LAPPEENRANTA-LAHTI UNIVERSITY OF TECHNOLOGY LUT
School of Business and Management
Degree programme in International Marketing Management (MIMM)

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COMMUNICATING PATENT INFORMATION FROM A BUSINESS PERSPECTIVE: SIGNALING, MOTIVES AND SATISFACTION

Examiners: Associate Professor Anssi Tarkiainen
Assistant Professor Jenni Sipilä

ABSTRACT

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Communicating patent information from a business perspective: signaling, motives, and satisfaction

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Keywords: Patents, patent information, patent communication, stakeholders, signaling, motives

Businesses devote a lot of resources to obtain and maintain their patents. This study aims to investigate how businesses with patenting activities perceive communication about patents. To form a comprehensive picture of the topic, the study will focus on the following themes: identifying relevant stakeholders in patent information sharing, principal signals of patent communication, motives for communication, and satisfaction with the current ways of communication. 96 participants from six companies answered the questionnaire that was used to collect data in this quantitative empirical study.

The findings indicate that large Finnish companies consider research and development (R&D), management, and marketing and sales important internal stakeholders in communicating about patents. Investors are considered the most significant external stakeholder, but also partners and customers are believed to be important. The study has also shown that firms believe they can signal innovativeness through patent information communication and that they signal more diverse competencies through internal communication than external communication. Similar internal motives that are found to drive obtaining patents also drive internal patent communication. They include motivation for employees to invent and measure of R&D productivity. Signaling acts as a motive for both internal and external patent communication. Improving the corporate image was found to be another external motive. Current ways of patent communication are mainly satisfying, and firms are more satisfied with communication of the information about their own company's patents than information about competitor patents. Patent communication is perceived as important, and businesses are hoped to be more active in their internal patent communication. These findings provide insights from a perspective not previously explored in the patent literature.

TIIVISTELMÄ

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Yritykset käyttävät paljon resursseja saadakseen ja ylläpitääkseen patenttejaan. Tämän tutkimuksen tarkoituksena on selvittää, miten yritykset, joilla on patentointitoimintaa, suhtautuvat patenteista viestimiseen. Jotta aiheesta saadaan kattava kuva, tutkimuksessa keskitytään patenttitiedon jakamisen sidosryhmiin, patenttiviestinnän signaaleihin ja motiiveihin, sekä tyytyväisyyteen koskien nykyisiä viestintätapoja. 96 henkilöä kuudesta yrityksestä vastasi kyselyyn, jolla kerättiin tietoja tässä kvantitatiivisessa empiirisessä tutkimuksessa.

Tulokset osoittavat, että patenteista viestiessä suuret suomalaiset yritykset pitävät tärkeinä sisäisinä sidosryhminä tutkimus- ja kehitysosastoa (T&K), johtoa, sekä markkinointia ja myyntiä. Sijoittajia pidetään merkittävämpänä ulkoisena sidosryhmänä, mutta myös kumppaneita ja asiakkaita pidetään tärkeinä. Lisäksi tutkimus osoittaa, että yritykset uskovat voivansa signaloida innovatiivisuutta patenttitietoa viestiessään. He myös kokevat voivansa signaloida eri ominaisuuksia monipuolisemmin sisäisen kuin ulkoisen viestinnän kautta. Samankaltaiset sisäiset motiivit, joiden on aiemmin tutkittu ohjaavan patenttien hankkimista, ohjaavat myös sisäistä patenttiviestintää: motivaation tuottaminen työntekijöille keksiä uutta ja tutkimus- ja kehitystoiminnan mittaus. Signalointi toimii motiivina sekä sisäiselle että ulkoiselle patenttiviestinnälle. Ulkoista patenttiviestintää motivoi lisäksi yrityskuvan parantaminen. Nykyisiin patenttiviestintätapoihin ollaan pääasiassa tyytyväisiä. Yritykset ovat tyytyväisempiä oman yrityksen patentteja koskevaan viestintään kuin kilpailijapatenteista viestimiseen. Patenttiviestintä koetaan tärkeäksi ja yritysten toivotaan olevan aktiivisempia sisäisessä patenttiviestinnässään. Nämä havainnot antavat uutta tietoa patenteista näkökulmasta, joka ei ole aiemmin saanut huomiota patenttikirjallisuudessa.

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1 Introduction

This thesis examines communicating patent information in large companies. The aim is to explore if communicating patent information has signaling value and what are the motives behind the communication activities. To gain a comprehensive view of corporate patent communication, internal and external stakeholders as well as companies' satisfaction with current means of communication are also explored. Earlier, corporate patents have been studied from multiple angles yet patent information from the marketing communication point of view has received no attention.

The first chapter consists of the background of the study and the preliminary literature review. They are followed by the theoretical framework, definitions, delimitations and research methodology including data collection plan. The last part of this chapter introduces the structure of this thesis.

1.1 Background

An invention made in a company is the first step towards a patent. It may lead to the company making a patent application, which sometimes leads to a granted patent. Many companies have intellectual property rights (IPR) activities, and they file patent applications abundantly. The purpose of a patent is to protect a particular innovation and to secure it against a third party who could use the patent's disclosed, protected information without the consent of the holder (Encaoua & Madiès 2013). Patents have value and they signal value (see e.g. Reitzig 2003; Parchomovsky & Wagner 2005; Grimaldi et al. 2015; Long, 2002; Hoenen et al. 2014).

An increasing number of patent applications is annually filed by companies located mainly in the USA, Europe and Japan (Dernis et al. 2019). In Finland, Finnish companies file around a thousand patent applications a year, and hundreds of corporate patents are granted every year (PRH 2020). 1685 applications were filed in 2020, which was the highest number in seven years in Finland (PRH 2021). In 2018, companies all over the world filed over 81,900 patent applications with the European Patent Office (European Patent Office 2019). Furthermore, from 253,000 Patent Cooperation Treaty (PCT) applications filed via World Intellectual Property Organization (WIPO) over 85 percent were filed by businesses in 2018 (WIPO 2019a; WIPO, 2019b). The number of total granted patents has been growing over the years and an

estimated 1.42 million patents were granted globally in 2018 (WIPO 2019a). Patents have a positive influence on firm performance. According to a report by European Union Intellectual Property Office (EUIPO) and European Patent Office (EPO) (2021), patent owning firms have an average of 36.3 percent higher revenue per employee compared to firms without any intellectual property rights. Ernst (2017) argues that intellectual property functions are traditionally seen as legally and technically oriented, but they will transform more strategic and management oriented.

Patents are valuable and they protect innovations, but their role can be complex in business communication. On one hand, patents can act as messengers, for example, by conveying information about the invention and the firm (Long 2002). On the other hand, patenting requires a firm to fully disclose their invention, which may make them hesitant to patent at all in fear of information leaking to outsiders (Arundel 2001). Even inside the firm patents are not univocally beneficial, and patents include jargon many do not know how to interpret, which makes it difficult to take advantage of them (Chiarello et al. 2018). However, patents can convey information to investors, and the patents signal value to them, which leads to attracting financing (Hoenen et al. 2014). One of the aspects this thesis will examine is if patents have a similar signaling role outside financing. More specifically, this thesis aims to research how large companies perceive patent information in marketing communication and other communications. The themes of this thesis are signals, motives, stakeholders, and satisfaction.

Patents have been studied widely from the point of view of motives to patent and value of patents. In the business world, patents' role in attracting financing has been the subject of numerous studies. The commercialization of patents has been studied, although much of the current literature on patent commercialization focus on academic patents. The patent behavior of firms has been the subject of several studies. For example, Peeters and van Pottelsberghe de la Potterie (2006) examined the relationship between patenting behavior and innovation strategies, whereas Schmidt (2013) researched how process-oriented industries patent their inventions. Instead, the aspects of marketing patents and patent communication seem to have been neglected. The following subchapter will review the earlier research literature on patents.

1.2 Preliminary Literature review

There are several reasons to file patent applications and obtain patents. A firm's market value and performance can be improved by the use of patents (Hall et al. 2005). When patenting

motives are reviewed in the light of the five categories of Holgersson and Grandstrand (2017): protection, bargaining, improving the corporate image, attracting external financing and internal reasons, the most important motives fall under the category of protection in large firms. Their research found that large companies rate protection of product technology as the most significant motive and securing the freedom to operate as the second most important. The top five motives also include blocking competitors from certain technology areas (*protection*), creating retaliatory power against competitors (*protection*) and providing motivation for employees to invent (*internal reasons*). In addition, de Rassenfosse (2011) found that for large companies, preventing imitation by competitors and protecting the freedom to operate are significant reasons for patenting. Veer and Jell (2012) argue that for small firms, there are similar motives such as preventing competition and freedom to operate. Furthermore, many small firms also rate signaling as one important motive to patent (Veer & Jell 2012). Sauermann and Wesley (2010) studied individual employees' motives, more precisely the motives of scientists and engineers, and found that filing patent applications has motives such as a desire for intellectual challenge, independence and higher income. For scientists working in research institutes, instead, patenting can be driven by commercialization motives (Blind et al. 2018).

As discussed above, patents are obtained for multiple reasons. Patents are also valued, and the next subchapter concentrates on determinants of patent value. It is followed by a subchapter on signaling, which is an important theme in this study. Lastly, the marketing of patents is reviewed before the research gap is addressed.

1.2.1 Determinants of patent value

Businesses wish to show their innovativeness, and it is mainly measured with statistics on new products and patents (Manu & Sriram 1996). The number of patents is considered important because patents bring value. Determinants of patent value have been the topic of numerous studies, and these determinants are introduced in this subchapter.

Conley et al. (2013) have researched IPR value articulation. Rather than merely patents, their research studied intellectual property rights in general. They concluded that IPR-related activities need to be linked with practices of marketing and strategy. Their framework based on six case studies includes three elements that help to gain insights that can lead to growth both in existing and in new markets. These elements are value transference, value translation, and value transportation.

Many patent holders struggle to demonstrate the value of their patents (Guellec & Ménière 2013). The concept of patent value has been defined by various researchers. Reizig (2003) suggested, based on his sample study, that the present value of a patent can be assessed via four aspects: knowledge of the patent's technical importance, a patent's portfolio position, the learning value obtained by competitors using a patent disclosure, and the difficulty in inventing around the patent. Reitzig argues that in patent portfolio management, a high degree of novelty and inventive activity are features needed for a patent to be worth renewal.

It is not necessarily individual patents that bring value to a company. In addition to Reitzig, who emphasizes the position of a patent in a portfolio, Parchomovsky and Wagner (2005) suggest that the value lies in a patent portfolio since obtaining a large number of related patents leads to increasing the scale and the diversity of available marketplace protections for innovations. Therefore, a high-volume, portfolio-based approach is needed to draw value via patents. In contrast to Parchomovsky and Wagner, Ernst et al. (2016) state that a firm's performance is improved by the patent management style, not by the patent portfolio size. The managerial perspective is often neglected, which according to Ernst et al. (2016) leads to an incomplete understanding of patents' value creation.

Many researchers have argued that patent citations have a role in determining the patent value. Hall et al. (2005) studied patent citations and market value, concluding that patent citations boost the market value of a firm, self-citations being more valuable than external citations. Apart from patent citations, R&D assets and simple patent counts also help in the evaluation of intangible assets of a firm. Sapsalis et al. (2006) examined determinants of value and value distribution of corporate patents. According to their study, backward patent citations, non-patent citations, the number of inventors and the number of co-assignees act as determinants. Grimaldi et al. (2018), in turn, created a quantitative index to analyze the value of a patent portfolio. This index was formed by merging determinants including claims, citations, market coverage, strategic positioning, and economic importance.

Both above-mentioned topics, the role of a patent portfolio and patent citations, are discussed in van Zeebroeck and van Pottelsberghe de la Potterie's (2011) study of the vulnerability of patent value determinants. They qualify four classes into which patent value determinants can be divided. They are patent characteristics, ownership characteristics, 'insider' information obtained from field surveys or interviews, and filing strategies. Filing strategies are the most

stable determinants, yet many other well-established determinants have an ambiguous relationship with the patent value. Patent citations and portfolios are discussed when the researchers name volatile determinants. The country of patents' origin, the technology area and the chosen value indicator have a heavy impact on the roles of backward patent citations and the patent portfolio size of the applicant. Therefore, van Zeebroeck and van Pottelsberghe de la Potterie's (2011) state that generalizations of the patent value determinants are often unreliable.

Failure to fully exploit patent information is a subject highlighted by Grimaldi et al. (2015). They contributed to the patent value determination research by creating a framework that can be used to assess the value of patent portfolios or to create a graphic analysis. In the framework, they combined the technologic-bibliometric information from patent databases with the economic-strategic judgements from managers. The study argues that patent information is not often utilized in strategic planning. Similarly, Ernst et al. (2016) argue that out of a patent's two main functions, protection and information, protection is well recognized and valued whereas the information aspect and its opportunities are not.

1.2.2 Signaling

Signaling theory relates to a situation where there is information asymmetry. Connelly et al. (2011) explain that signaling theory describes how two parties convey and interpret a message. The sender and the receiver's access to information differs. Thus, for one party, there is a choice whether and how to communicate that information and for the other party, there is a choice of how to interpret it as Connelly et al. (2011) expound. The theory concerns patents since patents have value, but they can create information asymmetry too.

Long (2002) has examined patents and information asymmetries and has created a patent signaling model. She lists three different ways how patents act as messengers: First, information about the invention and the firm can be gained through patents and patent portfolios; second patents can be effective signals of low future discount rates, and third, patents are correlated with various firm attributes according to market actors. In the patent signaling model, firms are classified into innovative and boring. She remarks that obtaining patents can be costly. Thus, obtaining a patent portfolio could serve as a credible signal of firm quality because boring companies can see the costs as a hindrance to engaging in such a process. Patents cannot include false statements, or a firm will face actual and reputational

costs. Therefore, investors can be easily convinced by patents. Long (2002) also notes that patent signals may be ambiguous since signals can be inaccurate, signalers and observes may be informed poorly and the information flows might have deficiencies.

Several articles and researches recognize the importance of patents as signals. A study on patent filing motives by Veer and Jell (2012) suggests that the motive of signaling is important for some small firms. The motive of signaling is described as "taking the patents in order to convince investors or banks of the value of my inventions" (Veer and Jell 2012, p. 520). Several studies on the topic have been concentrating on how patents act as signals in venture capital (VC) financing. Hoenen et al. (2014) studied a patents' signaling effect in emerging companies and their venture capital financing. They demonstrated that in the first-round VC investments, patent activity has an important role, and it affects the number of funds raised. In the second round, however, patent activity does not affect anymore as information asymmetries decrease. Furthermore, according to the researchers, patent applications actually have a more significant role than actual patents.

Hsu and Ziedonis (2013) suggest that in entrepreneurial firms, to secure initial funds from prominent venture capitalists, patents influence particularly in situations where the founders do not have prior entrepreneurial success. They argue that the influence of patents is more effective in earlier rounds of venture capital financing, which is a parallel finding to Hoenen et al (2014). The study by Hsu and Ziedonis (2013) also suggests that a patent's signaling function as an information giver is more important in situations with no other mechanisms for conveying quality. Hoenen et al. (2018) suggest that the signaling function of patent activity encourages venture capitalists to invest in start-ups intrigued by patents, and especially by patent applications. According to their study, geographical distance also plays a role as the signaling value of the patent activity is stronger in long-distance transactions.

Caviggioli et al. (2020) have also researched the relationship between venture capitalists and patent portfolios of young innovative companies, concluding that the portfolio size and the characteristics of patented inventions are significant. The portfolio size and the characteristics of patented inventions are also factors in the positive signaling effect of patents to venture capitalists. Venture capitalists value patented technologies originating from R&D alliances and the patented technologies are related to the amount of financing positively. Conversely, when analyzing the choice decisions of VCs, Hoenig and Henkel (2015) found that patents have no signaling effect on start-ups' technology quality. Yet their research considers only

technological qualities. This is why they remarked that patents can still signal something else. Hottenrott et al. (2015) have conducted the only study on the role of patents as quality signals for established R&D-active firms as earlier studies have been focusing on new companies. Interestingly, their research shows that the signaling effect of patents does not seem to arise in larger firms.

1.2.3 Commercialization, marketing, and patents

Several previous studies have explored the commercialization of patents, yet the studies tend to focus on university patents. The commercialization of universities' patents has been researched, for example, by Elfenbein (2007), Hsieh (2013), and Wu et al. (2015). Harrer and Lackner (2014) took a business-to-business viewpoint and identified four challenges that patent commercialization holds. First, a patent that is being commercialized cannot be modified to fit a certain target customer. Second, patents are complex. Third, the window of opportunity is tight. Lastly, the choice of a partner is crucial. Harrer and Lackner (2014) have also listed three key elements of integrated marketing communication of intellectual property. They suggest that it is essential to communicate the value clearly, to have third-party test reports, and to have a working prototype. Interestingly, Harrer & Lackner (2014) came to the conclusion that businesses can market their patents outside their core business for an additional stream of revenue, but they do not consider a situation where patents are part of the core business.

The relation between communications and patents has been in the focus of only a few studies. Mueller and Nyfeler (2011) investigated communication in patent information retrieval from the viewpoint of a patent search service, and small and medium enterprises (SMEs) as customers. In these services, companies value the competence of the staff the most. Also, ease of access and identification, timely delivery, individual contact, and costs were ranked as "highly relevant" factors. Regarding intellectual property rights and marketing, trademarks are more closely linked to marketing activities than patents. Zhou, Sandner, Martinelli and Block (2016) studied start-ups and venture capital financing. They took both patents and trademarks of start-ups' for examination. According to their study patents demonstrate start-ups' technological ascent, whereas trademarks tell about marketing capabilities. Also, Mendonça et al. (2004) found that trademarks signal about marketing advancement of a start-up. All in all, studies seem to link patents only to technical aspects or financing, whereas trademarks are observed from the marketing viewpoint, too.

Holgersson's (2013) study of patent management in SMEs is one of the few studies commenting on the topic of marketing. He states that numerous participants of the research regarded patents to have a significant value for the company in that they were used for customer marketing purposes. Signaling is also mentioned when Holgersson (2013) points out that products that are marketed by mentioning patents can signal inventiveness to customers or proprietary characteristics to competitors. SMEs in the study use patents in marketing to gain capital and to draw attention from customers.

1.2.4 Research gap

The literature discussed above focuses on topics such as patent value and value signaling. Patent value literature has been exploring the determinants of value, focusing for example on patent portfolios, citations and patent characteristics (e.g. Reitzig 2003; Parchomovsky & Wagner 2005; Sapsalis et al. 2006). Many researchers (e.g. Hoenen et al. 2014; Caviggioli et al. 2020) have been interested in patents' signaling role in investing, mainly concentrating on new firms and start-ups rather than large, established companies, except for the study by Hottenrott, Hall and Czarnitzki (2015). Moreover, earlier studies have been examining almost exclusively venture capital financing.

The role of management has been discussed by Conley et al. (2013) and Ernst et al. (2016). Marketing communication or other communication have not been in the focus of patent literature. They have been mentioned only in a few studies. Holgersson (2013) argued that some SMEs use patents in marketing and Holgersson and Granstrand (2017) remarked that improving the corporate image is a category of motives in patenting. Conley et al. (2013) concluded that IPR management needs to be connected to practices of marketing. Harrer and Lackner (2014) listed key elements of integrated marketing communication of intellectual property. Besides, two of the latter concentrates on IPR in general, not patents in particular.

Marketing communication aims to express value (Kotler & Keller 2015). Even though the determination of the patent value has been studied, the role of a patent in marketing communication has not received much attention in the literature. Both internal and external viewpoints have been neglected. How patents act as signals and effects of this acting on an investors' interest and actions has been studied from the financial point of view, yet marketing

communication's potential role in investor relations or other external communication have not been studied. The possible value of patents in marketing communication and patents as signals in communication are unexplored areas. Furthermore, while several motives to obtain patents have been identified in previous studies, motives behind communicating about patents have not been addressed. This indicates that there is a research gap on the role of corporate patents in marketing communication, as it seems that relatively little is known about communicating about patents both internally and externally.

1.2.5 Research aim and questions

The goal of this study is to examine the use of patent information in marketing communication in large companies. Marketing communication concerns internal and external stakeholders of a firm, which is why these groups are discussed. This work studies the signaling value and motives behind the communication of patents. Moreover, to gain a comprehensive picture of patent communication in companies the empirical part concentrates also on patent communication satisfaction. To find answers to the above theme of marketing, communication, and patents, the main research question (RQ) is:

RQ1: How large companies perceive communicating patent information?

Supporting questions have been created to elaborate on the topic.

- RQ2: What are the stakeholders for communication of patent information?
- RQ3: What, if any, are the perceived principal signal of patent communication?
- RQ4: What are the main motives driving companies to communicate about patents?
- RQ5: Are companies satisfied with the current state of their patent communication?

1.3 Theoretical Framework

This study focuses on large companies with patenting activity. Internal and external stakeholders need to be identified to comprehensively understand the marketing of patents. Value signaling is one of the key concepts as this study examines what kind of value is signaled by patent communication, in addition to motives to communicate about patents. To examine patent marketing and communication, this study focuses on patent information, communicating

patent information to the stakeholders in the right ways, determining the signaling effect of patents in the communication environment, and recognizing motives driving communication.

