pragmatic exploratory character.

3.4. Empirical sample, survey instrument and data collection

The data for this study were collected at a multi-national engineering company's three R&D centers in China. The company originates from Western Europe and specializes in drive, actuator and motion control technologies. Its global employee headcount is about 37,000 (as of 2013).

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

The company's annual investments in R&D account for about 6% of the revenue and are considered as substantially higher than the average in the related industrial sector. China is considered as important strategic market at the company. The R&D headcount in China almost doubled in the last five years and several measures were undertaken so far to increase the local patent output.

The survey instrument is a structured questionnaire in Chinese; it covered only local employees of the company. The development of the instrument started in April, 2014 with a preliminary qualitative study initiated by the company for which a small sample of company's in-house patent professionals, engineers and R&D managers was interviewed. Based on the data obtained from the interviews combined with findings in scientific literature (see Section 2 and 3 of the study), the initial version of the questionnaire was drafted in December, 2014. It was then further tested with 23 volunteers among engineers in three subsequent steps as suggested by Fowler (1995): focus group discussion, cognitive interviews and field test. Following the results of each step, the survey design was adjusted. The whole test procedure was carried out in close cooperation with company's R&D managers and patent professionals.

The survey took place from April through May 2015. The total number of relevant R&D staff was not high - 165 engineers excluding managers, administrative personnel and expats. For this reason two measures were undertaken to avoid a low response rate. First, the engineers were informed in advance on survey's content, procedure and anonymity measures. Second, the management permitted to schedule appointments during working time to let the engineers fulfill the questionnaire. A survey supervisor was assigned at each R&D location to collect and send off the fulfilled questionnaires. 141 responses were received accounting for 85% response rate.

3.5. Empirical analysis

3.5.1. Factor analysis and ANOVA

As it was mentioned in the previous section the survey was designed based on the data from the preliminary qualitative study combined with findings in scientific literature. As a result, seventeen patenting motives were included in the final version of the survey instrument. The answers were measured on a five-point Likert scale. The descriptive statistics and correlation for the seventeen motives are shown in the Appendix 1 Table 2. The means of all the motives are quite high, exceeding 4 points excluding the fourth, fourteenth and fifteenth which means are between 3.87 (interest in creation of patents) and 3.98 (enhance my reputation in the company). The motive "protect the benefits of the company" has the highest mean of 4.29. All the motives have significant positive correlations mostly at 0.01 or 0.001 except for the first motive "financial rewards" which correlates significantly only with five other motives out of sixteen.

Table 1 presents the results of factor analysis and reliability statistics. Principal axis extraction method and varimax rotation were used to obtain theoretically meaningful high level factors. The

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

adequacy of the sample was measured using Kaiser-Meyer-Olkin (KMO) index. Its value of 0.860 confirms the adequateness of the factor analysis method (Hutcheson & Sofroniou, 1999). The Bartlett test of sphericity ($\chi^2(136)=1616.97$, $p<0.001$) verifies the model's adequacy (Norusis, 2004).

A four factor solution was obtained from the data. To test the reliability of the constructs I computed Chronbach's α for each extracted factor. Factors 1, 2 and 3 showed high internal reliability of over 84%. The fourth factor's Chronbach's α of 0.645 is considered adequate (Tolmie, Muijs, & McAteer, 2011). Kline (1999) also states that for the psychological constructs values below 0.7 can be expected.

Table 1. Factor analysis and Chronbach's α

	Factor 1	Factor 2	Factor 3	Factor 4
Protect the benefits of the company	0,815			
Create a valuable output	0,788			
Enhance the company's value	0,751			
Protect innovative solutions	0,748			
Make a contribution for the company	0,577			
Interest in creation of patents		0,778		
Challenge to create a patent		0,663		
Honor to be an author of a patent		0,634		
Enjoying the patent creation process		0,600		
Sense of achievement		0,571		
Enhance my influence at the company			0,852	
Enhance my reputation at the company			0,758	
Demonstrate my engineering skills			0,527	
Gain better promotion opportunities			0,454	
Respect from colleagues				0,658
Recognition of the management				0,584
Financial reward				0,445
Eigenvalue	8,036	1,679	1,202	1,116
Variance explained (%)	47,271	9,876	7,068	6,565
Cumulative variance explained (%)	47,271	57,147	64,215	70,781
Chronbach's α	0,917	0,872	0,842	0,645