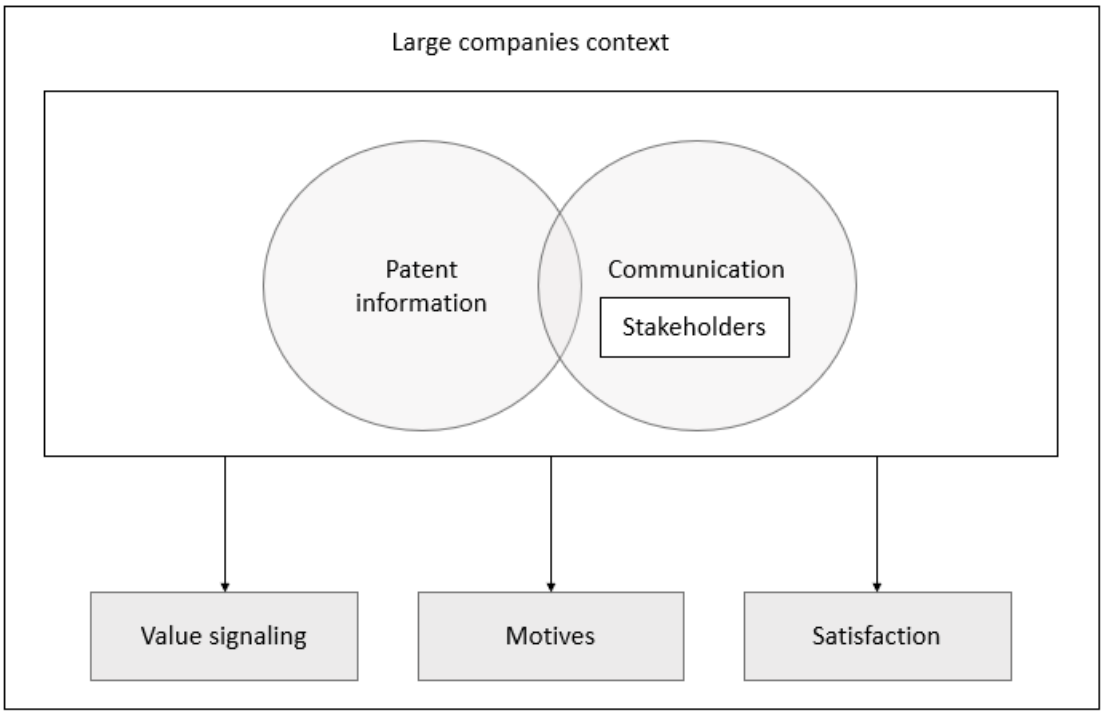


Figure 1. Theoretical framework

Most patent studies concentrate on patents or patent applications and obtaining the patents. This study takes a bit broader view by examining patent information. The communication of patent information is viewed from different perspectives. Communication happens between different stakeholders of the firms. For example, Ernst (2003) have studied who are the parties that can benefit from patent information. The empirical part of this thesis surveys which internal and external parties the participating firms find noteworthy of communicating patent information.

Another theme is signaling. In the environment, as defined by the signaling theory, there are three essential aspects: a signaler, a signal and a receiver, the latter of which may also be called an observer (Connelly et al. 2011; Long 2002). In some cases, there can be feedback after the observer has received the signal (Connelly et al. 2011). In this study, one situation examined is when the signaler is a company's intellectual property team or patents team. In different companies, teams responsible for patents may be called by diverse names, but for clarity, they will be referred to only as *patent teams* in this paper from now on. Also, a firm as a signaler is one point of view of the study. A signaler obtains information with underlying quality that is

not available for outsiders but such information that an outsider would find useful (Connelly et al. 2011). In this study, patents are signals, in a form of patent information used in marketing communication. Observability and signal cost are important characteristics of a signal (Connelly et al. 2011), and good signals are observable and costly to imitate (Connelly et al. 2010). Stakeholders for the communication of patent information are the receivers. The receiver observes and interprets the signal (Connelly et al. 2011). Asymmetry has a significant role from two standpoints, quality information and information about intent (Stiglitz 2000). From the patent information perspective, there can be information asymmetry in both of them. The patent team probably knows the quality of their patents and their intents concerning patents, but their stakeholders may not be aware of those. Signals are used to communicate underlying qualities or intentions to those who may want to know that information (Connelly et al. 2010). Also, a receiver may become the sender. This is the case when, for example, an employee needs to pass on the patent information received from the patent team to someone, like a partner, customer or investor. In that situation, in order to convey the message well to external stakeholders, the original sender needs to do their work well. Feedback or countersignals (Connelly et al. 2011) can be observed by the sender lastly, which may convey important information, too.

Motives to obtain patents are protection, bargaining, improving the corporate image, attracting external financing and internal reasons (Holgersson & Granstrand 2017). This study seeks to define the role of the motives' role when firms communicate about patents and examine if similar motives that drive obtaining patents affect the ways of communication.

While signaling and motives are important constructs that have appeared often in patent research and therefore are also part of this thesis with a communication angle, to gain a comprehensive picture, firms' satisfaction with current ways of communicating patent information and future prospects of communication are taken account of as well. Patents are related to competitive edge. Patent information can be used for competitor monitoring to review, for example, the technological and financial quality of competitors' patent applications (Ernst 2003). Motives behind patenting can relate to competitors if a firm uses patents to create retaliator power against them and tries to obtain patents to block competitors from a certain technology area (Holgersson & Granstrand 2017). Thus firms' views on patent information concerning competitor patents are also covered shortly.

1.4 Definitions

Patent

Intangible creations are intellectual property that can be protected by patents. World Intellectual Property Organization WIPO (2020a) defines a patent as an exclusive right granted for an invention. A patent's task is to prohibit others from utilizing a certain invention commercially, like in manufacturing, selling, using, or importing a product (PRH 2020). The main characteristics of patents are presented in Table 1, as defined by the European Patent Office and European Union Intellectual Property Office.

Table 1. Main characteristics of patents by EPO & EUIPO (2019, p. 35)

Subject matter:	Inventions (solution to technical problems)
Requirements for protection:	Novelty; inventive step (non-obviousness); industrial applicability
Acquisition of right:	Examination by the patent office, followed by grant and validation
Conferred rights:	Exclusive right to make, use, and sell the patented invention
Duration:	Typically 20 years from filing, subject to payment of annual renewal fees

Patent information

Patents describe new technologies, protect innovations and contain treasured information. EPO (2020) defines that patent documents consisting of basic information like the title of the invention, a detailed description of the invention, drawings, and claims that reveal foremost technical information are patent information. Also, legal and business-relevant information about patents is called patent information. Patent information can also mean other types of information, such as patent literature and other information sources, i.e., media releases, conference proceedings, industry standards definitions and product literature (Alberts et al. 2017).

Patent communication

In this thesis, patent communication refers to any message that parties send and receive that is related to patents, patent families, patent features or similar.

Patent value

Patents are intangible and valuable assets. The value of knowledge-intensive companies is partly determined by the value of their patents and for instance, patents can bring economic

value and strategic value (Grimaldi et al. 2015). Determinants of patent value may vary, but, for example, forward citations, grant decisions, families, renewals, and oppositions have been found positively correlated with the value of patents in the literature (van Zeebroeck 2011).

Patents as signals

A signal is a tool to convey information. Patents are mainly seen as protection for innovation, but they have other functions, too. One key function is signaling, meaning that patents can convey messages. Patent signals reduce information asymmetries between patentees and observers, and if patents convey information in a controlled and credible way, patents can have positive private value to firms. Both individual patents, as well as patent portfolios, can act as signals. (Long 2002.)

Stakeholder

Freeman (2010) defines stakeholders as groups and individuals who can affect, or are affected by, the achievement of an organization's mission. Stakeholders can be divided into two groups. Primary stakeholders include financiers, employees, customers, suppliers and communities, whereas media, government, competitors, consumer advocate groups and special-interest groups are secondary stakeholders (Freeman et al. 2008). To identify the stakeholders better, these groups can be defined in a more detailed way, similarly to dividing the category of employees in terms of which sector they work in (Friedman & Miles 2006). Primary stakeholders are vital to the growth and survival of a business, while secondary stakeholders are groups affecting the primary ones (Freeman et al. 2008).

Stakeholders can also be divided into internal and external. An internal stakeholder works, owns, or has shares in a particular company and likely wishes that the company will succeed (Cambridge Dictionary 2020a). An external stakeholder is affected by a company's success or failure but is outside that company (Cambridge Dictionary 2020b).

1.5 Delimitations

The study is limited to research the use of patent information in communication only from the company's perspective. The companies that will be asked to participate in this study are from different fields and represent several industries, but they are limited to large Finnish companies.

Even though this thesis examines both internal and external marketing communication, it is conducted from a company perspective and data is not collected from external stakeholders such as investors or customers. Instead, the company representatives' opinions on both subjects, internal and external, are collected. The signaling value conveyed by patent communication will be therefore based on the participant companies' perceptions only. The results also show how satisfied companies are with internal communication, but this study does not explain how external stakeholders perceive patent communication.

1.6 Research methodology and data collection plan

This thesis is a descriptive study aiming to provide a comprehensive view on patent communication in companies. A questionnaire, a tool often associated with descriptive research (Saunders et al. 2016), will be used to collect the data. The questions address previously researched patent themes such as stakeholders, signals, and motives, and link them to patent communication. Using a questionnaire, i.e. the survey strategy, quantitative can be collected and often descriptive statistics are used to analyze it (Saunders et al. 2016). As only one data collection method is utilized, this is a mono-method study.

The survey will be sent to large Finnish companies that have patenting activities. The self-completed questionnaire will be filled online using a computer or a mobile phone. The firms invited to participate represent different sectors, as the aim is not to describe a specific industry but to obtain a broader picture of the state of patent communication and marketing. As the topic has not been researched, a descriptive analysis outlines the phenomenon and helps to understand its role in businesses with intellectual property rights. This study takes a comparative approach in the sense that the participating firms' answers will be compared to one another. In addition, responses are examined by comparing the roles of respondents.

1.7 Structure of thesis

The thesis consists of five main chapters which are 1. introduction, 2. literature review, 3. research design and methods, 4. findings and 5. discussion and conclusions. The introduction includes the background of the study and the preliminary literature review. Subsequently, based on the latter the research gap is identified. The introduction chapter also presents the theoretical framework, key definitions, delimitations and research methodology.

After introducing the study, the literature review focuses on identifying stakeholders of patent information communication and the signaling value of patents in the first two subchapters. The third and final subchapter of the literature review concentrates on motives to communicate about patents. The third chapter on research design and methods introduces the research context, data collection methods, data analysis methods, and discusses the reliability and validity of the study. The chapter on findings presents the results of this thesis from the collected data. The final chapter on discussion and conclusions features the theoretical contributions, practical implications, and limitations of the study.

2 Literature review

Companies put a lot of effort to create new inventions, draft patent applications, and manage and use the granted patents in the best way. A considerable amount of knowledge, time and money are invested in patents. All this is done because corporate patents have multiple functions benefiting the company. In addition to protection, they can provide additional revenue from appropriation and licensing, improve credibility, have a positive effect on the stock price, facilitate market relationships, increase bargaining power, create an innovative corporate culture, build an image, create strategic networks and create trust between or among companies (Striukova 2007). Ernst et al. (2016) highlight that patents have two functions: protection and information. In this study, the focus is on that information function, which Ernst et al. (2016, p. 679) define as "the use of disclosed information in published patent documents". As patents can be very beneficial, information about patents should be communicated actively to both internal and external stakeholders so that their importance becomes clear.

Patent information can have many uses, such as the utilization of its strategic information regarding competitors, technological trends or licensing opportunities, using technological knowledge for example in product development or relying on legal information in tasks concerning patent infringements (Ernst et al. 2016). Patent information can be about a singular patent, or about a whole patent family. A patent family refers to a group of patent publications originating from the same invention and they are filed by the same applicant in one or more countries (Simmons 2009). Patent family data can be used to prevent double-counting, neutralize home advantage, forecast applications, analyze the internationalization of technology and estimate patent value (Martínez 2010). As mentioned earlier, patents can also signal value to stakeholders.

Varey (2002) defines marketing communication as a firm's management process enabling and facilitating dialogue along with consumers and other stakeholders. Thus, communicating patents or dialogue about patents can be counted as marketing communication. Varey (2002) states that marketing communication has two components: *the offer* which means providing competent information about the business and the products to chosen customer groups, and *the inquiry* referring to learning from other's interest and values and relating it to the interests of the people working the in the business. The customer group does not necessarily mean buying

customers, and a company has both internal and external stakeholders. The offer in this context is the patent information, and the inquiry includes learning about others' opinions and interests in relation to patents. The potential signaling function of patents would impact those opinions and interests. Kotler and Keller (2015) describe marketing communication similarly as means to inform, persuade and remind consumers about their offerings in a direct or indirect way. Their definition also includes communication with other stakeholders and establishing dialogues. The motivation behind extensive communication to a wide range of stakeholders can be ethical, strategic or economic (Crane & Livesey 2003).

Kotler and Keller (2015) list brand equity contribution, increase of sales and shareholder value creation as objectives of marketing communication. Active internal communications, in turn, influence an organization's knowledge, employee attitudes, and other intangible resources, and for this reason, organizations that are aware of the influences promote active internal communication to contribute to the success (Mazzei 2010). Varey (2002) describes internal marketing communication as an approach that recognizes that internal customers have to be served well in order to serve the ultimate external customer well. Strategic communicative actions should be identified according to groups of employees and managers having different professional attitudes and personal motivations (Mazzei 2014).

As an act of marketing communication, patent communication should be acknowledged as a noteworthy and significant part of the firm's operations. Fluid and interactive marketing communication is a tool to learn and renew knowledge within a firm as well as between the firm and its external stakeholders (Ballantyne & Varey 2006). Knowledge can be divided into tacit or explicit, explicit knowledge usually having the character of a public good, and it is coded in writing or symbols. The opposite, tacit knowledge, is only acquired by and stored within individuals even though patents are an exception as they are explicit yet intangible (Osterloh & Frey 2000).

This literature review combines the earlier patent research on signaling value of patents and patent motives and adds a new communication perspective used in the literature on knowledge signaling. The following subchapter discusses patents and patent information from the perspective of stakeholders. After that, prior studies about the signaling value of patents are observed. Finally, motives regarding patents are reviewed. Due to the lack of marketing

perspective in the patent literature, all the topics are reviewed at a more general level rather than from a marketing communication point of view.

2.1 Stakeholders for patent information

Stakeholders can be defined as groups and individuals who can affect, or are affected by, the achievement of an organization's mission (Freeman 2010, p. 52). Patent-wise, stakeholders can be seen as entities on which the invention has or will have either a positive or negative effect so as to show usefulness (Bonaccorsi et al. 2017 cited in Chiarello et al. 2018). Brem and Viardot (2015) argue that the integration of marketing strategy and innovations strategy — that patents are a part of — deserves more research as well as the marketing of innovation by acknowledging all the stakeholders. Brem and Viardot (2015) highlight that most of the research is made from the customer perspective even though both internal and external stakeholders should be taken into account broadly because the more diverse and more positive participants are involved in the processes of marketing innovation, the higher are the probability of success.

Firms have multiple stakeholders, yet everyone's needs cannot be met as their demands, needs and goals vary. Podnar and Jancic (2006) believe that therefore an efficient firm identifies the most significant groups of stakeholders, gives less attention to more irrelevant groups, and may save resources by focusing only on the essential ones. Monitoring stakeholders' actions and communicating with them are essential in order to have a successful relationship according to the researchers. They divide levels of exchange and communication into three levels: inevitable, necessary and desirous. These levels have varying relevance. The inevitable level usually includes employees, shareholders, suppliers, regulation, competitors and customers. Podnar and Jancic explain that the inevitable group is the most crucial to succeed since they have the most powerful relationship with the company. Many bystanders may be affected in some way by patents, but this chapter concentrates on identifying the most relevant stakeholders for patent information communication.

In companies having patenting activity, the employees who look for patent information themselves include often patent attorneys, members of the patent department, inventors, general managers, heads or members of R&D departments and legal department's members or managers (WIPO 2020b). One of the key tasks to use patent information for is managing the patent portfolio (Ashton & Sen 1988), which likely concerns managers. In general, especially

senior management is believed to benefit from patent information, but patent information's continuous and systematic use benefits various parties in a company in many ways (Ernst 2003). Inventors create innovations that lead to patents, and patent attorneys and the rest of the patent department are involved in that. Inventors often represent R&D, and the department has roles in the patenting process too. Patent laws need to be followed, and regulations impact patenting, which means that the legal department is involved in patenting activities. In addition to these common patent information users, several others could make good use of patent information, internal and external. Ernst (2003) discusses patent information from the strategic management viewpoint, and some other studies have touched on the topic as well. Leaning on those studies, various patent information communication stakeholders are discussed. While these studies do not examine patent information from a communication point of view, this study will draw on these stakeholders to examine whether the same stakeholders are important from a communication perspective.

Patent information affects many internal stakeholders. Agostini, Nosella and Teshome (2019) believe that it is useful to measure cross-functional patent management and the involvement of R&D, production, marketing and sales, top management, legal and finance departments in patenting activities, and measuring the involvement is one way to gauge patent management. Ernst et al. (2016) researched contributions of patent information management to technology management. Clearly, management is considered important regarding patent information. R&D investment decisions and competitor monitoring, which is part of R&D investments, are in a category of internal creation. Internal creation is one of the four categories for contributions of patent information management, created by Ernst et al. (2016). Ernst (2003) suggests that competitor monitoring can reveal patent activity, technology share, co-operation intensity, technological and economic quality of competitors' patent applications and technological strength of a firm, among other aspects via patent information. Technology assessment is a part of the internal creation category too (Ernst et al. 2016). Technology management can, according to Ernst et al. (2016), use patent information in the identification of patent infringers and patent activity limiting the effectiveness of the firm's patent position. The identifications of infringements and limiting activity form the second category called internal use (Ernst et al. 2016). The two remaining categories are external. The external creation category includes identification and assessment of sources for external technology creation (e.g., mergers and acquisitions (M&A), alliances). Analyzing patent data can help achieve the goals set for M&A transactions (Ernst 2003). Patent information can also be used in tasks related to new venture

evaluation (Ashton & Sen 1988). The fourth category in the study by Ernst et al. (2016) is use-related contributions, and identification and assessment of external technology users are part of that.

In addition to management, other people working with technology are affected by patents. The employees who work with technology's operational and strategical tasks should be aware of the patents and patenting activities, as they can be utilized, for example, in selling a patent or R&D alliances (Ernst 2003). Because a patent can protect a product's strategic position (Grimaldi et al. 2015), employees responsible for product development should be also interested in patents and have access to relevant patent information concerning products. Patents provide information about technologies that a firm possess and can be seen as results of technological investments like R&D activities (Ko et al. 2020).

R&D department and its activities are tied together with the intellectual property department, and, according to Ernst (2017), the important relationship of these departments has been notified by many researchers. Patent information can be used to identify *key inventors* among the members of R&D. Key inventors' inventions lead to high-quality patents in an active manner. Human resources (HR) management can make better recruitment decisions for R&D teams by identifying those inventors. The HR department can also create new effect teams by bringing together their company's key inventors. (Ernst 2003.) Management can use patent data to make decisions on the R&D budget (Ernst 2003) and manage R&D in general (Ashton & Sen 1988).

Marketers are patent information stakeholders as they can use patent information to impress potential customers, investors or partners of a technology's unique qualities (Daizadeh et al. 2002; Grimaldi et al. 2015). A patent can have importance in terms of corporate image (Grimaldi et al. 2015). Thus, marketers and other operators trying to affect corporate image should care about patent information.

External stakeholders of the firm are believed to benefit from patent information, too, and they can use patent information to assess a firm's technological competence (Ernst 2003). The importance of patents to investors in the light of funding received has been a topic in many articles, and they are also discussed in the next subchapter. In addition to investors, a patent can attract partners and customers (Grimaldi et al. 2015). Businesses may use a patent as a tool

for identifying potential R&D partners because a patent can reveal the desired knowledge that the potential partner possesses (Angue et al. 2014). Patent databases can be used for the exploration of new business opportunities and to understand competitors' strategies (Lee & Lee 2017). Patents can improve the corporate image toward stakeholders and that is a patenting motive for firms, especially to attract interest from customers and investors (Holgersson & Granstrand 2017). Patents can also create trust between companies (Striukova 2007). Therefore, a company's employees who interact with investors, customers, or partners (or with potential investors, customers and partners) should have access to relevant patent information so that they can pass on relevant patent information to those parties.

Identifying useful stakeholders is not the only function to use patent information. Besides, the patent information must be in a suitable form. Patents describe new technology and they involve technical and juridical jargon that can be challenging to understand and therefore difficult to grasp when seeking to take advantage of patents (Chiarello et al. 2018). Patent information used in the company should overcome that obstacle. The target audience must be familiar with the way the complex patent information is presented (Ernst 2003). A summary of relevant patenting indicators in reports like annual reports benefit external stakeholders (Ernst 2003). If an invention is presented in a way that extracts its users, it gives a wider and more valuable representation of the invention described in the patent, and for example, marketers could benefit from that in their work (Chiarello et al. 2018). In intellectual property marketing, clear communication of the value for the customers is a key element (Harrer & Lackner 2014).

Patent teams, the legal department, management, researchers, production development, marketers, and human resource are internal stakeholders of patent information. All these parties can improve a company's operations by using information about patents. Externally, partners, investors and customers are important stakeholders. They should be taken into account in external marketing such as investor relations and other forms of communication.