The first factor was named *making a contribution*. It relates to the engineers' motives to create a valuable output, protect an innovative solution, make a contribution for the company, protect its benefits and enhance its value. The responses for the second factor refer to *interest and sense of achievement* associated with patenting activities. It includes five motives: interest in creation of patents, challenge to create a patent, honor to be an author of a patent, enjoying the patent creation process and sense of achievement. The third factor, which was labeled *reputation and promotion*, encompasses the aspirations to enhance one's influence and reputation at the company, demonstrate engineering skills and gain better promotion opportunities. Finally, the fourth factor relates to the desire for *recognition and reward* and includes three items: respect from colleagues, recognition of the management and financial reward.

I ran one-way repeated-measures ANOVA analysis on the four factors to find out if the four types of motivation show any significant differences in their importance for the participants in the given sample. Mauchly's test indicated the violation of the assumption of sphericity ($\chi^2(5)=19.374$, $p=0.002$). Therefore I report Greenhouse-Geisser corrected tests ($\epsilon=0.92$). The results

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

demonstrate a significant difference of the importance among the four factors ($F(2.76, 386.34)=9.73, p<0.001$). Particularly, the post hoc tests showed significantly higher importance of the factors *reward and recognition* and *making a contribution* compared to *reputation and promotion* and *interest and sense of achievement* (see Table 2).

Table 2. Pairwise comparisons of one-way repeated-measures ANOVA

Motivation factors		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1. Reward and recognition	2	0,115	0,051	0,025	0,014	0,216
	3	-0,085	0,050	0,094	-0,185	0,015
	4	0,153	0,056	0,007	0,043	0,264
2. Reputation and promotion	1	-0,115	0,051	0,025	-0,216	-0,014
	3	-0,200	0,047	0,000	-0,293	-0,108
	4	0,038	0,050	0,451	-0,061	0,137
3. Making a contribution	1	0,085	0,050	0,094	-0,015	0,185
	2	0,200	0,047	0,000	0,108	0,293
	4	0,238	0,040	0,000	0,159	0,318
4. Interest and sense of achievement	1	-0,153	0,056	0,007	-0,264	-0,043
	2	-0,038	0,050	0,451	-0,137	0,061
	3	-0,238	0,040	0,000	-0,318	-0,159

3.5.2. Multiple hierarchical regression

Questions related to working climate, management encouragement of patenting and engineers' patent awareness were also included in the survey instrument (see Appendix 1 Table 1 for details on these variables). I ran multiple hierarchical regression to find out if there is an influence of these factors on different types of motivation revealed by factor analysis in the previous section. Due to non-normal distribution of the data I performed bootstrapping with 95% confidence interval (bias corrected accelerated).

I controlled for age, education and working experience at the company (see Appendix 1 for details on these variables). For ethical considerations, the specific age and length of working experience were not asked in the questionnaire, but rather put into categories.

The regression models for motivation factors *interest and sense of achievement* and *making a contribution* are presented in Tables 3 and 4 (for factors „reward and recognition“ and „reputation and promotion“ the models did not fit the data).

Standardized regression coefficients (β), standard error and significance value are presented for each predictor. The summary for each model is shown at the bottom of the table. Both regressions demonstrated similar results. Little variations in the perceived motivation can be seen in the Model 1 where only control variables are entered (R^2 of 2% and 0,3% in the Tables 3 and 4 respectively, no variables significant at <0.05 level). Model 2, with the entry of patenting motivation, does not show increase of R^2 either. Entering working climate and management encouragement in the Model 3 results in the increase of R^2 to 12% (Table 3) and 14% (Table 4).

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

Standard errors of the models become more deflated compared to the previous ones. Model 3 in both cases (Tables 3 and 4) shows significant positive beta of working climate at $p < 0.01$.

Table 3. Multiple hierarchical regression with “interest and sense of achievement” as an outcome variable

Variable	Model 1			Model 2			Model 3		
	β	Std. Error	Sig.	β	Std. Error	Sig.	β	Std. Error	Sig.
(Constant)		0,270	0,000		0,449	0,000		0,497	0,000
Age	0,043	0,123	0,622	0,011	0,124	0,899	0,004	0,120	0,967
Education	-0,130	0,067	0,132	-0,108	0,067	0,210	-0,126	0,066	0,135
Working experience	-0,026	0,074	0,769	-0,022	0,073	0,801	-0,037	0,072	0,665
Patent awareness				0,169	0,105	0,056	0,110	0,116	0,255
Working climate							0,252	0,105	0,009
Man. encouragement							0,045	0,118	0,679
R ²		0,020			0,047			0,119	
ΔR^2		0,020			0,027			0,073	
Adjusted R ²		-0,002			0,018			0,079	
Std. Error		0,657			0,650			0,630	
Sig. F Change		0,445			0,056			0,006	

Table 4. Multiple hierarchical regression with “making a contribution” as an outcome variable

Variable	Model 1			Model 2			Model 3		
	β	Std. Error	Sig.	β	Std. Error	Sig.	β	Std. Error	Sig.
(Constant)		0,237	0,000		0,396	0,000		0,426	0,000
Age	0,013	0,108	0,880	-0,008	0,109	0,933	-0,021	0,103	0,800
Education	-0,045	0,059	0,605	-0,030	0,059	0,729	-0,045	0,056	0,591
Working experience	-0,034	0,064	0,696	-0,032	0,064	0,717	-0,069	0,062	0,419
Patent awareness				0,110	0,093	0,219	-0,007	0,099	0,944
Working climate							0,274	0,090	0,004
Man. encouragement							0,163	0,101	0,133
R ²		0,003			0,015			0,143	
ΔR^2		0,003			0,011			0,128	
Adjusted R ²		-0,019			-0,015			0,103	
Std. Error		0,575			0,573			0,539	
Sig. F Change		0,930			0,219			0,000	

3.6. Discussion

As the authors of self-determination theory once mentioned, “motivation is highly valued because of its consequences: motivation produces” (Ryan & Deci, 2000a; p. 69). SDT differentiates intrinsic and extrinsic motives. The former ones relate an involvement into an activity with joy, interest and personal challenge (Amabile, 1993). The latter ones refer to acquisition of a

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

separable outcome which is not in the activity itself (Ryan & Deci, 2000a) and vary within a self-determination continuum in their autonomy between amotivation and intrinsic motivation (Deci and Ryan, 2000).

The four groups of patenting motives revealed by the factor analysis in the previous section can be described as different types of motivation within the mentioned continuum (see Graph 1):

Recognition and reward factor refers most closely to *externally regulated* type of motivation (the behavior is controlled externally). In this case, the engineers relate the involvement into patenting activity with a monetary (financial reward) or non-monetary (recognition, respect) outcome.

Reputation and promotion motives imply the ego-involvement, i.e. gaining influence, reputation or a promotion opportunity which relates to *introjected regulation* in the SDT (performing an activity to attain an ego endorsement; the control administered by others).

Making a contribution group of motives encompasses a higher commitment to involvement into patenting activity. Though the reason for the involvement is still not in patenting itself, the engineers internalize the value of the activity (desire to protect an innovation or company's benefits). This refers to *identified regulation* within the self-determination continuum.

Finally, *interest and sense of achievement* attributed to patenting activity refer to intrinsic motivation. The involvement in patenting in this case does not depend on external benefits, but can rather be described in SDT as "doing an activity for its own sake" (Deci & Vansteenkiste, 2004; p. 28).