2.2 Signaling theory

As mentioned in the preliminary literature review, the signaling theory describes a situation where a sender and a receiver have information asymmetry and access to different pieces of information (Connelly et al. 2011). In the economics literature, the concept of signaling was introduced by Michael Spence (1973), who argued that in the job market, applicants can send signals to the potential future employer with their education. After that the signaling theory has

received a lot of attention and has been researched for example from the viewpoints of brand managers using advertising and branding as signals to convey information to consumers (Chung & Kalnins 2001), firms signaling with alliance announcements to investors (Park & Mezias 2005), boards of directors sending a message to organizational stakeholders with their degree of diversity in firms (Miller & Triana 2009) and sellers who signal to buyers by using reservation prices (Srivastava 2001). To signal something, the process requires a sender who needs to choose if they communicate certain information and how they communicate it to the receiver and the receiver who has the choice of how to interpret the signaled information (Connelly et al. 2011).

2.2.1 Patents as signals

Although the original function of a patent is to define innovation rights, at the same time a patent can be a signal and act as a messenger by giving information about other attributes, i.e. a part of patents' value may lay in their informational mechanisms (Long 2002). As mentioned in the previous subchapter, numerous internal and external stakeholders could benefit from using patent information in their work. Yet it is not necessarily the technological, legal, and strategic information available in patents that interest people. Instead, just the existence of a patent can send a message. Multiple studies have researched patents' signaling effect. However, there are no studies about whether patent information in marketing communication can signal attributes a firm has. Therefore, general findings of patent signals are presented in this subchapter.

A quality signal is a piece of information capable of altering an observer's probability distribution of unobserved variables (Hsu & Ziedonis 2013). Patents may be signals of firm quality (Hoenen et al. 2014) or they can be signals of the quality of a more specific aspect, such as technology (Mann 2005). The signaling effect that patents have is correlated to the portfolio size and the characteristics of the inventions (Caviggioli et al. 2020). The higher quality the patent is perceived to have, the more valuable signal the patent is (Atal & Bar 2014). If the signals are believable and the patents are of good quality, they can signal various matters, especially in new firms and in start-ups. The more informative the signal, the more the information asymmetry is reduced (de Rassenfosse 2011). The significance of patents' signaling function may differ depending on the situations. It is particularly important in situations where no alternative means of conveying quality exists (Hsu & Ziedonis 2013).

Patents can be signals of a firm as a “true” or “false” innovator (Comino & Graziano 2015). They show that a firm has the skills to transform research investments into valuable knowledge (Levitas & McFadyen 2009). Patents can also send a signal of the underlying technology, or they can be a tool for marketing by showing their technology is valuable (Mann 2005). Similarly, new technological opportunities can be signaled by patents (Yoon 2011). These fresh or unusual signals can be detected by exploiting the semantic structural dissimilarity of patents. Further technological development can be revealed by fresh or unusual signals too (Yoon 2011.)

Patents do not only signal the quality of the firm or value of a firm’s technology but can also signal the quality of management, as they show that the company has the ability to obtain patents (Cockburn & MacGarvie 2009). A patent can send a signal that a firm has a better understanding of what is special about their products than competitors without patents (Mann 2005).

It has been found that patents and their signaling value are beneficial regarding financing (Hoenen et al. 2014). The signaling function of patents, especially of patent applications, makes a firm attractive for venture capitalists (Hoenen et al. 2018). Particularly start-ups use patents to convey information about the value of their inventions, along with using patents to attract new investors (Conti et al. 2013). Patent applications are positively associated with future growth and survival in new firms (Hall 2019). A firm with patent applications will more likely receive funds than a firm without applications (Cockburn & MacGarvie 2009). Often applications matter more in received funding than actual granted patents (Cockburn & MacGarvie 2009; Hoenen et al. 2014). External capital providers’ faith in the firm’s abilities may increase when patents act as explicit signals and add understanding between the parties (Levitas & McFadyen 2009).

However, signals are not entirely unambiguous. Over time, patenting offices have been found to lower their standards which has led to an increasing number of bad patents (Comino & Graziano 2015). The general decreased level of patent quality harms all patent holders and their patent value because bad patents decrease average patent quality (Atal & Bar 2014). Therefore, it has been demanded that patent offices take responsibility and pay attention to the quality of the patents they examine so that it can be assured that patent quality is high and patents can act

as credible signals (de Rassenfosse 2011). This is related to the concept of signal believability. In addition to just seeing the signal, the receiver will judge it, which can be based on the way the signal is represented (Mavlanova, Benbunan-Fich & Lang 2016). If a sender can make a receiver associate the signal with high quality and believe the message is true, the signal is effective and does not require verification from other sources (Mavlanova, Benbunan-Fich & Lang 2016).

In sum, corporate patents can signal an ability to obtain patents (Cockburn & MacGarvie 2009) or send a message if an organization is a real innovator or not (Comino & Graziano 2015). Company possessing patents may be a signal of valuable inventions (Conti et al. 2013) and patent applications are a possible indicator of growth and survival to those parties who explore a company's patent activities (Hall 2019). Furthermore, patents do not only indicate that the inventions are of high quality but they can also reveal the firm quality (Hoenen et al. 2014; Long 2002). Patents can signal information that would be hard to obtain in other ways (Long 2002) and tell about the valuable or underlying technology a firm has (Mann 2005). In addition to present technological capabilities, patents can signal about new technological opportunities (Yoon 2011). A summary of possible alternatives that a patent can signal is presented in Table 2. Patents as signals have been mostly viewed from the perspective of start-ups as signalers and external stakeholders, mainly venture capitalists or investors, as receivers. Prior research has proved that patents affect received funding, but other possible actions caused by patent signals have received less attention.

Table 2. What can a patent signal?

What can a patent signal?	
Author(s)	**Trait(s) signaled**
Cockburn & MacGarvie 2009	Ability to obtain patents
Comino & Graziano 2015	If a firm is a "true" or "false" innovator
Conti et al. 2013; Veer & Jell 2012	Value on invention
Hall 2019	Growth and survival
Hoenen et al. 2014; Long 2002	Firm quality
Hsu & Ziedonis 2013	Quality

Long 2002	Information about patents and firms; Low future discount rates; If a firm is innovative or boring
Mann 2005	Valuable technology; Underlying technology; Good understanding of products
Yoon 2011	New technological opportunities

Patents and patent applications signal value, and so do patent citations. Citations as determinants of value were discussed above in the preliminary literature review. Trajtenberg (1990) found that patent citations may be indicative of the value of innovations. The logic behind patent citation signaling value is that the patent refers to a new product. Over time, the product is further developed, which generates so-called down-the-line patents. These new patents refine and improve the original innovation. The original patent affects the new patents, so it also is cited in the new patents, and the increasing number of citations indicates that the original innovation has value. (Trajtenberg 1990)

Patent information may refer to patent documents like a description of the invention or claims describing technical information, or other types of information of patents like media releases or product literature (EPO 2020; Alberts et al. 2017). Patents, patent applications and patent citations can have a signaling function, so the question is if patent information in communications similarly can signal something.

2.2.2 Signaling by communication

The goal of signaling is reducing information asymmetry (Connelly et al. 2011), and filing patent applications and obtaining patents is a means for reducing it, at least in start-ups or small firms (Hoenen et al. 2014; Hsu and Ziedonis 2013) and signaling can be a motive to patent (Veer and Jell 2012). Motives are discussed in more detail in chapter 2.3. Patent literature has been focusing on patent signaling by researching only patents or patent applications and concentrating on financing whereas patent communication has got no attention. Contrary to patent studies, Haas and Hansen (2007) and Ndofor and Levitas (2016) approached the signaling function from the communication viewpoint. Haas & Hansen (2007) have researched signaling knowledge via communication. According to them, an important aspect of task

performance is communicating strengths or unique abilities, by which a firm can signal competence. Communication can be done through work and interaction. Ndofor and Levitas (2016) believe that the strategic value of knowledge can be signaled. Depending on the firm-level and environmental uncertainty, the firm should signal the knowledge by telling about their intentions, strategic endowments, or strategic flexibility.

Haas and Hansen's (2007) showed in their study about knowledge in general that communicating other knowledge strengths and abilities can signal competence. If communicating knowledge can signal value, perhaps communicating patents can have a signaling function, too. Patents are in earlier studies found to signal multiple traits, as described in Table 2. In these prior studies, the receivers have a more active role. The sender is the party who files a patent application or gets the granted patent. The prior studies (see e.g. Hoenen et al. 2014; Hsu & Ziedonis 2013) assume that the venture capitalists or other parties interested in patents search for patent data themselves as they look for new firms or start-ups in which to potentially invest, or the information is gradually revealed as the investors learn about the target. In contrast, the study on signaling the strategic value of knowledge by Ndofor and Levitas (2016) and knowledge competence research by Haas and Hansen (2007) present the signaler in a more active role. In that sense, this thesis has adopted the latter view highlighting the sender's role as the focus changes on what happens if patent information is communicated by the sender. Since communicating other knowledge is studied to have a signaling effect, it supports the proposition that patent communication can signal something, too.

2.3 Motives

Subchapter 2.1 discussed stakeholders for patent information and showed how numerous stakeholders could use or benefit from patent information. Subchapter 2.2 discussed patents as signals. They can convey a message about for example quality, capabilities, or a firm's future. These matters are important in an organization as they can affect the way internal and external stakeholders view the organization. The signaling value of patents can also lead to concrete actions, such as gaining financing. One could assume that since patents themselves act as signals, patent information might have a similar signaling value. Given that there are many stakeholders involved in patent information communication, its potential signaling value could have a broad influence on a firm. To gain a more comprehensive view of the use of patent information, it is important to know what the motives are to communicate about patents, which is the focus of this subchapter.

One of the few studies surrounding the topic of motives to communicate knowledge assets is a survey by Martín-Sempere, Garzón-Garcia and Rey-Rocha (2008), who observed motivations of scientists to communicate science or technology to the public. Their survey revealed that the most important motivations were related to increasing the public's interest in science, the public's scientific culture, and public awareness of science. A sense of duty affected senior researchers' communication, whereas personal satisfaction was an important motivation for younger scientists. Given that motives to communicate patent information have not been studied, this subchapter approaches motivation with a special focus on what the motives to file patent applications and obtain patents are.

As mentioned in the preliminary literature review, Holgersson and Granstrand (2017) have identified five categories of motives of firms to patent: protection, bargaining, improving corporate image, attracting external financing, and internal reasons. The motives and the attributes under each motive are presented in Table 3. Motives for patenting are related to characteristics, such as the number of citations and oppositions, of corporate patent portfolios (Blind, Cremers & Mueller 2009). The five categories will be discussed in detail next.

Table 3. Patenting motives by Holgersson and Granstrand (2017)

Protection	Bargaining	Improving the corporate image toward	Attracting external financing in a form of	Internal reasons
Protecting product technology	Giving better possibilities of selling licenses	Employees/new recruits	Bank loans and similar from non-governmental institutions without governmental guarantees	Providing motivation for employees to invent
Protecting process technology	Giving better possibilities of accessing technology through cross-licensing	Customers	Private equity/venture capital	Providing a measure of R&D productivity

Creating retaliatory power against competitors	Facilitating R&D collaboration with others	Suppliers	Governmental loans and grants and other loans with governmental guarantees	
Blocking competitors from certain technology areas	Giving a better bargaining position in standard-setting	Investors	Governmental equity/venture capital	
Securing freedom to operate		Other collaborators		
		Local government(s)		

In their study, Holgersson and Granstrand (2017) explored patent motives to link patents with technology strategies. Their research concentrated on why patents are obtained, whereas this study aims to explore motives to communicate patents. Four of the categories cover external or mainly external topics, while only the last one concentrates solely on internal motives. Using the categories of Holgersson and Granstrand (2017), this study examines if the same motives apply to communication. Blind et al. (2006) identified similar motives to patent, and Veer and Jell (2012) studied reasons to file a patent application. Their studies are also discussed in this chapter.

Protectionism

The first category of motives to file patent applications and obtain patents is protection. Contrary to the latter categories, this is something this study accounts for a motive not to communicate patents. In the study by Holgersson and Granstrand (2017), protection motives include protection of product and process technologies, creation of retaliatory power, blocking competitors from certain technology areas, and securing the freedom to operate. Blind et al. (2006) identified protection as one category of motivation and blocking competitors as another. However, Holgersson and Granstrand (2017) grouped the blockade category with protection motives in their research. This study uses the grouping of Holgersson and Granstrand (2017), where blocking motivation is not its own category. Holgersson and Granstrand (2017) state

that large companies find the protection, more specifically protection of product technology and securing the freedom to operate, as the most important reason to patent.

Veer and Jell (2012) identified five motives to file a patent application and investigated differences in motives among individual inventors, small companies, mid-sized companies, large companies, and universities. Their method of categorization is different from Holgersson and Granstrand (2017) and Blind et al. (2006) because three out of five categories by Veer and Jell (2012) fall under the category protection by Holgersson and Granstrand (2017). The three categories are preventing imitation, freedom to operate, and blocking competitors. Slightly over half of the large companies taking part in Veer and Jell's (2012) study rated these three motives important. 66 percent of big companies rated prevent imitation as an important motive, 54 percent considered freedom to operate significant, and 56 percent rated blocking competitors important.

If a firm uses a patent for protection, the firm's will to communicate patents to a wide audience, at least to external stakeholders, can be slender. The reason for a firm to keep quiet about patents can be not wanting to reveal too much about their intellectual capital in fear of losing competitive advantage or wanting to prevent competitors from exploiting their knowledge (Ernst 2003). It is worth exploring if the protection motive affects patent communication. Patents have several positive features that respond to different needs that a firm has. Yet some firms may be hesitant to patent at all, because of the requirement to fully disclose the invention which can release valuable information to outsiders of the firm (Arundel 2001). According to a study by Arundel (2001), R&D-performing firms find secrecy to be a more effective means of appropriation than patents.

Bargaining

The second category of motives, bargaining, consists of increasing licensing and cross-licensing possibilities, facilitating R&D collaborations, and improving bargaining position in Holgersson and Granstrand's (2017) research. Blind et al. (2006) have a similar category called an exchange motive, which includes improvement of position in cooperation and capital market access and exchanging potential. Holgersson and Granstrand (2017) count exchange motives as a part of bargaining. Veer and Jell (2012) identified licensing as a motive to patent, too, even though in their study only the minority of big companies (13%) rated it important.

Bargaining is a potential motive for patent communication too if a firm wishes to convey a message about patents in hopes of, e.g., licensing or collaborations possibilities.

Improving the corporate image

Firms may use patents to improve the corporate image among employees, customers, suppliers, investors, other collaborators or local governments, according to Holgersson and Granstrand (2017). The motive of improving the corporate image is similar to what Blind et al. (2006) call the reputation motive. It is described as improving the technological image or increasing company value. Managing the company image is one of the objectives of marketing, and several factors are impacting it, including communication (Barich & Kotler 1991). Communicating patent information to stakeholders could therefore have an effect on the image stakeholders have concerning the firm's capabilities and assets. In fact, patent communication is a combination of two factors impacting company image, because, in addition to communication, company business conduct also affects the image, and one attribute of the conduct factors is the innovation of a business (Barich & Kotler 1991).

Attracting external financing

The fourth motive by Holgersson and Granstrand (2017) is attracting external financing from alternative sources: bank loans, private equity/venture capital, governmental loans and grants or governmental equity/venture capital. As discussed above, the signaling function of patents does affect the funding that firms receive. The studies on patents as signals have been concentrating on small companies or start-ups. Holgersson and Granstrand (2017) observed that small and medium-size enterprises rate external financing-related motives significantly more important than large firms. Patents do not seem to be associated with the finances of large companies in the same way as those of smaller firms. However, that does not mean that the aspect of attracting external financing should be excluded in patent communication, either. Communication to external stakeholders may have motives related to attracting external financing.

Internal reasons

The final motive category by Holgersson and Granstrand (2017) is internal reasons. It has two attributes: providing motivation for employees to invent and providing a measure of R&D productivity. Blind et al. (2018) propose that there is an incentive motive to patent, consisting of motivation of staff and internal performance indicators. Communicating patents internally

may have similar motives behind it if firms utilize patent information in conveying motivating messages.

Signaling

Holgersson and Granstrand (2017) listed five motives to patent: protection, bargaining, improving the corporate image, attracting external financing and internal reasons. They were partly coherent with motives by Blind et al. (2018) (protection, blocking, reputation, exchange and incentive) and with motives by Veer and Jell (2012) (preventing imitation, freedom to operate, licensing, blocking competitors). Table 4presents a summary of the motives of the three articles. It lists the patenting motives classified by each study in the order created by the authors of each study, and it demonstrates differences and similarities in the authors' ways of classifying patenting motives are. As Table 4 reveals, there was one motive, signaling, that emerged in the research by Veer and Jell (2012) only. Other studies on patent motivations have ignored the signaling function. Having the signaling motive for filing a patent application means that the firm wishes to convince investors of its value once the patent is obtained (Veer and Jell 2012).

Table 4. Motives to patent

Authors	**Motives**				
Holgersson and Granstrand, 2017	Protection	Bargaining	Improving the corporate image	Attracting external financing	Internal reasons
Blind et al. 2018	Protection	Blocking	Reputation	Exchange	Incentive
Veer and Jell 2012	Preventing imitation	Signaling	Freedom to operate	Licensing	Blocking competitors

Long (2002) puts forward the idea of ambiguity of signaling as a motivation. She points out that the behavior of a firm is the outcome of multiple variables, and a patentee might obtain patents for reasons that have nothing to do with signaling. Long (2002) points out that even if a firm has obtained a high number of patents which may signal high quality, it does not

necessarily mean obtaining patents is a signaling strategy. A firm can obtain them for other reasons. Nevertheless, patents can signal something even if a firm does not deliberately use them as signals (Long 2002). Prior studies on patents signaling function have not always recognized the motivation aspect. For example, Hoenen et al. (2014) studied the signaling function of patents in start-ups by examining the number of granted patents and submitted patent applications of a firm, then comparing them with received funding between early rounds of venture capital financing. They argue that patents have signaling value, yet they do not pay attention to considerations if the start-ups strategically file patent applications or obtain patents for the sake of signaling function or if signaling is one of the possibly many patenting motives they possess.

Veer and Jell (2012) surveyed patent motives by using a questionnaire in which patent applicants responded. The questionnaire gathered information about intentions concerning future patenting activities. They observed that only a minority of large companies (13 %) hold signaling as an important reason to file a patent application. However, filing patent applications and communicating about patents may be driven by different motives. Therefore, one cannot draw a conclusion on the relevance of the signaling effect in communication in large companies based on Veer and Jell's (2012) study.

3 Research design and methods

This descriptive and quantitative study aims to observe and measure the nature of corporate patent communications. It is examining large Finnish companies with patenting activities, their communication about patents, concentrating on stakeholders, signaling, motives, and satisfaction. Next, the research context will be presented in detail. It is followed by data collection methods and data analysis methods. The last subchapter discusses the reliability and validity of this study.

3.1 Case description

This study is conducted to gain a description of how corporates communicate patents. To examine patent communication of corporations holistically, different themes, including stakeholders, motives and signaling, i.e., topics covered earlier in this thesis needed to be considered. A questionnaire was created, and several companies were contacted. A sampling frame that could be used in this case does not exist; therefore, a non-probability sampling technique, more specifically self-selection sampling, was used. The questionnaire was sent to companies, and they were asked to participate and distribute the questionnaire to suitable participants.

The companies that were asked to participate were chosen based on meeting certain criteria. They were Finnish companies, and only large companies were considered. The European Commission (2020, p. 10) defines large companies to have more than 250 employees and their annual turnover is more than EUR 50 million and/or their total balance sheet is more than EUR 43 million. Finnish Patent and Registration Office's statistics, as well as a patent family database called PatBase Express, were used to search for companies that have multiple patent families and recent patenting activities. This led to sending the questionnaire to eleven companies that are all Finnish, their size is large, and they have multiple patent families and recent patent activity, i.e., they have filed patent applications or patents have been granted to them. The fields of the companies varied, as the purpose was not to study a specific field but to get an overall picture of the patent communications of companies representing different fields. The questionnaire was sent to different firms with a request to be distributed to people within those firms who are not members of patent teams, but who otherwise interact with patents, patents team or they could, because of their position, have tasks related to patents.

Six companies out of the eleven responded to the request to participate. Next, the respondents are presented at a company level. They will be called companies A, B, C, D, E and F. 96 individual responses were collected. Table 5 shows how the number of responses is distributed among the firms. In chapter 4.1, the respondents are presented in more detail, and their background information, such as roles and frequency of their patent-related work tasks are reviewed.

Table 5. Number of responses

Firm	Number of responses
A	10
B	8
C	12
D	30
E	21
F	15
= 96 responses in total	

Using Global Industry Classification Standard developed by MSCI and S&P Dow Jones Indices, industries can be divided into eleven sectors (MSCI 2021). Two of the companies can be seen as a part of the same sector, i.e, materials. According to the standard, the sector includes industries like chemicals, construction materials, containers and packaging, and paper and forest products. Company A and D belong to this group. Industrials is another sector. Global Industry Classification Standard classifies capital goods, commercial and professional services and transportation as subparts of the industrials sector. Firm C, E, and F operate in this sector. The sixth participant, firm B, operates in the utilities sector. The utilities sector includes industries like gas utilities, multi-utilities and electric utilities.