Graph 1. Self-determination theory and patenting motivation

Behavior	Nonself-determined					Self-determined
Type of motivation	Amotivation	Extrinsic Motivation				Intrinsic Motivation
Type of regulation	Non-regulation	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation	Intrinsic Regulation
Type of patenting motivation		Recognition and reward	Reputation and promotion	Making a contribution		Interest and sense of achievement

The explored types of patenting motives are similar to the ones found by Mathew and Chakraborty (2012) in their study on aspirations of Indian inventors. *Recognition and reward* and *reputation and promotion* are in line with their "wealth and fame as a personal motivator"

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

representing extrinsic motivation. *Making a contribution* motive of Chinese engineers refers to “societal concern” motive of their Indian colleagues. Both can be described as somewhat extrinsic altruistic motivation factors. Besides, similar to Mathew and Chakraborty’s (2012) “pragmatism”, i.e. problem-solving orientation, the factor analysis in the present study revealed an intrinsic motivation type *interest and sense of achievement*. Though both studies found analogical types of patenting motivation, the content of the latter is somewhat different, e.g. contributing to the company vs. contributing to the society, problem-solving orientation vs. interest and challenge. This suggests that the socio-cultural context matters for the patenting motivation.

Interestingly, similar motives (financial rewards, reputational/career rewards and intrinsic satisfaction) were explored by Lam (2011) in her study on motivation of academic scientists to engage in research commercialization.

The results of the factor analysis are also in accordance with “*the motivation-work cycle match*” suggested by Amabile (1993). Patenting is a complex task with different stages that should require different forms of motivation. Intrinsic motives associated with joy, challenge and sense of achievement most probably come into play during idea generation and problem solving stages. At the same time, writing and submitting an invention disclosure may not encompass an inherent interest for the engineers. Performing this task may be motivated by expected monetary and non-monetary benefits as well as by an urge to protect the new invention and/or the competitive advantage of the employer.

One-way repeated-measures ANOVA analysis showed some significant differences in the levels among different types of motivation. *Making a contribution* ranked the highest, whereas *interest and sense of achievement* had the lowest mean score.

Given that the levels of different types of motivation in the sample vary, we ran multiple regression analysis to find out if there are some external factors affecting the motivations. The multiple regression showed a positive influence of working climate on the motivation factors *interest and sense of achievement* and *making a contribution* which refer to intrinsic motivation or highly autonomous extrinsic motivation (see above). STD states that the supportive environments facilitate the intrinsically motivated behavior, whereas the opposite is also true (Deci & Vansteenkiste, 2004; Ryan and Deci, 2000a; Ryan and Deci, 2000b). Hence, this finding also shows the applicability of the SDT to the patenting motivation.

Surprisingly patent awareness of the engineers and management encouragement showed no significant influence on any motivation factor. The first contrasts with the findings of Chang and Chang (2010) who suggest that patent awareness precedes patenting motivation. The second should theoretically (Amabile, 1993; Ryan and Deci, 2000a) serve as an external reward and hence affect the extrinsic motivation types.

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

My study revealed a complex nature of the patenting motivation of the corporate R&D engineers. I argue that this phenomenon needs further investigation and deeper understanding to help the companies to improve their patenting performance. Same as general working motivation, patenting motivation should vary as a function of different factors in the working environment, including “evaluation expectation, actual performance feedback, reward, autonomy, and the nature of the work itself” (Amabile, 1993: p.186). R&D management should learn to understand and manage the patenting motivation effectively to achieve their internal targets on patent disclosures and through that enhance their companies’ competitive advantage.

3.7. Limitations and further research

The findings of this study are based on a small sample taken from three Chinese R&D units of a single multi-national corporation. This puts some limitations on my research. First, the study depicts the experiences in a limited socio-cultural context. Furthermore, since the phenomenon of engineers’ patenting motivation was not widely addressed in the previous research, my study includes only a limited number of possible patenting motives. Thus, the present study can set a threshold for several possible further research directions.

First, forthcoming research can be cross-national so that the inter-country variation in individual and contextual factors might also be understood (Figueiredo Moutinho et al., 2007). Our study investigates the experiences of Chinese R&D engineers working for a European-based MNC. The brief comparison of our findings with the ones of Mathew and Chakraborty (2012) in the previous chapter suggests that though the patenting motivation factors may be similar in different countries, there are some differences that are to be further explored. Studies in other countries and organizations, and comparative studies (e.g. corporate context vs. academia) may lead to a more profound understanding of individuals’ patenting behavior.

Second, my research shows a positive influence of working climate on some types of motivation. Further studies can be undertaken to explore other factors affecting engineers’ patenting motivation. A pragmatic research approach with mixed methods could be appropriate in order to generate and confirm/reject the hypotheses within single study. Larger samples may allow triggering more minor effects.

Furthermore, the present study investigates only the factors that motivate the engineers to patent. It would be reasonable to also explore the obstacles or de-motivating factors that result in low or zero patent productivity.

Finally, individuals’ motivation depends on the environments they are exposed to. These environments may not remain constant over time. A longitudinal study could analyze, for example, the effects of the working environment change on the engineers’ patenting motivation.

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

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Appendix 1. Variables, measures and descriptive statistics

Table 1. Variables and measures

Variable/ Construct	Description/Items	Coding
Control variables		
Age	---	1 = ≤30; 0 = >30.
Education	---	0 = no higher education; 1 = bachelor; 2 = master; 3 = Ph.D.
WorExp	Working experience at the company, years	1 = >1; 2 = 1-2; 3 = 3-4; 4 = ≤5.
Predictor variables: individual factors		
Patent awareness (Chronbach's $\alpha = 0,831$)	I know what kind of technical solutions may become a patent.	Mean of the items scores on 5-point Likert scale
	I know the difference between an invention patent, a utility model and a design patent.	
	In general, I am able to understand the claim section of a patent without external help.	
	I know the necessary criteria of an invention to apply for a patent.	
	I know how to submit an invention disclosure in our company.	
	I know which patents are in the products I am working with.	
I know what benefits the patents provide to my company.		
Predictor variables: external (management) factors		
Working climate (Chronbach's $\alpha = 0,811$)	Our company provides a good financial reward to the engineers for their patented inventions	Mean of the items scores on 5-point Likert scale
	Engineers who patent their inventions are highly respected in our company.	
	Engineers who patent their inventions receive a high degree of recognition in our company.	
	Engineers with good patented inventions are a role model for other colleagues at our R&D center.	
Management encouragement (Chronbach's $\alpha = 0,760$)	Engineers with good patented inventions can get a career promotion in our company.	Mean of the items scores on 5-point Likert scale
	My supervisor encourages the engineers to patent their innovative technical solutions.	
	My supervisor supports the engineers if they need to write an invention disclosure.	
	The engineers in my department are provided with consultancy for writing an invention disclosure.	
	The engineers in my department are given enough time capacity if they need to write an invention disclosure.	