The number of patents families the firms possess varies. According to the patent family database PatBase Express, firm B has a considerably lower number of patents families than the others. Firm C has the second-lowest number of patents families. Firm A, D and F's number of active patent families are close to each other whereas firm E's number of patent families is the highest of the six companies. The situation changes if the numbers of patent families are compared to turnover. In Table 6, firms are ranked based on how many patent families they have per turnover. Turnovers from 2019 have been used to calculate the ranking order. In addition, the table shows the sectors they represent.

Table 6. The surveyed firms, their sectors and the number of patent families per turnover

Firm	Sector	Ranking from the highest to the lowest based on patent families per turnover
Firm A	Materials	3rd
Firm B	Utilities	6th
Firm C	Industrials	2nd
Firm D	Materials	5th
Firm E	Industrials	1st
Firm F	Industrials	4th

3.2 Data collection methods

The data was collected using an online questionnaire. For this study, a self-completed internet questionnaire was chosen (see Saunders et al. 2016) because it is a convenient way to reach respondents who are in different companies in different locations. Attitudes variables and opinions variables record how respondents think about something and are used in descriptive research (Saunders et al. 2016). Apart from the background questions, the respondents were asked to always choose an option or options that represent their personal opinion.

The survey strategy is a popular business research and allows easy comparison (Saunders et al. 2016). Using a survey is justifiable in this study too, as other studies about patents have often utilized the strategy. The three studies that were the focus of Chapter 2.3 on patent motives used the survey to collect data. Holgersson and Granstrand (2017) sent a survey to chief technology officers in different-sized firms in Sweden to study which motives for patenting they find important. In their study, they used descriptive statistics to show the importance of different motives between different-sized enterprises. Blind et al. (2016) sent a questionnaire to all German enterprises that had at least three patents. Veer and Jell (2012) collected their data from a survey and conducted a comparative study to determine whether the motives for patenting in large firms differ from those in small firms, universities and inventors.

The questionnaire of this study included questions of various themes. Identifying important stakeholders of patent information is a significant task, and therefore the participants were asked which groups they perceive as important. Their options to choose were based on earlier

identified internal and external groups in literature, which were discussed in chapter 2.1. Second, signaling and motives were addressed. In the questionnaire, it was asked if the participants believe patent communication signal the same traits patents are studied to signal in general in prior studies. The studies were presented in chapter 2.2. They were also asked about motives to communicate about patents. The aim was to find out if signaling is a motive at all and if previously researched motives to obtain patents (see chapter 2.3) are the same ones that act as motives to communicate about patents. Questions about the topics from both internal and external communication perspectives can reveal differences in signaling function or motives depending on the parties involved in the activity. In addition to the above themes, questions related to how corporates perceive their current patent communication were asked. Moreover, the participants were asked about their views on patent communication in the future. Both perspectives, internal and external, are carried through the whole questionnaire. The full questionnaire can be found in Appendix A. In addition, a table in Appendix B presents which research topic each survey question relates to.

3.3 Data analysis methods

Six companies participated in this study and 96 individual responses were collected. The collected data was partly in ordinal scale as some variables were measured using 5-point Likert-type scale (from strongly disagree (1) to strongly agree (5)) and partly in nominal scale since some questions were multiple choice. Closed questions were used as they are the most suitable for online questionnaires (Saunders et al. 2016). However, in some questions, the respondents had the opportunity to add their own answers if the given options did not suit them.

Different software applications were used to handle data. Qualtrics was used to create the questionnaire and collect the data. Each company was given their own links to their own identical questionnaires. The data from each company was merged using Excel and further processed in Stata. The settings of the questionnaire were adjusted so that the respondents were made to answer every question. This was done to prevent a respondent from accidentally missing or skipping a question which would result in missing data. Nonetheless, the respondents were always given an option “not applicable” in case they would feel that they cannot answer a question.

Descriptive statistics were used to describe the findings. As the questions relating to stakeholders, signals and motives are mainly nominal, the analysis will focus on the answers

occurring most frequently, the distribution of the answers and what differences and similarities are found in the responses at the firm and role level. Satisfaction-related questions were mainly in ordinal scale which allows to calculate central tendency including median and mean. Descriptive statistics are supported by graphs and tables because they help to explore, present and describe the data (Saunders et al. 2016). Because the aim is to describe companies' patent communication and not to seek explanations for variables' relationships, causal relationships between variables are not studied.

3.4 Reliability and validity

A reliable study can be replicated and is conducted consistently, and the validity of research is ensured by using appropriate measures, accurate analysis and generalizations that are tenable (Saunders et al. 2016). This study could be replicated by using the same questionnaire. Nevertheless, the participant firms are self-selected, which according to Saunders et al. (2016) can lead to the low possibility of replication. Threats to reliability include participant error and participant bias (Saunders et al. 2016). The questionnaire was an internet questionnaire enabling the respondents to answer it whenever and wherever convenient to them, which is likely to reduce the risk of error and bias. In addition, closed questions leave little room for other threats such as research error and research bias. Open answers can lead to misinterpretation more easily.

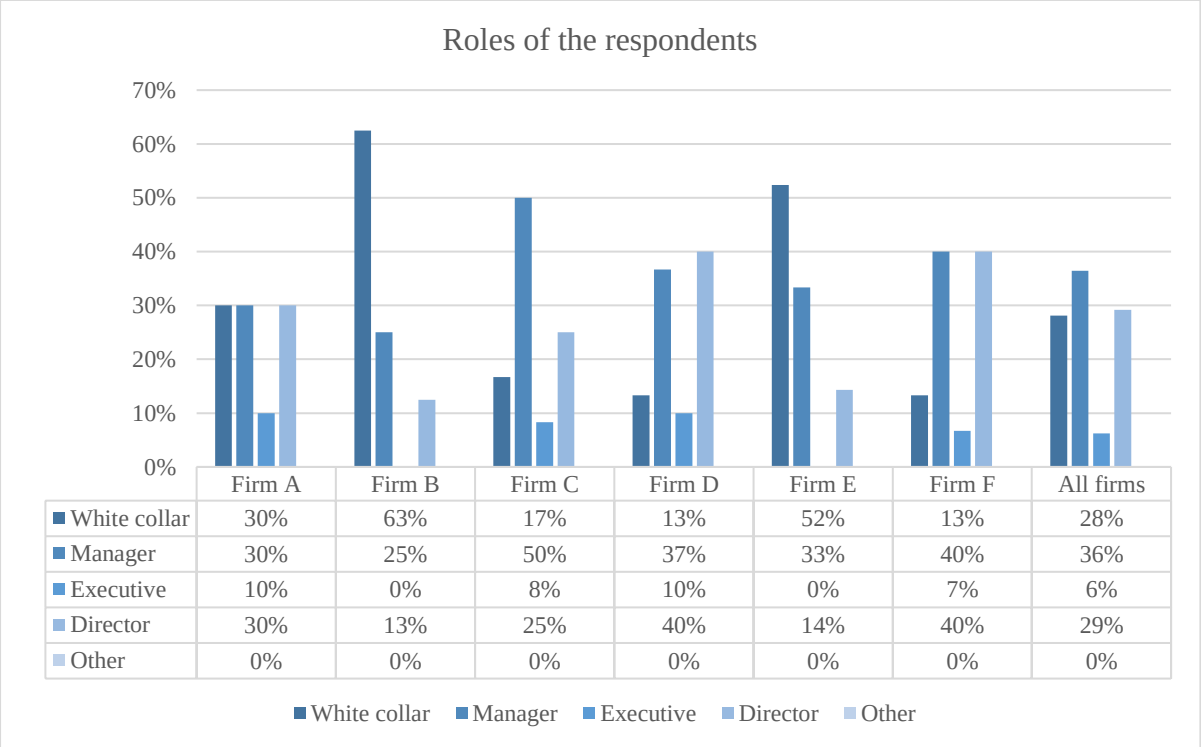
The novelty of the topic led to questions that have not been asked in previous research. To ensure the questions are understandable and serve the purpose of examining patent communication in a versatile manner, the questions were evaluated and adjusted together with the commissioner company. Another factor to ensure content validity in addition to a prior discussion (Saunders et al. 2016) was to base the answer options in multiple-choice questions about stakeholders, signals, and motives to previously reviewed literature. Closed questions ensure that the answers are easy to decode in the way the respondent intended. However, it is possible that the respondent does not decode the questions as was intended since the respondents were answering the questionnaire online by themselves. The questionnaire also involved statements to which the respondents answer by using a 5-point Likert scale. Generalizations based on analysis were done cautiously because in some variables the numbers of respondents were small.

4 Findings

Out of eleven companies, six participated and distributed the questionnaire within their companies. 96 individual responses were collected. This chapter presents the findings. The descriptive statistics show how the firm responded in general and compares the results at a company level giving an overview of the data and the distributions of the variables. The results are also examined at the individual level, focusing on the influence of the respondent's role on responses.

4.1 Background

In Figure 2, the respondents' distribution is visualized based on the firm that they represent and their role. 10 responses were collected from firm A, 8 from firm B, 12 from firm C, 30 from firm D, 21 from firm E and 15 from firm F. Out of all 96 respondents, up to 37% worked as managers, 29% were directors, 28% were white collars and 6% operated as executives. 71% have been in the role of inventor in a patent or a patent application, 29% have not (Figure 3).



	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	All firms
White collar	30%	63%	17%	13%	52%	13%	28%
Manager	30%	25%	50%	37%	33%	40%	36%
Executive	10%	0%	8%	10%	0%	7%	6%
Director	30%	13%	25%	40%	14%	40%	29%
Other	0%	0%	0%	0%	0%	0%	0%

Figure 2. Firm and role distribution

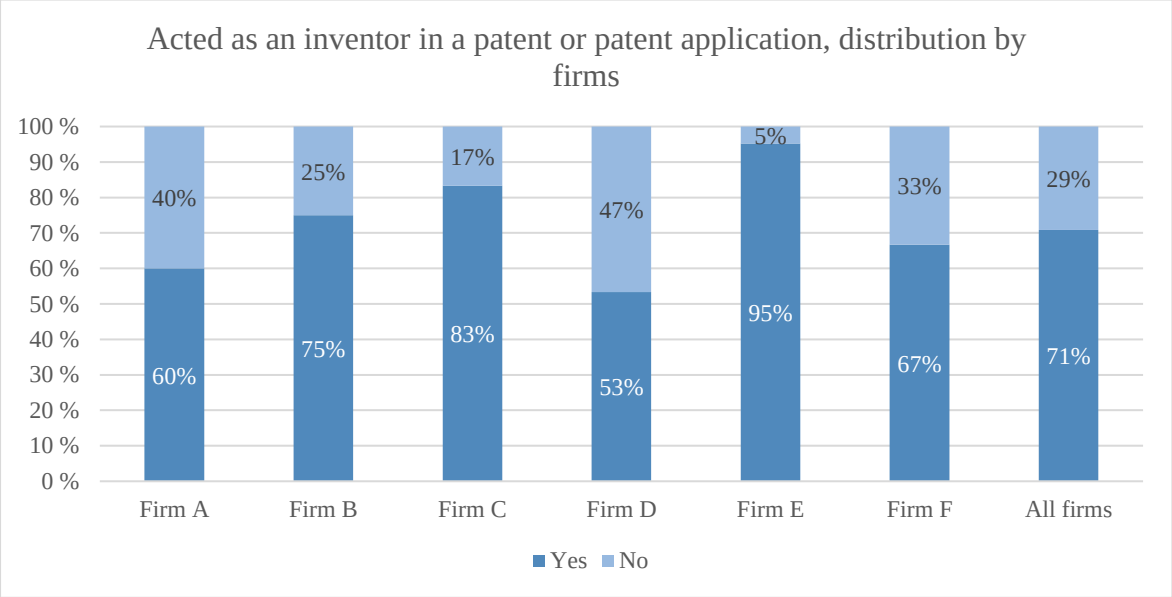


Figure 3. The number of inventors among respondents

When the respondents were asked to assess their understanding of patents and uses of patents, 83% rated their understanding as good or very good. 63% felt their knowledge of their company's patents and patenting activities is at in good or very good level (Figure 4). Figure 5 visualizes how often the respondents have patent-related tasks in their work. A majority (52%) have tasks related to patents monthly. A more detailed description of the background of the respondents in a firm and role level can be found in Appendix C.

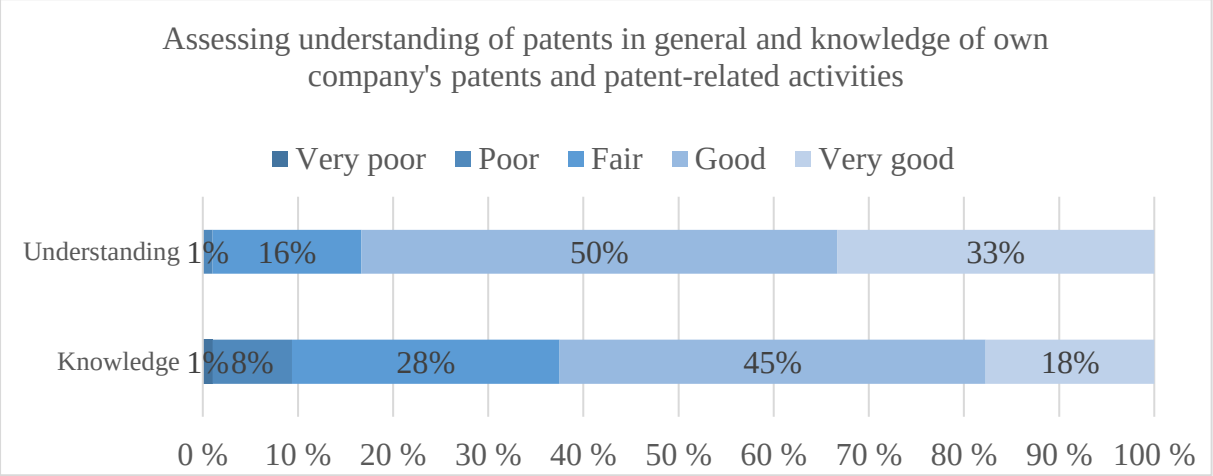


Figure 4. Understanding of patents in general and knowledge of own company's patents and patenting activities

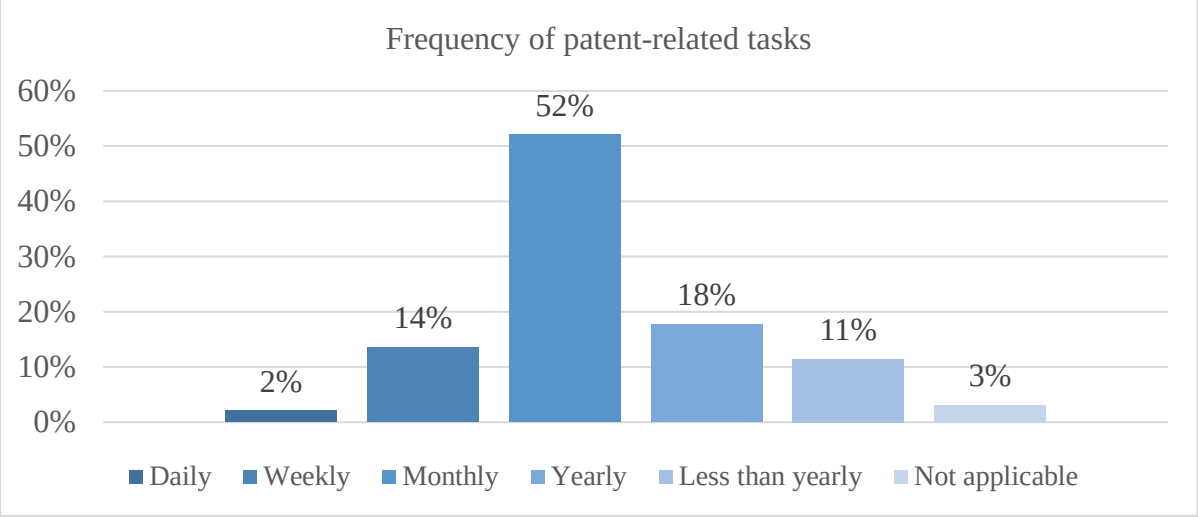


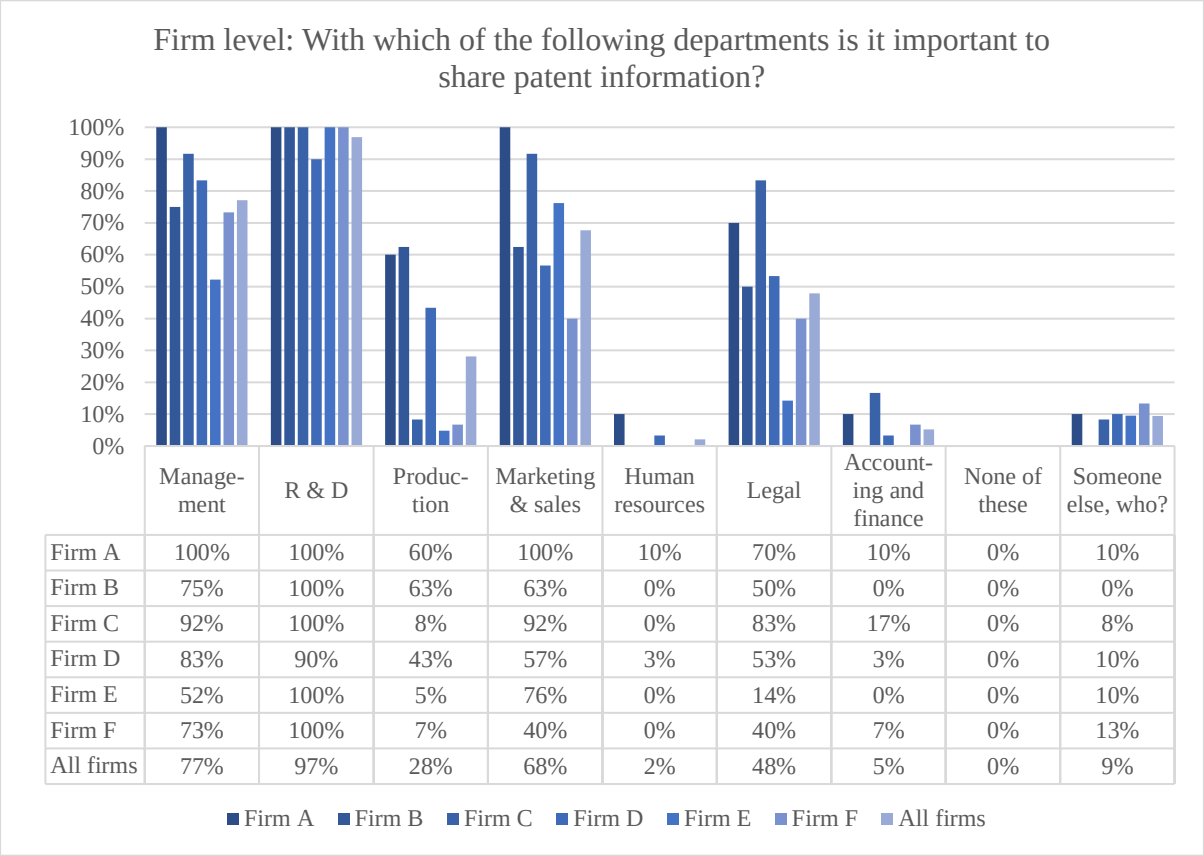
Figure 5. Frequency of patent-related tasks

4.2 Stakeholders

Stakeholders for communication of patent information is examined from two perspectives, internal and external. The first subchapter concentrates on internal stakeholders. The second subchapter focuses on external stakeholders: partners, customers, and investors

4.2.1 Internal stakeholders

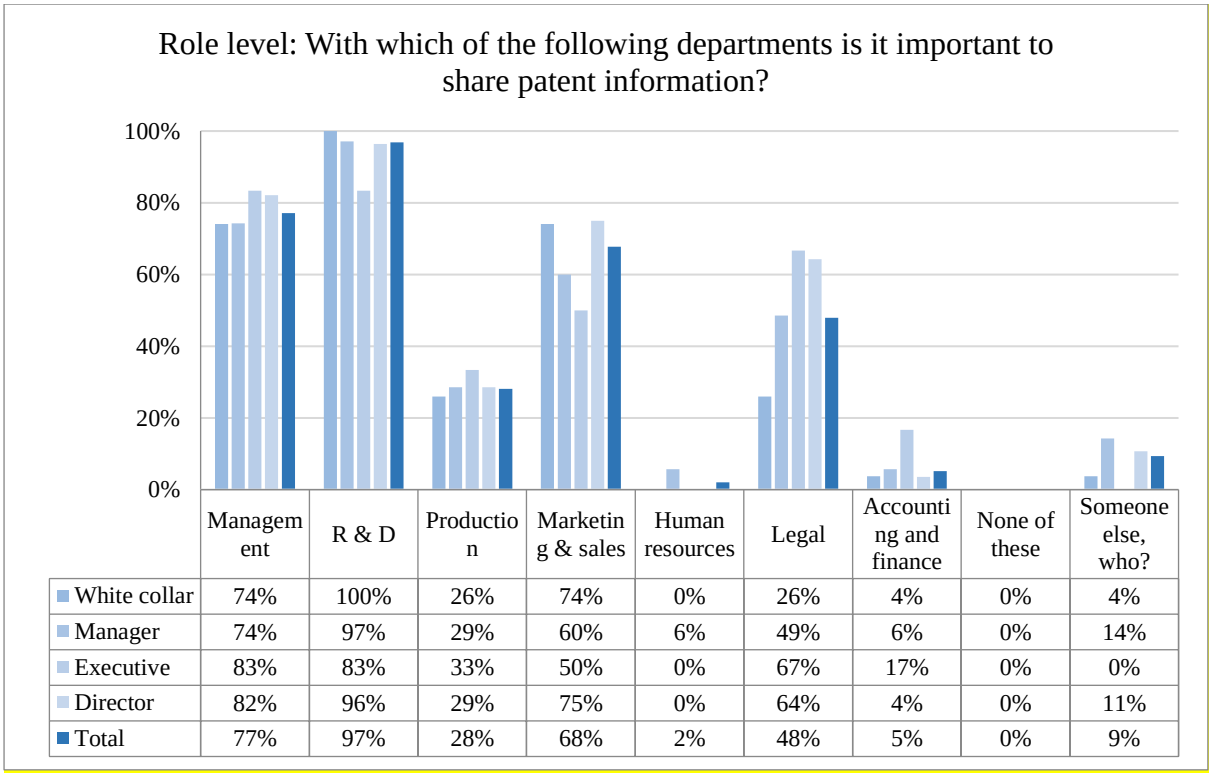
95 respondents answered the question regarding internal stakeholders and these 95 respondents gave 321 answers to this multiple answer question. They were asked to choose the departments they believe are important in patent information sharing in a company. Every respondent believed it is important to share patent information with some departments, and the option "none of these" was selected by no one, as presented in Figure 6. R&D was the most frequently selected answer both at the company level and when looking at responses by role. Management and marketing & sales were also seen as important in most companies and regardless of the role of the respondent. The legal department was seen as important by less than half (48%) of all respondents. The perceived importance of production regarding patent information communication varied between the firms substantially. In total, 28% rated it important. Accounting & finance and human resources were viewed as more irrelevant departments regarding patent information sharing. 5% believed accounting and finance are important and 2% saw human resources as significant. Next, the perceived importance of each department is discussed both at the firm level and role level.



	Manage-ment	R & D	Produc-tion	Marketing & sales	Human resources	Legal	Account-ing and finance	None of these	Someone else, who?
Firm A	100%	100%	60%	100%	10%	70%	10%	0%	10%
Firm B	75%	100%	63%	63%	0%	50%	0%	0%	0%
Firm C	92%	100%	8%	92%	0%	83%	17%	0%	8%
Firm D	83%	90%	43%	57%	3%	53%	3%	0%	10%
Firm E	52%	100%	5%	76%	0%	14%	0%	0%	10%
Firm F	73%	100%	7%	40%	0%	40%	7%	0%	13%
All firms	77%	97%	28%	68%	2%	48%	5%	0%	9%

Figure 6. Important departments to share patent information with, answers by firms

According to the respondents, R&D and management are the most important departments to share patent information with. The respondents were quite unanimous in this as shown in Figure 6. 90% of firm D respondents (?) believed that it is important to share patent information with R&D, while in the other five companies 100% felt R&D is important. In total, 97% rated R&D important. As for the role, 100% of white collars perceived R&D important. In other roles, there were merely some individual respondents who did not consider it notable. Figure 7 presents the answers of different roles.



	Management	R & D	Production	Marketing & sales	Human resources	Legal	Accounting and finance	None of these	Someone else, who?
White collar	74%	100%	26%	74%	0%	26%	4%	0%	4%
Manager	74%	97%	29%	60%	6%	49%	6%	0%	14%
Executive	83%	83%	33%	50%	0%	67%	17%	0%	0%
Director	82%	96%	29%	75%	0%	64%	4%	0%	11%
Total	77%	97%	28%	68%	2%	48%	5%	0%	9%

Figure 7. Important departments to share patent information with, answers by roles

Management was considered important by 77% of participants. In this, firm E stood out as only 52% felt it is important to share patent information with management, whereas 100% of firm A respondents considered management important. It is worth noting that in firm E, 52% of respondents were white collars. The proportion of white-collar respondents in firm E could explain their different stance towards managers' importance regarding patent information sharing. However, in firm B 63% of the respondents were white collars and still, 75% of firm B considered the legal department important. In other firms, the percentage of white collars as respondents varied from 13 to 30. Also, when looking at the results at the role level, the explanation that the role of the respondent influences the opinion regarding management does not seem justifiable. Only slightly more executives (83%) and directors (82%) perceived management important than white collars (74%). The percentages of white collars and managers considering management important were the same (74%).

Of all respondents, 68% felt marketing and sales is an important department to share patent information with. In firm A, 100% of respondents answered that it is important to share patent information with marketing and sales, while in firm F the corresponding percentage was 40. A possible explanation for the different attitudes towards marketing and sales is that the two

companies operate in different sectors, firm A in materials, firm F in industrials. This was not the only place where marketing and sales were mentioned since one respondent of firm D answered in another question that they use patent information for marketing. Another respondent of firm D said they use it for customer communication. Similarly to firm A, firm D also operates in the sector of materials. In terms of role, 75 % of directors and 74% of white collars believed marketing and sales are important in patent information sharing, while the percentages for managers was 60 and for executives 50.

After R&D, management and marketing & sales, the answering option "Legal" got the fourth-highest number of answers. In total, a little less than half of the respondents (48%) considered the legal department important. In Firm C, the percentage was 83% in contrast to Firm E where 14% of respondents regarded legal as important to share patent information with. The differences may derive from the roles of the respondents in the firms. As Figure 2 shows, in firm C most of the respondents work at a higher level, 25% as directors, 8% as executives, and 50% as managers. 17% of the respondents were white collars. In firm E, 14% of the respondents were directors, 33% managers and 52% white collars. This explanation is supported when looking at the results at the role level. The white collars stood out with their low number as 26% of white collars considered the legal department important. 49% of managers, 67% of executives and 64% of directors believed the department is important.

27 answers mentioned that production is an important department to share patent information with, which makes 28% of the respondents. In firm A and firm B around 60% believed it is important to share patent information with production, unlike firms C, E, and F, where only one person in each chose the option (8%, 4%, and 7% respectively). This difference might be explained by the different industries they operate in. All the companies that did not see the production that important, i.e., firms C, E, and F, operate in the industrials sector. The differences were not that significant at the role level. 26% of white collars, 29% of managers, 33% of executives and 29% of directors perceived production as an important department regarding patent information sharing.

The sixth most popular answer option was "someone else, who?" as 9% of respondents wanted to add departments not mentioned in the questionnaire. Firm B was the only firm that had nothing to add. A respondent in firm A suggested that it is important to share patent information with communication, in firm C one person answered the product line. Firm D gave three open answers, everyone suggesting patent information should be shared with sourcing. There were

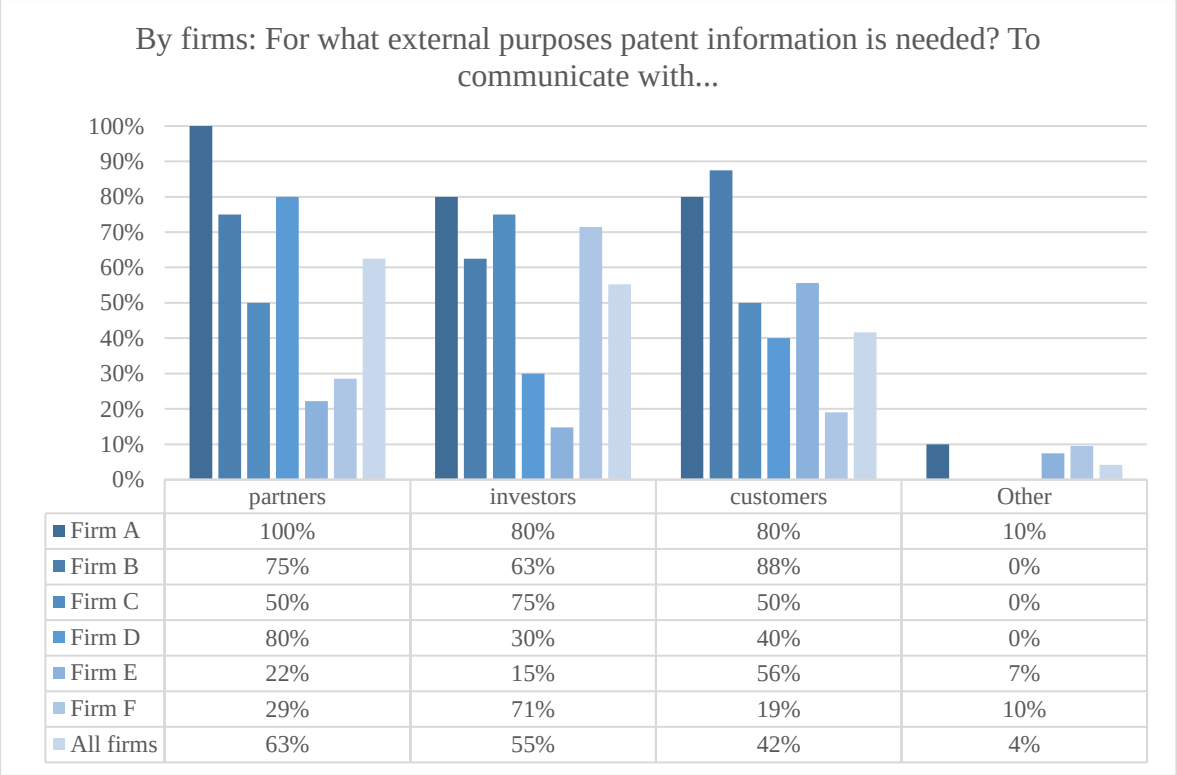
two open answers with firm E, both saying engineering. In firm F one respondent answered supply management, and another mentioned innovation and M&A. Looking from the role viewpoint, no executives wanted to add anything and just one white collar chose the option of someone else. 14% of managers and 11% of directors wanted to add departments not mentioned in the questionnaire.

One of the less important departments was accounting and finance, as in total 5% saw it as an important department regarding patent information. In firms B and E, no one saw it as important, while in firm C, 17% chose the option. For each role, some individual respondents chose the option. Human resources were not classified that significant either, as in total 2% chose that option in the questionnaire. As for roles, it means that 6% of managers considered it important, while no one else did.

4.2.2 External stakeholders

The respondents were asked if they use patent information to communicate with investors, partners, customers, or for some other external use. They were also asked if they agree or disagree that it is important to share patent information with investors, partners, and customers. First, the results are briefly reviewed looking at the responses altogether, then at the firm and role level.

In total, the most popular use of patent information is to communicate about it to partners as 63% of respondents chose that option. Over half of the respondents (55%) use it to communicate with customers. 42% use it to communicate with investors, and 4% had other external uses for patent information. The other uses included communication with policy makers, utilizing it in inventing, and "staking ownership around strategic playfields". 15% of respondents did not choose any of the options indicating that they do not need patent information for external uses. The necessary uses of patent information by different companies and in total are presented in Figure 8.



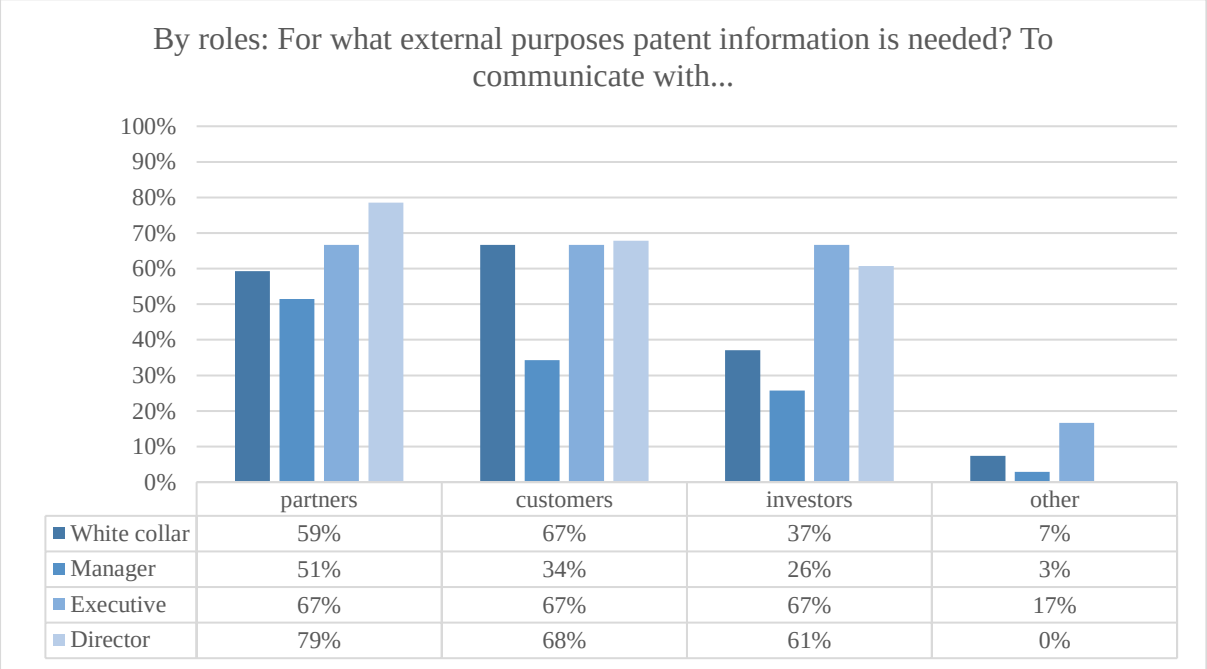
	partners	investors	customers	Other
Firm A	100%	80%	80%	10%
Firm B	75%	63%	88%	0%
Firm C	50%	75%	50%	0%
Firm D	80%	30%	40%	0%
Firm E	22%	15%	56%	7%
Firm F	29%	71%	19%	10%
All firms	63%	55%	42%	4%

Figure 8. External purposes firms need patent information for, answers by firms

As Figure 8 shows, there were large differences in responses between firms. In firm A everyone, and firms B and D a clear majority needs to share patent information with partners while in firm C, half chose the answer. Furthermore, it was a considerably less popular answer in firms E and F, where it was chosen by 22% and 29% of the respondents, respectively. One arresting observation is that the firms that use patent information with partners the most (A and D) operate in the materials sector whereas the firms having lower percentages operate (E and F) in the industrials sector.

The number of responses was not uniform between firms regarding investors, either. Again, firm A had the highest number of respondents choosing the option, 80%. Almost similarly, in firms B, C and F, the majority chose the option. This is dramatically different from firm D where less than a third (30%) uses patent information with investors., even more from firm E, where only 15% use patent information with investors. Although many respondents in firm E did not opt for partners or investors, more than half (52%) said they use patent information with customers. Customers were thus the most important external stakeholder for firm E. Customers were also the most chosen option in firm B. The most frequently chosen option in each firm varied. In firms A and D, partners were the most frequently chosen option, while in firms C and F it was investors.

At the role level, communication with partners was the most popular answer amongst managers (51%) and directors (79%). With executives, every option got an equal number of choices. White collars chose the option customers (67%) the most often. Although investors was the most chosen option within two firms, at the role level it was the least chosen option among white collars, managers and directors, like Figure 9 shows. However, the majority of directors (61%) still said they did use patent information with investors.



	partners	customers	investors	other
White collar	59%	67%	37%	7%
Manager	51%	34%	26%	3%
Executive	67%	67%	67%	17%
Director	79%	68%	61%	0%

Figure 9. External purposes firms need patent information for, answers by roles

The respondents were asked if they agree or disagree that it is important to share patent information with investors, partners, and customers. Communicating patent information to external stakeholders was perceived as important by the vast majority like shown in Figure 10. In total, 46% somewhat agreed and 36% somewhat agreed it is important to communicate about patents to investors (M = 4.1, SD = .8747391), whereas 36% somewhat agreed and 38% strongly it is important to communicate patent information to customers (M = 4.02, SD = .9942501). 45% somewhat agreed and 17% strongly agreed it is important to communicate patent information to partners (M = 3.61, SD = 1.01588), meaning that even though according to this questionnaire's responses the most common use of patent information is to communicate with partners, it is not perceived as significant as communication with investors and customers.

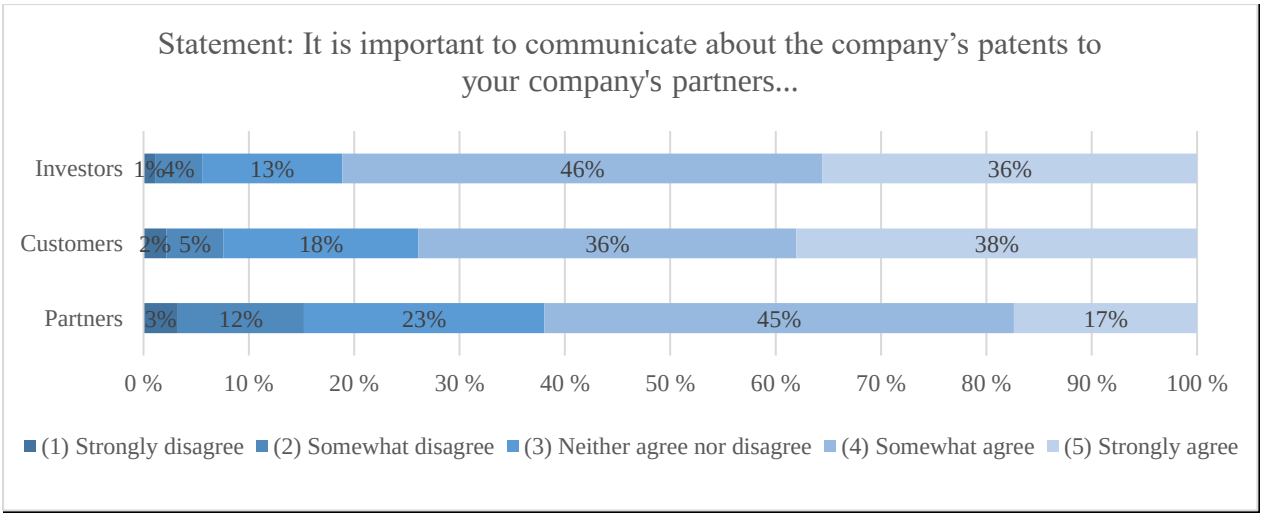


Figure 10. The importance of investors, customers, and partners as receivers of patent information, answers by all the respondents

Looking at the results at the company level, Figure 11 shows that in firm A, 44% somewhat agreed and 55% strongly agreed with the statement that it is important to communicate about the company's patents to their company's partners (M = 4.56, SD = .5270463). In firm D, 29% somewhat agreed and 21% strongly agreed with the statement, while 25% somewhat disagreed and 4% strongly disagreed (M = 3.39, SD = 1.196887). As discussed above (?), communicating with partners was the most frequently chosen option of external use of patent information in firms A (100%) and firm D (80%), shown in Figure 8. In firm B, 75% of respondents use patent information in communicating with partners. In firm B half of the respondents somewhat agreed or strongly agreed with the statement that it is important to communicate about the company's patents to their company's partners and half did not agree nor disagree (M = 3.88, SD = .9910312). With that, the firm stood out from others by responding more often "neither agree nor disagree" than other firms. 50% of firm C's respondents use patent communication to communicate with partners. 33% somewhat agreed and 17% strongly agreed that it is important to communicate about the company's patents to their company's partners. Firm E and F differed from other firms with significantly lower percentages, as 22% of respondents in firm E and 29% of respondents of firm F uses it to communicate with partners. Even though 65% somewhat agreed in firm E and 73% somewhat agreed in firm F with the statement that it is important to communicate about the company's patents to their company's partners (firm E: M = 3.45, SD = .8870412, firm F: M = 3.67, SD = .6172134), it is interesting that no one strongly agreed with the statement in these two firms. The majority of every role group considered partners important, as Figure 12 shows. White collars considered them important

more often than others, even though more executives and directors use patent information to communicate with partners.