3. What motivates the engineers to patent? A Study at the Chinese R&D Laboratories of a European MNC

Table 2. Descriptive statistics

	Mean	Std. Deviation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1 Financial reward	4,23	0,76	1																
2 The respect of my colleagues	4,05	0,68	0,28**	1															
3 The recognition of the management	4,19	0,68	0,26**	0,62***	1														
4 Enhance my reputation in the company	3,98	0,78	0,17	0,46***	0,48***	1													
5 Enhance my influence in the company	4,00	0,80	0,13	0,43***	0,46***	0,79***	1												
6 Gain better promotion opportunities	4,07	0,81	0,31***	0,37***	0,46***	0,61***	0,61***	1											
7 Demonstrate my engineering skills	4,11	0,79	0,10	0,25**	0,41***	0,57***	0,56***	0,46***	1										
8 Create a valuable output	4,27	0,67	0,13	0,39***	0,40***	0,39***	0,41***	0,54***	0,57***	1									
9 Protect innovative solutions	4,24	0,68	0,10	0,41***	0,43***	0,40***	0,38***	0,39***	0,52***	0,80***	1								
10 Protect the benefits of the company	4,29	0,62	0,09	0,31***	0,38***	0,46***	0,41***	0,36***	0,50***	0,74***	0,74***	1							
11 Enhance the company's value	4,23	0,62	0,08	0,35***	0,27**	0,43***	0,39***	0,33***	0,44***	0,69***	0,70***	0,82***	1						
12 Make a contribution for the company	4,17	0,68	0,15	0,36***	0,36***	0,41***	0,34***	0,36***	0,42***	0,64***	0,52***	0,65***	0,64***	1					
13 Enjoy the creation process of a patent	4,03	0,82	0,28**	0,27**	0,34***	0,30***	0,35***	0,34***	0,40***	0,52***	0,44***	0,47***	0,54***	0,60***	1				
14 The honor to be an author of a patent	3,90	0,78	0,14	0,28**	0,45***	0,54***	0,47***	0,31***	0,53***	0,35***	0,40***	0,43***	0,45***	0,43***	0,58***	1			
15 Interest in the creation of patents	3,87	0,86	0,15	0,19*	0,28**	0,38***	0,35***	0,28**	0,56***	0,54***	0,51***	0,46***	0,53***	0,44***	0,58***	0,62***	1		
16 Sense of achievement	4,18	0,72	0,19*	0,27**	0,31***	0,45***	0,38***	0,37***	0,43***	0,67***	0,51***	0,54***	0,52***	0,60***	0,60***	0,50***	0,56***	1	
17 Challenge to create a patent	4,04	0,82	0,10	0,19*	0,31***	0,35***	0,35***	0,28**	0,43***	0,48***	0,54***	0,50***	0,49***	0,45***	0,44***	0,53***	0,72***	0,65***	1

*. Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

***. Correlation is significant at the 0.001 level (2-tailed).

4. Conclusion

4.1. Summary

This dissertation contributes to the understanding of the corporate IP management by focusing on the management approaches the companies use in order to enhance the appropriation of their IPRs. It chooses China as a research context where the improving IP environment motivates companies to rely more on conventional means of IPR protection on the one hand and to develop and deploy special management approaches aiming to support the conventional IP appropriation to address the shortcomings of China's IP regime on the other hand. This thesis contributes three scientific papers on the topic of IP management. The first article has qualitatively explored management approaches to enhance the patent and trademark protection using multiple case study research method. The study reveals 11 different approaches and extends the existing knowledge on IP protection strategies based on management approaches and provide an understanding on how such approaches are crafted as well as how they can support the IP appropriation. The second paper has defined how the patent awareness of engineers can be measured and what individual and external factors can affect it. This article proves the significant positive effect of invention disclosure experience, use of patent literature, supervisory encouragement and patent trainings provided by in-house patent professional on the patent awareness of the engineers in the corporate context. Finally, the third paper investigates the phenomenon of patenting motivation of R&D engineers by applying self-determination theory of motivation. This study reveals a complex nature of patenting motivation and shows that it varies from purely extrinsic motivation, such as getting financial reward to intrinsic motivation that can be described as interest and personal challenge in creating a patent. Implications for management are developed and discussed in each paper.

4.2. Main results

MNCs skillful managers develop and deploy various and complex approaches to enhance their IP appropriation

Each of six companies participated in the study for the first paper uses several management approaches for both patent and trademark protection in both domains of IPRs obtaining and enforcement. They apply these approaches internally in the company as well as externally by interacting with their dealers, distributors, end customers and industry partners. One approach

4. Conclusion

can be universal for patent and trademark protection or can be used for both obtaining and enforcement of the IPR. Furthermore, the first paper revealed a double role of some management approaches, such as trainings to engineers, other employees, distributors and customers. These strategies were interpreted in the previous studies as measures to prevent infringement, whereas the companies participated in my research also use them to support the formal protection and enforcement of their IPRs.

Managers can influence engineers' patenting behavior

In the domain of patent rights obtaining one of the focus topics of the management's concern is improving the patent productivity of the corporate R&D that can be achieved via influencing engineers' patenting behavior. To patent an invention the engineers should possess sufficient knowledge to recognize a patentable invention in their work. As the second paper of this dissertation shows, patent trainings provided by in-house patent professional and supervisory support of the in-line manager positively influence patent awareness among R&D employees. Besides, the high correlation between individual factors (patenting experience, use of patent literature) and management factors (patent trainings, supervisory encouragement) affecting patent awareness suggests that the latter may have some impact on the former.

Patenting motivation of the engineers is a complex phenomenon

Besides patent awareness, another dimension of the engineers' patenting behavior is their patenting motivation. The third article of the dissertation revealed a complex nature of this phenomenon. Applying self-determination theory approach the study explored four types of patenting motivation varying in their autonomy within the self-determination continuum:

Recognition and reward factor refers most closely to *externally regulated* type of motivation (the behavior is controlled externally). In this case, the engineers relate the involvement into patenting activity with a monetary (financial reward) or non-monetary (recognition, respect) outcome.

Reputation and promotion motives imply the ego-involvement, i.e. gaining influence, reputation or a promotion opportunity which relates to *introjected regulation* in the SDT (performing an activity to attain an ego endorsement; the control administered by others).

Making a contribution group of motives encompasses a higher commitment to involvement into patenting activity. Though the reason for the involvement is still not in patenting itself, the engineers internalize the value of the activity (desire to protect an innovation or company's benefits). This refers to *identified regulation* within the self-determination continuum.

Finally, *interest and sense of achievement* attributed to patenting activity refer to intrinsic motivation. The involvement in patenting in this case does not depend on external benefits, but can rather be described in SDT as "doing an activity for its own sake" (Deci & Vansteenkiste, 2004; p. 28).

4. Conclusion

The results of the factor analysis are also in accordance with “*the motivation-work cycle match*” suggested by Amabile (1993). Patenting is a complex task with different stages that should require different forms of motivation. Intrinsic motives associated with joy, challenge and sense of achievement most probably come into play during idea generation and problem solving stages. At the same time, writing and submitting an invention disclosure may not encompass an inherent interest for the engineers. Performing this task may be motivated by expected monetary and non-monetary benefits as well as by an urge to protect the new invention and/or the competitive advantage of the employer.

Working climate has a positive influence on more intrinsic types of patenting motivation

The multiple regression analysis showed a positive influence of working climate on the motivation factors *interest and sense of achievement* and *making a contribution* which refer to intrinsic motivation or highly autonomous extrinsic motivation (see above). This finding is in line with the STD that states that the supportive environments facilitate the intrinsically motivated behavior, whereas the opposite is also true (Deci & Vansteenkiste, 2004; Ryan and Deci, 2000a; Ryan and Deci, 2000b).

Patent awareness and management encouragement didn't show a significant influence on the motivation factors

Surprisingly the results of the third paper of the dissertation showed no significant influence of patent awareness of the engineers and management encouragement on any patenting motivation factor. The first contrasts with the findings of Chang and Chang (2010) who suggest that patent awareness precedes patenting motivation. The second should theoretically (Amabile, 1993; Ryan and Deci, 2000a) serve as an external reward and hence affect the extrinsic motivation types.

4.3. Management implications

The explored management approaches can be applied in a wide range of industries

Though the data for this dissertation was obtained only at the companies operating in automotive and automation industries, I claim that the explored approaches can be adopted in a wider range of industries. By implementing such strategies, firms can effectively protect their IPRs by registering and enforcing them in an IP regime where relevant laws' internalization is still to be achieved. Furthermore, companies may enjoy such benefits as saving of enforcement costs, exchange the experience with other experts from the industry and influence the further development of the country's IP regime.

Local IP management is an important factor

As shown in the first paper, IP management is fully or partially localized at the six analyzed cases. The company participated in the research for the second and the third paper of the dissertation

4. Conclusion

also has local patent management. Most of the approaches would be impossible to conduct efficiently without significant physical presence of an IP manager in China since many personal interactions as well as mobility within the country are expected.