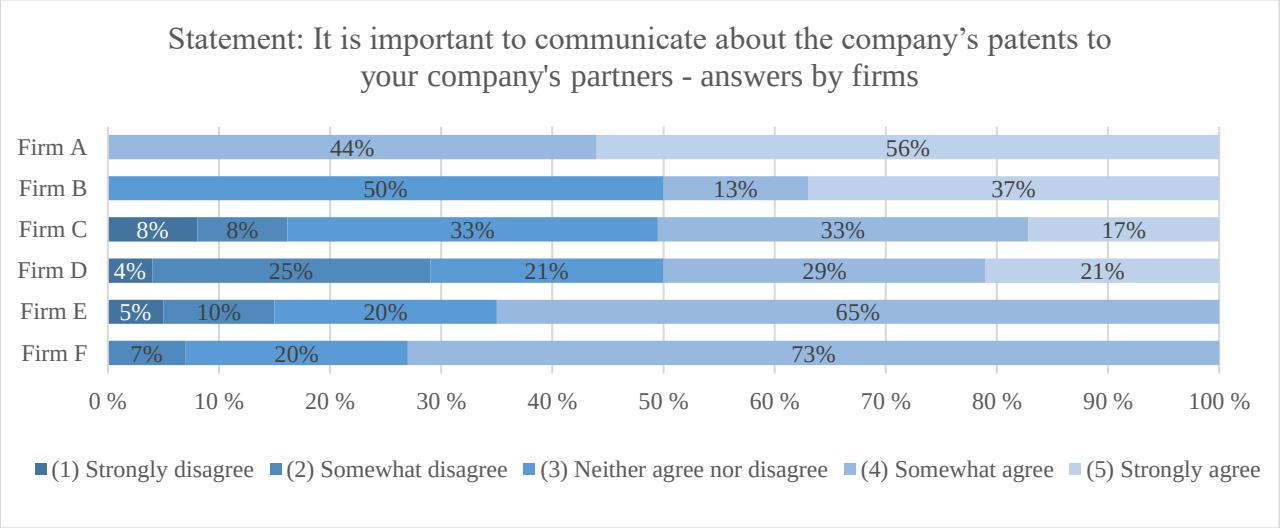


Figure 11. Importance of partners as receivers of patent information, answers by firms

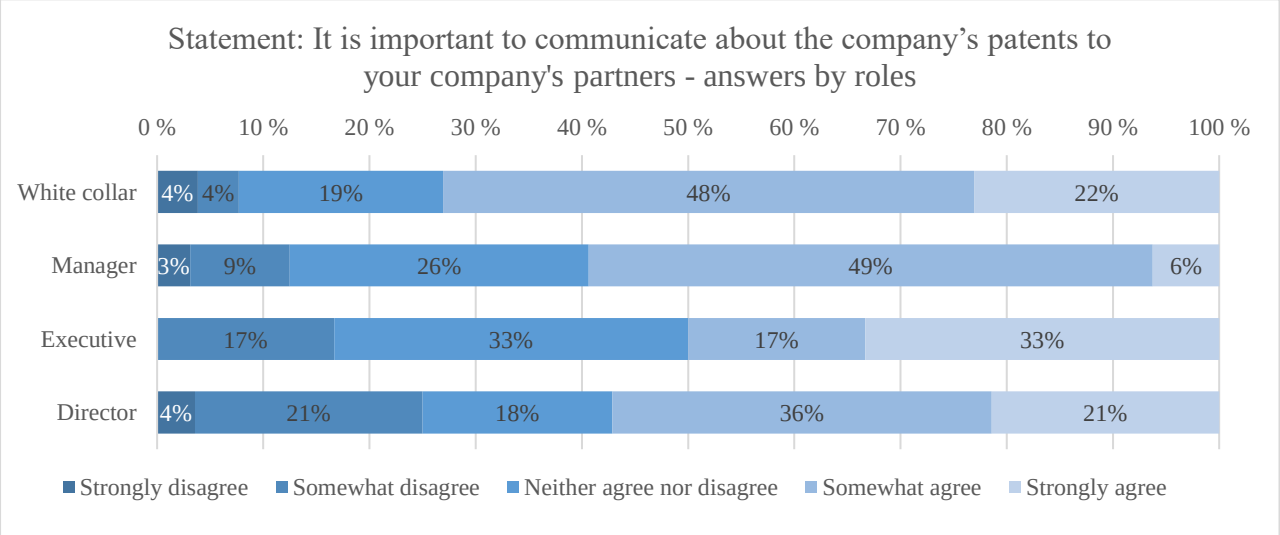


Figure 12. Importance of partners as receivers of patent information, answers by roles

The second external party the respondents were asked about was customers. The majority of all respondents in the firms agreed with the statement that it is important to communicate about the company's patents to the company's customers, as Figure 12 shows in more detail. At the firm level, firm B considered it the more important (M = 4.63, SD = .5175492) than others. 37% somewhat agreed and 63% agreed that it is important to communicate patent information with customers. This is in line with the fact that firm B also uses patent information to communicate with customers more than others. On average, in firm F customers were not seen as important as in other firms (M = 3.47, SD = .7432234). This, too, is in line with previous

information that only 19% use patent information with customers in firm F. Almost half of firm F (47%) chose the option neither agree nor disagree when asked about the importance of customers. See Appendix D for other firms' means and standard deviations. At the role level, customers were seen more important by white collars (M = 4.20, SD = 1.0590271) and managers (M = 4.03, SD = .86077141) than executives (M = 3.83, SD = 1.1690452) and directors (M = 3.89, SD = 1.0659472). 43% somewhat agreed and 29% strongly agreed of managers that is important to communicate patent information to customers. Only approximately a third (34%) of managers use patent information themselves with customers, so customers are perceived as important even if the managers are not dealing with them themselves.

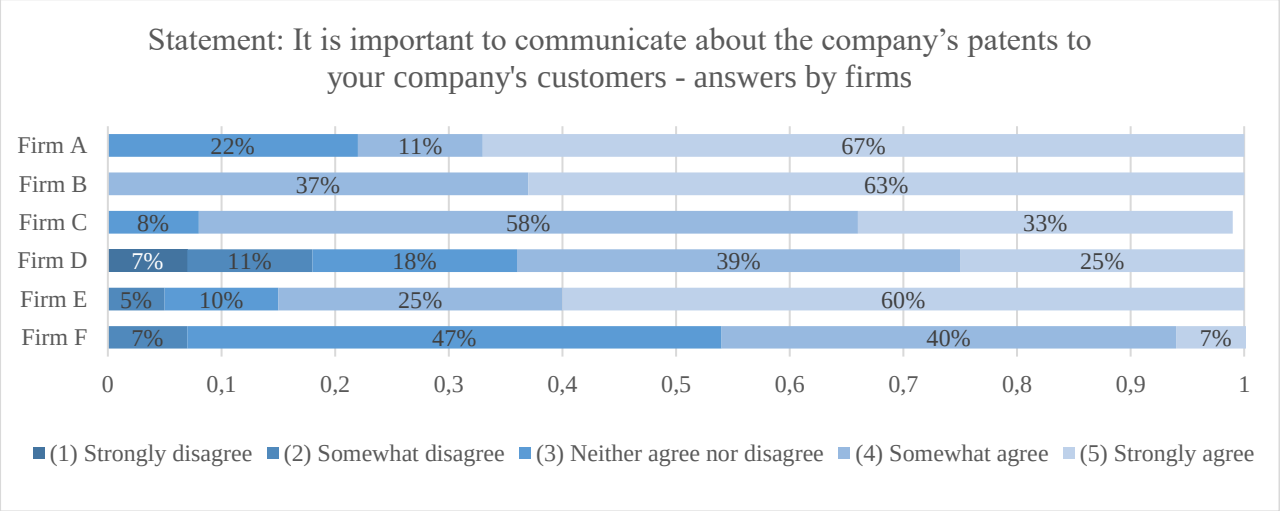


Figure 13. Importance of customers as receivers of patent information, answers by firms

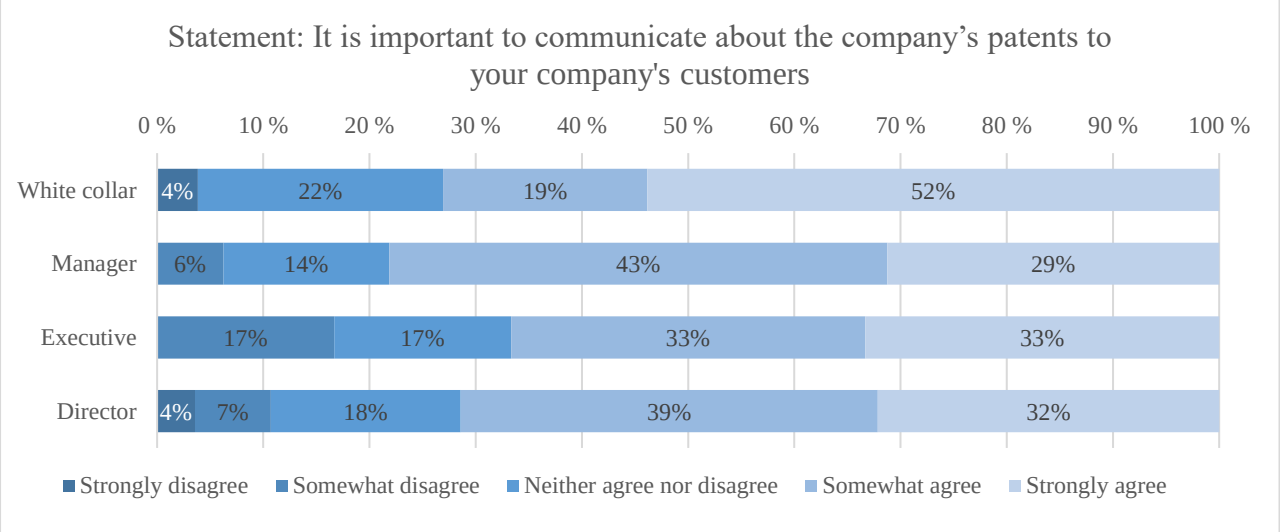


Figure 14. Importance of customers as receivers of patent information, answers by roles

The majority of all firms agreed with the statement it is important to communicate about the company's patents to the company's investors, as Figure 13 shows. On average, firms A (M = 4.67, SD = 0.5), B (M = 4.43, SD = .5345225) and C (M = 4.5, SD = .797724) considered investors more important more often than firms D (M = 3.96, SD = 1.055443), E (M = 3.8, SD = .7988086), and F (M = 3.93, SD = .7988086). However, as Figure 15 displays, in every firm, the majority either somewhat agreed or strongly agreed with the statement that it is important to communicate about the company's patents to investors. At the role level, the majority of white collars, managers and directors and half of the executives somewhat agreed or strongly agreed with the statement, as can be seen from Figure 16. Managers (M = 4.32, SD = .7910793) considered the investors important more often than the other groups.

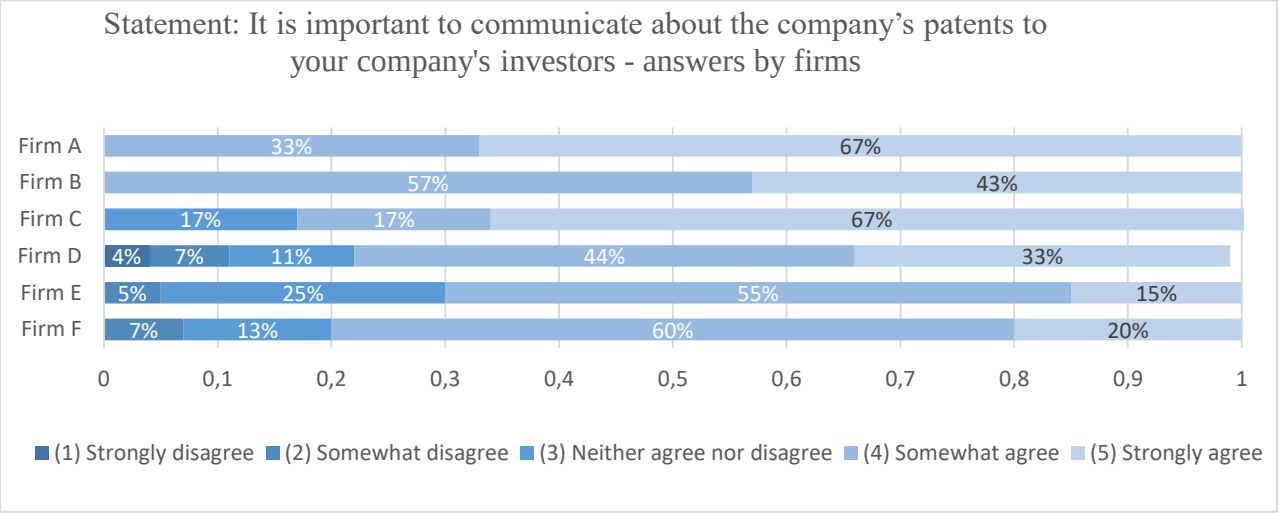


Figure 15. Importance of investors as receivers of patent information, answers by firms

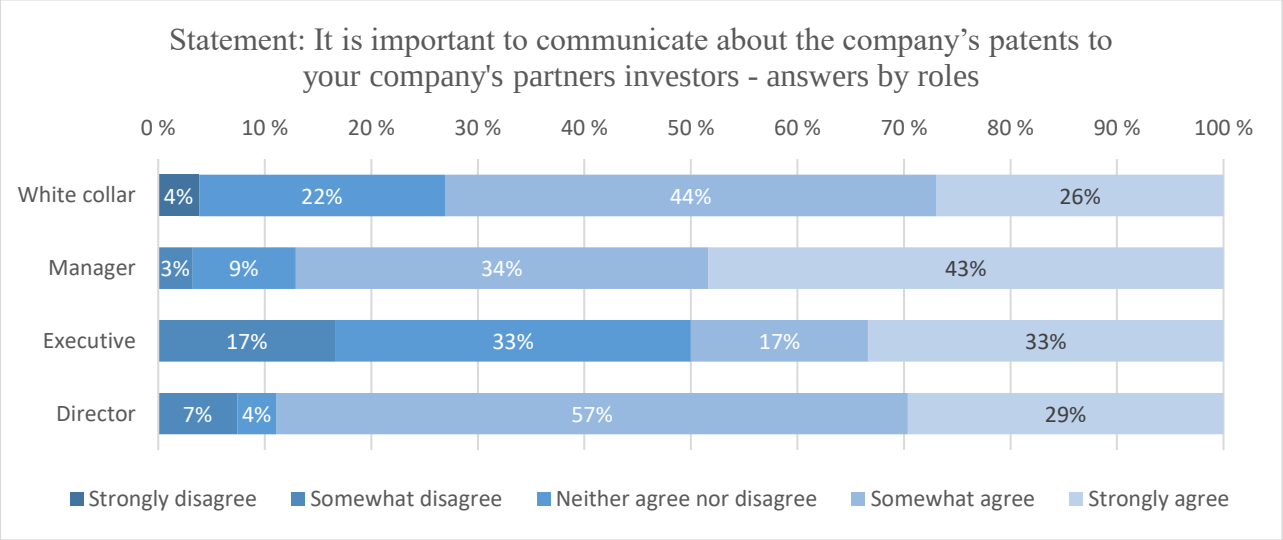


Figure 16. Importance of investors as receivers of patent information, answers by roles

The second research question in this study sought to determine what the stakeholders for communication of patent information are. In conclusion, the participants seem to consider research & development the most important internal stakeholder. Management and marketing & sales are perceived significant too by the majority. Many considered legal and production important, but attitudes toward the importance of the legal department and the production department varied notably between groups of respondents and in total, less than half considered them as significant stakeholders. For external stakeholders, partners, customers, and investors are all considered noteworthy. Investors are perceived as the most important external stakeholder, yet the respondents themselves use patent information more for communicating with partners than for other uses.

4.3 Signals of patent communication

The second theme of the findings is value signaling. The respondents were asked if they believe their company can or wants to communicate the same signals through internal communication and external communication. Next, the findings are presented from the internal viewpoint and after that from the external.

4.3.1 Signals in internal communication

The first focus is on what the respondents find that the companies are capable of signaling in internal communication. As Figure 17 shows, in total 72% of respondents believed that their company is able to signal innovativeness in internal patent communication. A majority also was of the opinion that their company can signal possession of valuable inventions (57%), possession of valuable technology (55%) and having new technological opportunities (54%). There were some dispersions between firms. In firm B, 88% believed the firm can signal to possess valuable inventions and technology, whereas in firm D the percentages were 43% and 33%, respectively. 47% of all respondents believed their firm can signal growth in the future through their internal communication. In firm B 88% believed so, while just 33% of firm D and 33% of firm F agreed with that. Being able to signal the high quality of the firm was selected by 32%. In addition, a respondent wanted to add their own option what their firm can signal through internal communication saying that the firm can signal freedom to operate. No one chose the option that their company can communicate none of the competencies. However,

in every company excluding firm B some respondents chose the option that their company does not communicate about patents internally, a total of 15% answering so.

The respondents were asked what their companies can communicate. Furthermore, they were asked what they believe their companies want to communicate. The results of the questions are also presented in Figure 17. Next, the answers are inspected closer at the firm level as well as through roles.

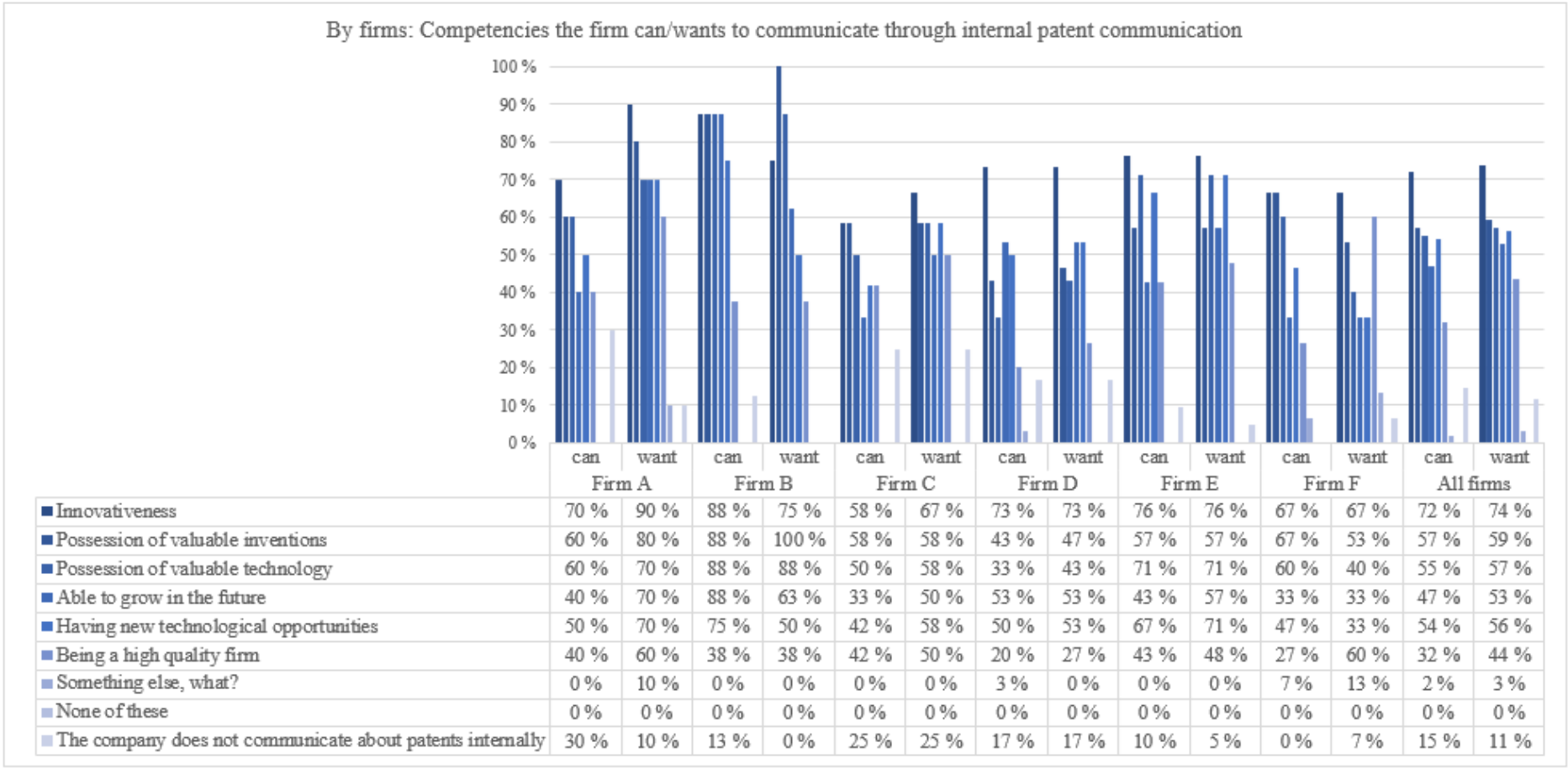
Similarly, about what the companies can signal, 74% believed that their company aims to signal innovativeness in their internal patent communication. In firms A and C, more people believed their companies want to signal innovativeness compared to how many people believed their companies can signal innovativeness. In firm A, 70% chose the option that their company can show innovativeness through internal patent communication, whereas 90% believed they want to signal that. In firm C the percentages were 58% for being able, 67% for wanting. In firm B the situation was the opposite, as 88% thought the company can signal innovativeness, yet 75% believed the company want to signal it. In firms D, E and F the response percentages were the same for both options regarding innovativeness. The vast majority of every participating firm saw innovativeness as a quality that their firm wants to signal. Also, at the role level, the majority of each group chose the innovativeness-response option. Especially white collars and executives believed their firms can signal it. Figure 18 presents the answers by roles.

59% of all respondents chose the option that their company wants to signal that they possess valuable inventions. The distribution of responses in the two different perspectives was similar between firms as in the case of innovativeness. Again, in firm A, more people believed their company wants (80%) to signal possession of valuable innovativeness, compared to respondents who thought their company is able (60%) to signal it. In firm B 100% believed their company wants to signal possession of valuable inventions while 88% thought the company can do so in addition to firm F, where also more people believed their company want (53%) to signal it, compared to being able (67%). In firm D, slightly more people believed their company wants (47%) to signal it, compared to who believed they can (43%) signal the competence. Firm D was the only firm in which the majority did not believe their company wants to signal possession of valuable inventions. In firms C and E, the response percentages were the same for both viewpoints at 58% and 57%, respectively. Looking by roles, the majority of white collars (59%) and directors (75%) believed their companies want to signal

possession of valuable inventions. A slightly smaller number of white collars (56%) and directors (64%) believed they would be able to signal it. Half of the executives thought their companies want to signal it, yet only a third believed they can. Managers were the only group where more people believed they can signal possession of valuable inventions (57%) compared to the ones that believed they want to signal it (49%).