Management requires cultural competence

Secondly, the effectiveness of some management approaches highly depends on the cultural competence of the responsible managers. The majority of the respondents interviewed for the first article, as well as patent attorneys and R&D managers of the company investigated in the second and third articles are Chinese citizens for whom language or cultural barriers are not an issue. Such an advantage may significantly ease the building of effective internal and external networks. For example, a local patent attorney may have a better understanding of the shortcomings in the patent knowledge of the engineers and hence provide more effective patent trainings.

Financial considerations must be taken into account

Implementing and practicing some management approaches require a certain budget and human resources. It would be more reasonable to adopt time-consuming and costly strategies either for large-size or companies with significant local operations in China.

Management has many ways to influence engineers' patenting behavior

As shown in the second paper of this dissertation the managerial and individual factors show high significant positive correlations. This means, that managers could potentially influence the engineers' attitude toward using patent literature or make them put some extra efforts to transform their ideas into patentable inventions. It's the managers' ability and responsibility to provide time and other necessary resources to enable the engineers to perform certain tasks.

Patenting motivation requires more attention and deeper understanding by the management

This dissertation revealed a complex nature of the patenting motivation of the corporate R&D engineers. This phenomenon needs further investigation and deeper understanding to help the companies to improve their patenting performance. Same as general working motivation, patenting motivation should vary as a function of different factors in the working environment, including "evaluation expectation, actual performance feedback, reward, autonomy, and the nature of the work itself" (Amabile, 1993: p.186). R&D management should learn to understand and manage the patenting motivation effectively to achieve their internal targets on patent disclosures and through that enhance their companies' competitive advantage.

4.4. Limitations and further research

The findings of this dissertation depict only a limited sample of experiences in the IP management among all those that can possibly exist. The research is based on the experiences of six

4. Conclusion

companies operating in the automotive industry and one company in the automation industry which choice anticipated rich research results. Therefore, the IP management of other companies and other industries could not be investigated.

Given that it is probably not easy to conduct a company-level study on such a sensitive topic as IPR protection and this opportunity often depends on the researcher's network in the business world, the phenomenon of management approaches enhancing IPR appropriation remains relatively unexplored. Hence, the present dissertation can set a threshold for several possible further research directions.

First, a separate detailed research on management approaches focused on a single IP protection domain could provide a deeper understanding of their phenomenon. For example, the second and the third article of this dissertation focused solely on the patent rights obtaining and yielded interesting results not covered by the first paper.

Second, it would be interesting to study management and employees experiences in different socio-cultural contexts, countries and IP regimes. The present research focuses on operations of multi-national companies in China, therefore represents the experiences in certain legal, economic and social settings specific for this country. Studies in other economies, emerging and developed ones, and comparative studies between them may further extend the knowledge on the IP management approaches and the areas of their implementation and provide an understanding on which phenomena are universal and which are unique to a certain country. Besides, the experiences such as individuals' motivation depend on the environments they are exposed to. These environments may not remain constant over time. A longitudinal study could analyze, for example, the effects of the working environment change on the engineers' patenting motivation.

Third, the effect of certain management approaches on a firm's performance in a relevant IP protection area can be analyzed with the introduction of some quantitative measurements. For example, a study can be conducted to investigate the effect of patent trainings and supervisory support on the patent output, in particular, by comparing companies or R&D divisions within the same company where patent trainings were provided with the ones where they were not offered or where the quality of the patent knowledge among engineers varies significantly. A cumulative effect of a combination of several approaches and factors might be also investigated in this case.

Finally, the present dissertation explores only approaches and factors with a positive effect on the companies' IPR. It would be reasonable to also explore the obstacles or negative factors that result in a worse IP appropriation.

The internationalization of business is accompanied with pressure on the strategic choices companies make tackling with different socio-economic and legal frameworks in different countries worldwide. The availability and effectiveness of legal instruments for the appropriation

4. Conclusion

of intangible assets always depends on the IP regime of a country which may be not mature enough or be discriminatory. Hence, the phenomenon of corporate approaches aimed to increase IP appropriation using alternative resources encompasses a promising research field for the academics.

4.5. References

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