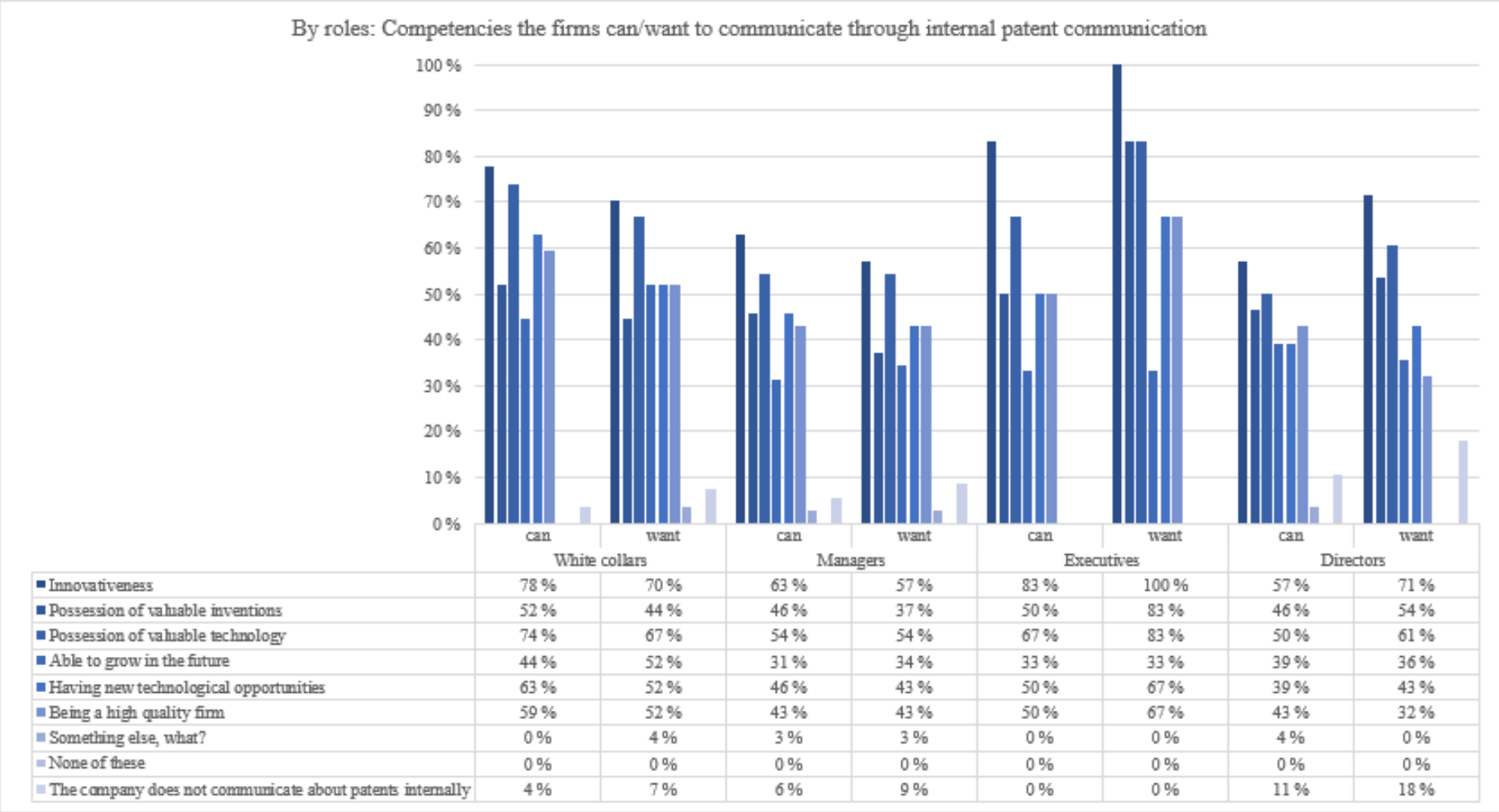
57% believed their firm wants to signal possession of valuable technology. In firms A, C, and D more respondents believed their companies want to signal that competence, compared to the number who believed their company can signal it. The difference was around 10% in all three firms, as in firm A the percentages were 70% and 60%, in firm C 58% and 50% and firm D 43% and 33%. In firms B and E, the same number of respondents believed they can and can signal possession of valuable technology, with 88% and 71%, respectively. Firm F was the only firm where more people believed their company can (60%) signal possess of valuable technology compared to wanting (40%). Shifting from firms to roles, 67% of white collars and 67% of executives believed their company wants to show possession of valuable inventions by communicating about patents. 49% of managers and 57% of directors believed so, indicating that there were no major differences between roles in this response option either. For white collars and executives, fewer people believed their company is able to show possession of valuable inventions since 56% of white collars and 50% of executives believed so. For managers and directors, it was vice versa because more people believed they can communicate it than believed they want to communicate it, as Figure 18 shows.

Wanting to communicate about new technological opportunities was selected by 56% of all the respondents. In firms A, C, D, and E more people believed their company wants to signal it, compared to the number of people who thought their company can signal it. In firms A and C the differences were bigger with A's 70% believing they want to signal it and 50% believing they can and in firm C 58% choosing the option they want to signal it and 42% choosing they can. In firm D the difference between wanting (53%) and being able (50%) was only 3 percentages, and in firm E the difference was 4% as 71% believed they want to signal about new technological opportunities and 67% believed they can signal about that. Like in the case of possessing valuable technology, here too firm F was the only firm where the percentage



	Firm A		Firm B		Firm C		Firm D		Firm E		Firm F		All firms	
	can	want	can	want	can	want	can	want	can	want	can	want	can	want
Innovativeness	70 %	90 %	88 %	75 %	58 %	67 %	73 %	73 %	76 %	76 %	67 %	67 %	72 %	74 %
Possession of valuable inventions	60 %	80 %	88 %	100 %	58 %	58 %	43 %	47 %	57 %	57 %	67 %	53 %	57 %	59 %
Possession of valuable technology	60 %	70 %	88 %	88 %	50 %	58 %	33 %	43 %	71 %	71 %	60 %	40 %	55 %	57 %
Able to grow in the future	40 %	70 %	88 %	63 %	33 %	50 %	53 %	53 %	43 %	57 %	33 %	33 %	47 %	53 %
Having new technological opportunities	50 %	70 %	75 %	50 %	42 %	58 %	50 %	53 %	67 %	71 %	47 %	33 %	54 %	56 %
Being a high quality firm	40 %	60 %	38 %	38 %	42 %	50 %	20 %	27 %	43 %	48 %	27 %	60 %	32 %	44 %
Something else, what?	0 %	10 %	0 %	0 %	0 %	0 %	3 %	0 %	0 %	0 %	7 %	13 %	2 %	3 %
None of these	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
The company does not communicate about patents internally	30 %	10 %	13 %	0 %	25 %	25 %	17 %	17 %	10 %	5 %	0 %	7 %	15 %	11 %

Figure 17. Competencies the firm can/wants to communicate through internal patent communication



	White collars can	White collars want	Managers can	Managers want	Executives can	Executives want	Directors can	Directors want
Innovativeness	78 %	70 %	63 %	57 %	83 %	100 %	57 %	71 %
Possession of valuable inventions	52 %	44 %	46 %	37 %	50 %	83 %	46 %	54 %
Possession of valuable technology	74 %	67 %	54 %	54 %	67 %	83 %	50 %	61 %
Able to grow in the future	44 %	52 %	31 %	34 %	33 %	33 %	39 %	36 %
Having new technological opportunities	63 %	52 %	46 %	43 %	50 %	67 %	39 %	43 %
Being a high quality firm	59 %	52 %	43 %	43 %	50 %	67 %	43 %	32 %
Something else, what?	0 %	4 %	3 %	3 %	0 %	0 %	4 %	0 %
None of these	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
The company does not communicate about patents internally	4 %	7 %	6 %	9 %	0 %	0 %	11 %	18 %

Figure 18. Competencies the respondents believe their firms can/want to communicate through internal patent communication

regarding being able to signal new technological opportunities (47%) was higher than the part of respondents who chose their company wants (33%) to signal it. Also, the majority of white collars (63%), managers (51%), executives (67%) and directors (54%) thought their companies want to signal that they have new technological opportunities.

As Figure 17 shows, over half of the respondents (53%) believed their company wants to show that they are able to grow in the future by communicating about patents internally. It is slightly higher than the number of respondents that believes their company can signal that as it was 47%. In firm, A 70% believed their company wants to signal it, while in firm F the percentage was 33. There were some notable differences in the number of answers that believed their company can signal it and the numbers of answers that believed their company wants to signal it, except for firms D and F. Especially firm A and B stand out. In firm A, 40% believed their company can communicate about being able to grow in the future, while 70% believed their company wants to communicate about it. In firm B it was the other way round because 88% believed their can company can communicate about it, yet 63% thought their company wants to communicate about it. Able to grow in the future was a little more popular option amongst white collars (59%) and directors (61%) than amongst managers (43%) and executives (50%), as Figure 18 displays. However, this was the case only in the question was they believe their companies want to signal. When asked what their companies can signal, directors were the only group where the majority (57%) chose the option.

One of the lasts answer options was being a high-quality firm, and in total, 44% of all respondents believed their company wants to communicate that through their internal patent communication. As Figure 17 shows, there was again some dispersion between the firms. In firms A and F, 60% of respondents chose the option. In firm D 27% chose the option. Comparing this to the answers to the question of what their companies can signal, it can be seen that there were fewer people who believed their company can signal it than people who thought their company wants to signal it. While the majority of firm A (60%) and F (60%) respondents believed their company wants to communicate they are a high-quality firm, 40% of firm A and 27% of firm F believed they are able to communicate it. At the role level, fairly more white collars (56%) and executives (67%) believed their companies want to communicate about their high quality compared to managers (37%) and directors (36%).

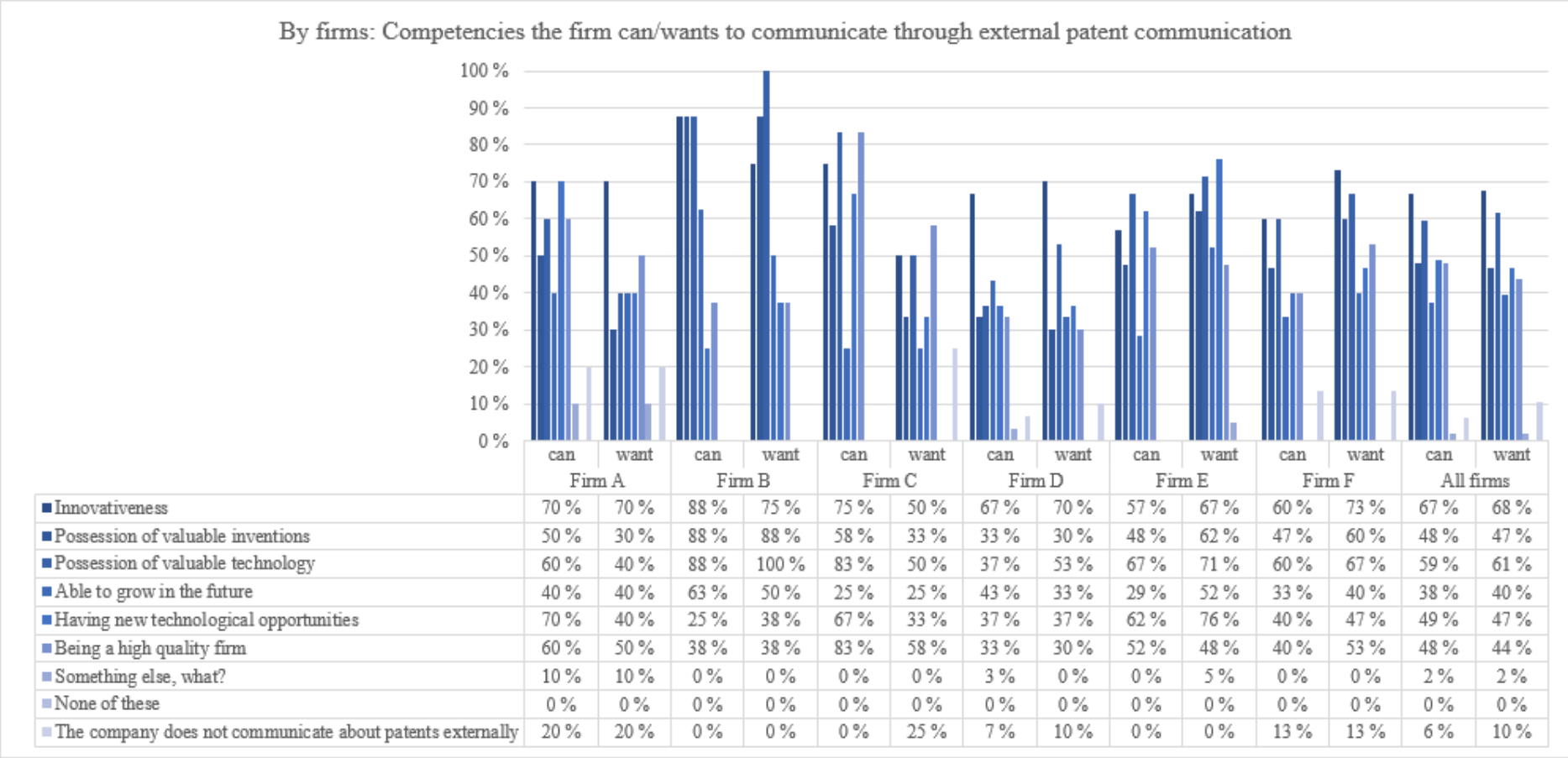
The respondents had the opportunity to write open answers to this question too. One respondent told their company can communicate freedom to operate through their internal patent communication. The same response was given to the question of what their company want to communicate. Other responses regarding what their company want to communicate included "being seen as an industry leader" and "people encouragement".

11% of respondents chose the option that their company does not communicate about patents internally. Overall, in internal patent communication, innovativeness was the most selected competence to signal, while being a high-quality firm was the least selected competence to signal in both scenarios. Next is reviewed the data about signals of external communication.

4.3.2 Signals in external communication

First, all respondents' answers to the question of what they believe their companies can communicate in external patent communication are reviewed. Like in the case of internal patent communication, innovativeness was the most selected option as 67% of all respondents believed their company can communicate innovativeness through external communication. 59% believed their firm can signal possession of valuable technology. Slightly less than half of the respondents thought their firm can signal new technological opportunities (49%), possession of valuable inventions (48%) and being a high-quality firm (48%). Just like in internal communication, signaling growth in the future was not that popular opinion and 38% selected that. 6% of respondents believed their company does communicate about patents externally. As for the target (?) of their external patent communication, 68% thought that their company wants to signal innovativeness, 61% possession of valuable technology, 47% possession of valuable inventions and having new technological opportunities, 44% being a high-quality firm and 40% growth in the future. 10% believed their company does not communicate about patents externally.

The respondents were also asked what their companies want to communicate through their external patent communication. Like in the previous part, the answers are presented at the firm level and role level. Figure 19 shows what the respondents believe their companies want to communicate through external patent communication.



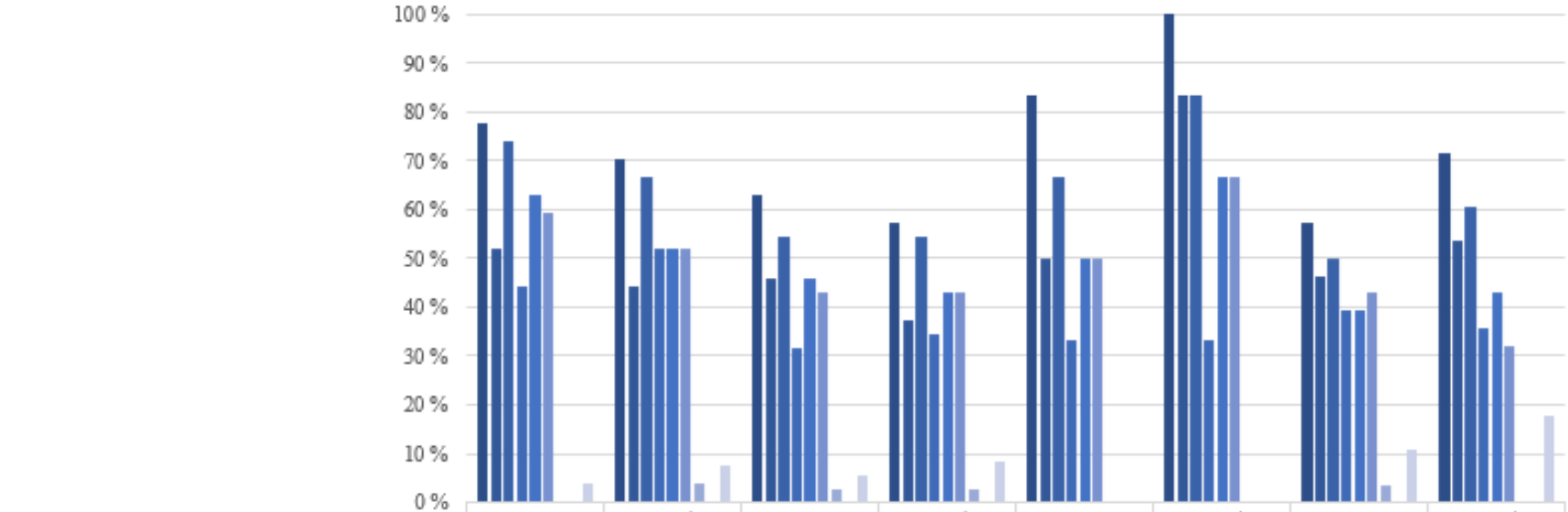
	Firm A		Firm B		Firm C		Firm D		Firm E		Firm F		All firms	
	can	want	can	want	can	want	can	want	can	want	can	want	can	want
Innovativeness	70 %	70 %	88 %	75 %	75 %	50 %	67 %	70 %	57 %	67 %	60 %	73 %	67 %	68 %
Possession of valuable inventions	50 %	30 %	88 %	88 %	58 %	33 %	33 %	30 %	48 %	62 %	47 %	60 %	48 %	47 %
Possession of valuable technology	60 %	40 %	88 %	100 %	83 %	50 %	37 %	53 %	67 %	71 %	60 %	67 %	59 %	61 %
Able to grow in the future	40 %	40 %	63 %	50 %	25 %	25 %	43 %	33 %	29 %	52 %	33 %	40 %	38 %	40 %
Having new technological opportunities	70 %	40 %	25 %	38 %	67 %	33 %	37 %	37 %	62 %	76 %	40 %	47 %	49 %	47 %
Being a high quality firm	60 %	50 %	38 %	38 %	83 %	58 %	33 %	30 %	52 %	48 %	40 %	53 %	48 %	44 %
Something else, what?	10 %	10 %	0 %	0 %	0 %	0 %	3 %	0 %	0 %	5 %	0 %	0 %	2 %	2 %
None of these	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
The company does not communicate about patents externally	20 %	20 %	0 %	0 %	0 %	25 %	7 %	10 %	0 %	0 %	13 %	13 %	6 %	10 %

Figure 19. Competencies the firm can/wants to communicate through external patent communication

The most often selected option to the question about which competencies their companies are able to communicate through external communication was innovativeness and in total 67% chose the option. This was also the case for the question about which competencies their companies want to communicate: it was the most selected option and 68% of all respondents chose the option. 50% of firm C believed their company wants to communicate innovativeness, whereas, in other firms, percentages of choices were higher and ranged from firm E's 67% to firm B's 75%. Figure 19 presents the answer selections in detail. When reviewing the answers by roles one can find that 100% of executives believed that their companies want to show innovativeness through external patent communication whereas 70% of white collars, 57% of managers and 71% of directors chose the option. Figure 20 provides the results at the role level.

The second most-often selected option was possession of valuable technology. 61% of all respondents believed their companies want to communicate possession of valuable technology through their external patent communication. The number of responses thus did not differ much from how many felt that their company was able to communicate it as 59% of all respondents chose that. 100% of firm B's respondents chose the option, while 40% of firm A's respondents chose it. In firms E and F there were minor differences between the percentages of respondents who believed their companies can communicate possess of valuable technology (67% of firm E, 60% of firm F) and the percentages of respondents who believed their companies want to communicate it (71% of firm E, 67% of firm F). In firms A and C, clearly more respondents thought their companies can communicate it (A: 60%, C: 83%), compared to how many believed they want to communicate about it (A: 40%, C: 50%). It was the opposite for B and D. More respondents believed they want to signal possession of valuable technology (B: 100%, D: 53%), compared to respondents who chose the option that they can communicate it (B: 88%, D: 37%). On the role level, white collars were the only group where more people believed their company can communicate it (74%) than they want to communicate it (67%).

47% of all respondents believed their company want to communicate about possess of valuable inventions through their external patent communication, making it the third most selected option out of nine different options. Again, the difference to the percentage of how many believed their company can communicate was almost the same: 48%. On the firm level, B had a higher number of people believing their company can and want to signal possession of valuable inventions. 88% of respondents chose the options in the firm. The majority of firm E (62%) and F (60%) believed their company wants to communicate it. In firms A, C, and D,



	can	want	can	want	can	want	can	want
	White collars		Managers		Executives		Directors	
Innovativeness	78 %	70 %	63 %	57 %	83 %	100 %	57 %	71 %
Possession of valuable inventions	52 %	44 %	46 %	37 %	50 %	83 %	46 %	54 %
Possession of valuable technology	74 %	67 %	54 %	54 %	67 %	83 %	50 %	61 %
Able to grow in the future	44 %	52 %	31 %	34 %	33 %	33 %	39 %	36 %
Having new technological opportunities	63 %	52 %	46 %	43 %	50 %	67 %	39 %	43 %
Being a high quality firm	59 %	52 %	43 %	43 %	50 %	67 %	43 %	32 %
Something else, what?	0 %	4 %	3 %	3 %	0 %	0 %	4 %	0 %
None of these	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
The company does not communicate about patents externally	4 %	7 %	6 %	9 %	0 %	0 %	11 %	18 %

Figure 20. Competencies the respondents believe their firms can/want to communicate through external patent communication

roughly a third chose the option. While in firm D the percentage choices of wanting (30%) and being able (33%) to communicate possess of valuable inventions were close to each other, in firms A and C there was a disparity between them. While a third of both firms believe their companies want to communicate it, 50% of firm A and 58% of firm C thought they can communicate it. On the role level, approximately half of each group believed their company can communicate possess of valuable inventions, as can be seen from Figure 20. In the question about what their company want to communicate, there was slightly more dispersion: 37% of managers believed their companies want to communicate possess of valuable inventions, while 88% of executives believed so.

In the question of what their companies want to communicate, the option ”having new technological opportunities” was chosen by as many as the option “possess valuable inventions47% of all respondents. Firm E was the only company in which a clear majority (76%) believed their company want to communicate that they have new technological opportunities. In other firms, the number of those who chose the answer option ranged from 33% (firm C) to 47% (firm F). As shown in Figure 19, the majority of half of the firms thought their company can communicate that they have technological opportunities. Even though just 40% of firm A and 33% of firm C thought their companies want to communicate it, 70% of firm A and 67% of firm C believed their companies still can communicate it. Figure 20 illustrates how respondents chose the option on the role level. 43% of managers and directors thought their companies want to signal new technological opportunities, while 52% of white collars and 67% of executives chose so.

The next most frequently chosen option was being a high-quality firm. 44% of all respondents believed their companies want to communicate it through external patent communication. The majority of firms C (58%) and F (53%) chose the option, while half of firm A chose it, as Figure 19 shows. In firms A, C, D, and E more people believed their companies can signal that they are a high-quality firm compared to how many thought their companies want to communicate it. In firm B the same number of people chose both the options and firm F was the only firm where more respondents believed their company want to signal it compared to how many respondents thought they can signal it. The majority of white collars (52%) and executives (67%) believed their companies want to communicate that they are a high-quality firm in their external patent communication. The majority of white collars (59%) and half of the executives also thought they can communicate it. 43% of managers and 32% of directors

indicated their companies want to signal it, while 43% of both managers and directors indicated they can signal it.

40% of those surveyed indicated that their companies want to signal that they can grow in the future. Marginally fewer respondents (38%) believed their companies can signal it. In most firms, less than half believed their company want to signal that they can grow in the future, firm B and firm E being exceptions to that. While 52% of firm E's respondents believed their company want to communicate possible growth, just 29% believed their company is able to communicate it. As Figure 19 shows, firm B was the only firm where the majority (63%) thought their company can signal it. On the role level, the responses ranged from 52% of white collars to 33% of executives believing their companies want to communicate growing in the future through external patent communication. There were no large-scale differences between the answers about companies wanting and companies being able to communicate it as Figure 19 illustrates.

None of the respondents believed their companies can or want to communicate none of the options given in the survey. Some open answers were given. One respondent suggested that their company can signal freedom to operate in their external patent communication. Another respondent reported that their company wants to signal that they are a technology leader. Except for firms B and E, in each firm, there were a few respondents who felt that their firm did not communicate patents externally.

With respect to the third research question concerning possible signals of patent communication, it was found that innovativeness emerged as the most selected option in every aspect: the respondents selected it the most often as a competence their company can signal through internal and external patent communication. It was also the most selected option when asked what their company wants to signal through internal and external patent communication. Regarding what competencies companies can signal in their internal patent communication, possess of valuable inventions, possess of valuable technology and having new technological opportunities were often selected too. Most of the respondents believed their companies want to communicate possess of valuable inventions, possession of valuable technology, having new technological opportunities and being able to grow in the future in their internal patent communication. A comparison of the answers to internal patent communication and the answers to external patent communication questions reveals that respondents believed their

companies can communicate more competencies through internal patent communication than external patent communication. In external patent communication, the majority of those surveyed thought their companies are able and want to communicate possess of valuable technology and it was the only option in addition to innovativeness selected by the majority.

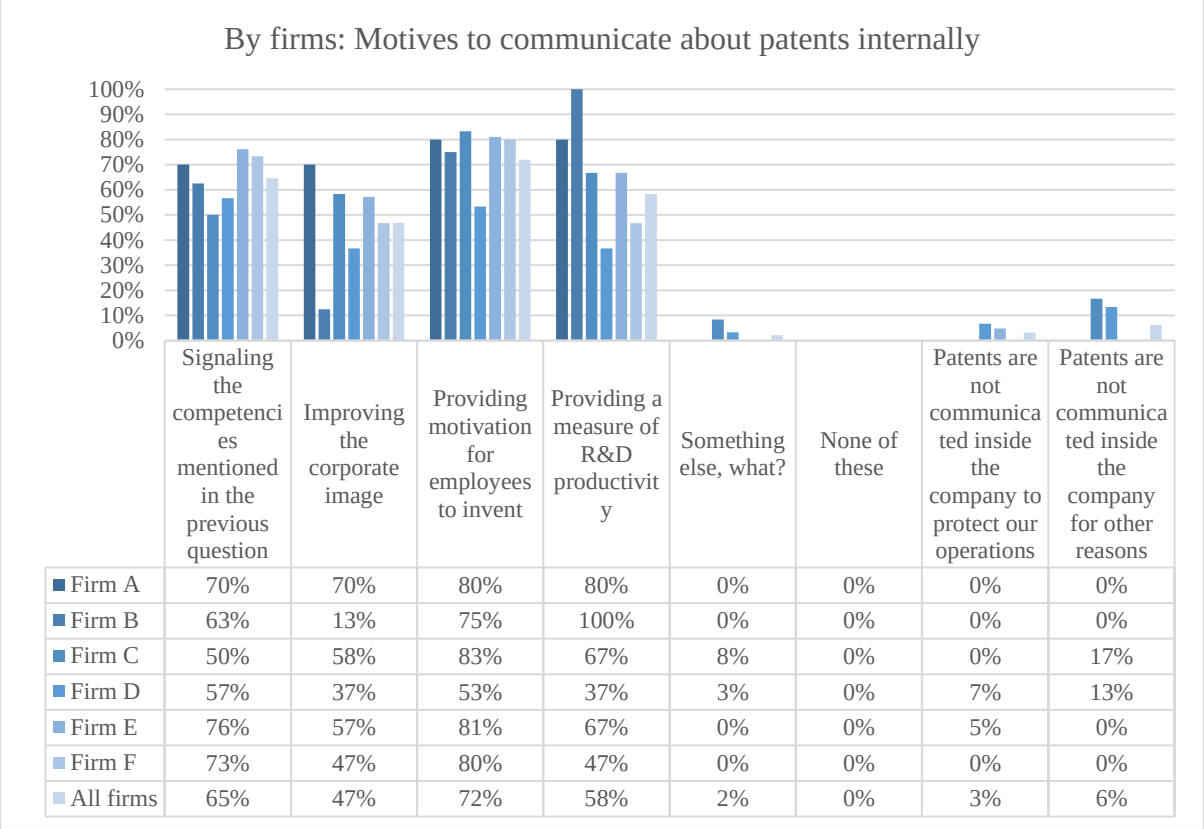
4.4 Motives

Motives are the third theme of the findings. Results of internal motives are reviewed first, then external motives. As in previous subsections, results are examined at the firm level as well as through roles at the individual level.

4.4.1 Motives driving internal communication

Holgersson and Granstand (2017) listed different motives to patenting inventions. One of their five categories is internal reasons, which involves providing motivation for employees to invent and providing a measure of R&D productivity. Another category, improvement of the corporate image, involved improving the image towards employees. The respondents were asked if they believe these same motives drive internal patent communication too. Veer and Jell (2012) argued that signaling can be a motive to obtain patents, so the respondents could choose signaling as one reason to communicate.

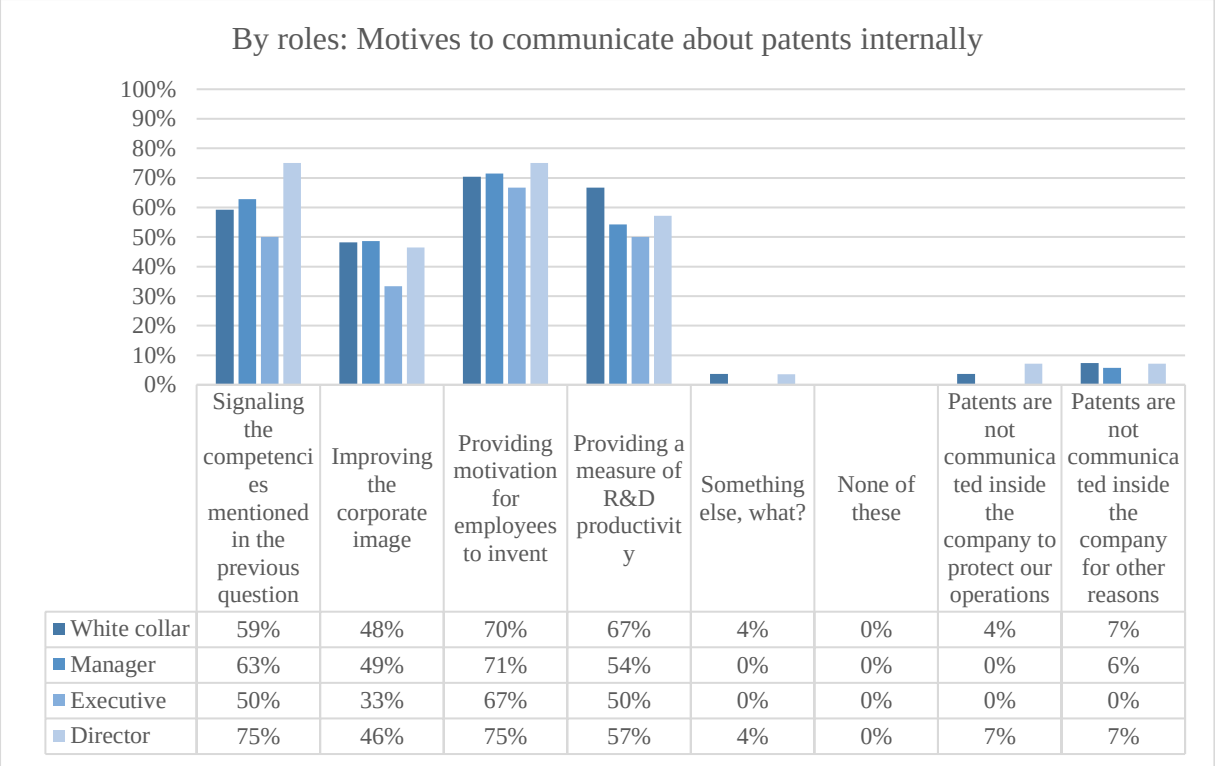
Figure 21 displays the responses of the six firms. Motivating for employees to invent was the most selected motive by 72%. In firms A, C, E, and F it was the most selected option. At least 80% of the respondents selected the option in each of those four firms. In firm D, the percentage was the lowest at 53%. Firm D's different response rate might be explained by looking at the background information and the question about inventorship. Looking at all firms, 71% have been inventors in a patent or a patent application. In firm D, 53% have been inventors meaning more respondents have not been inventors than in other firms. The non-inventors may see it as a less relevant motive because the matter does not concern them so clearly, while the inventors may have different personal experiences how it motivates. Turning to the roles again, it can be seen from Figure 22 that there were no major differences in responses. The percentages that saw providing a motivation to invent as a reason for the company to communicate ranged from 67% for executives to 75% for directors.



	Signaling the competencies mentioned in the previous question	Improving the corporate image	Providing motivation for employees to invent	Providing a measure of R&D productivity	Something else, what?	None of these	Patents are not communicated inside the company to protect our operations	Patents are not communicated inside the company for other reasons
Firm A	70%	70%	80%	80%	0%	0%	0%	0%
Firm B	63%	13%	75%	100%	0%	0%	0%	0%
Firm C	50%	58%	83%	67%	8%	0%	0%	17%
Firm D	57%	37%	53%	37%	3%	0%	7%	13%
Firm E	76%	57%	81%	67%	0%	0%	5%	0%
Firm F	73%	47%	80%	47%	0%	0%	0%	0%
All firms	65%	47%	72%	58%	2%	0%	3%	6%

Figure 21. Motives to communicate about patents internally, answers by firms

The second most selections were collected by the option the signaling motive. In total, 65% believed signaling their company's competencies is a reason for their company to communicate about patents internally. Only in firm D, signaling was the most often selected option and 57% of firm D chose it as a motive. Although the option was not the most chosen in other firms as it was in firm D, other firms excluding firm C still had higher percentages of respondents who saw it as a motive. In total, percentages ranged from 50% (firm C) to 76% (firm E). Neither certain industries nor certain backgrounds seemed to influence the firms' attitudes toward this response option. At the role level, this response option was more popular among directors (75%) than in other roles. Yet in each group, at least half of the respondents chose this option.



	Signaling the competencies mentioned in the previous question	Improving the corporate image	Providing motivation for employees to invent	Providing a measure of R&D productivity	Something else, what?	None of these	Patents are not communicated inside the company to protect our operations	Patents are not communicated inside the company for other reasons
White collar	59%	48%	70%	67%	4%	0%	4%	7%
Manager	63%	49%	71%	54%	0%	0%	0%	6%
Executive	50%	33%	67%	50%	0%	0%	0%	0%
Director	75%	46%	75%	57%	4%	0%	7%	7%

Figure 22. Motives to communicate about patents internally, answers by firms

58% believed that providing a measure of R&D productivity drives internal patent communication. In firms A and B, it was the most selected option, whereas in firm D and firm F it was the least selected motive together with the option "improving the corporate image". All of the respondents of firm B chose the option, and the majority chose it in firms A (80%), C (67%) and E (67%) too. In firm F, 47% chose it and in firm D 37% saw providing a measure of R&D productivity as a motive. A possible explanation is that the firm D's and F's distribution in the roles of the respondents is similar and, in both firms, just 13% of the respondents were white collars. When looking at the responses from the perspective of roles, this motive has been slightly more popular among white collars than among other roles. 67% of the white collars believed that is a reason for their company to communicate about patents internally, while 54% of managers, 50% of executives and 57% of executives thought it is a motive.

In total, 47% believed improving corporate image is a motive for their company to communicate about patents internally. The dispersion ranged from firm A's 70% to firm B's 13%. As Figure 21 shows, in firm B, the number of those choosing the option was notably lower than in other firms. It is noteworthy that firm B operates in the utilities sector, and it is

the only firm of respondents in that sector. It seems possible that these results are due to their sector. However, there were only eight respondents in firm B and since they were the only firm in the thesis representing the industry, generalizations must be made cautiously. Another factor that differs firm B from the roles of the respondents. When looking at the distribution percentages of respondents' roles, firm B had more white collars than other firms. They also had the smallest share of managers and directors. Yet at the role level, there were not as drastic differences as at the firm level. 48% of white collars, 49% of managers and 46% of directors chose the option. With executives, the number was slightly lower as 33% believed improving corporate image is a motive. This indicates that the roles of the respondents in firm B do not explain the difference either.

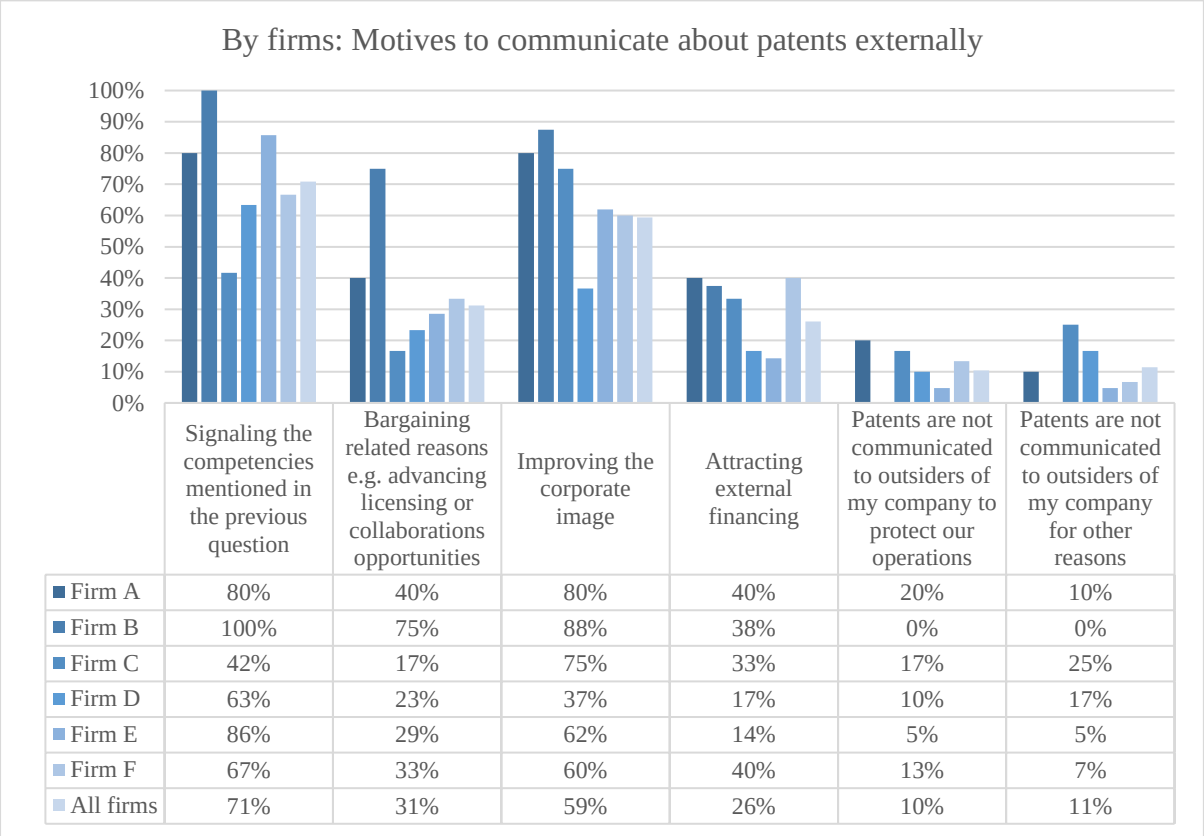
Two companies chose the option that their company does not communicate internally to protect their operations: in firm D 7% believed so, in firm E the percentage was 5%. Similarly, only two companies believed there is no internal patent communication for other reasons. In firm C 17% chose the option, in firm D 13%. At the role level, both response options were chosen mainly by a few individual respondents per role.

4.4.2 Motives driving external communication

The respondents were asked what they believe are reasons for their companies to communicate about patents externally. Internal reasons were left out, as this question was about external communication. The protection viewpoint was taken into consideration by giving the respondents an option to choose that said their company does not communicate about patents to protect their operations. In addition to the option that the companies do not communicate about patents externally, signaling as a motive was also included as an option because Veer and Jell (2012) consider it as a motive to obtain patents.

Signaling those previously mentioned competencies mentioned in the previous subchapter was the most selected reason to communicate about patents externally, as Figure 23 shows. A total of 71% believed signaling works as a motive. In firm B every respondent believed it is a motive for their firm, whereas in firm C 42% believed so. Looking at firm C's background, no clear factor emerges that makes the firm different from the others and possibly explain the difference. However, in firm C the percentage of managers as respondents was slightly higher than in other firms. In firm C it was 50% while all firms' all respondents combined, percentage of managers

was 36 (see Figure 2). If signaling as a motive is viewed at the role level, it is revealed that 66% of managers saw it as a motive. With other roles, the percentages were higher: 78% of white collars, 83% of executives and 68% of directors believed signaling is a reason to communicate about patents externally. The difference between managers and directors was slender, like Figure 24 presents.



	Signaling the competencies mentioned in the previous question	Bargaining related reasons e.g. advancing licensing or collaborations opportunities	Improving the corporate image	Attracting external financing	Patents are not communicated to outsiders of my company to protect our operations	Patents are not communicated to outsiders of my company for other reasons
Firm A	80%	40%	80%	40%	20%	10%
Firm B	100%	75%	88%	38%	0%	0%
Firm C	42%	17%	75%	33%	17%	25%
Firm D	63%	23%	37%	17%	10%	17%
Firm E	86%	29%	62%	14%	5%	5%
Firm F	67%	33%	60%	40%	13%	7%
All firms	71%	31%	59%	26%	10%	11%

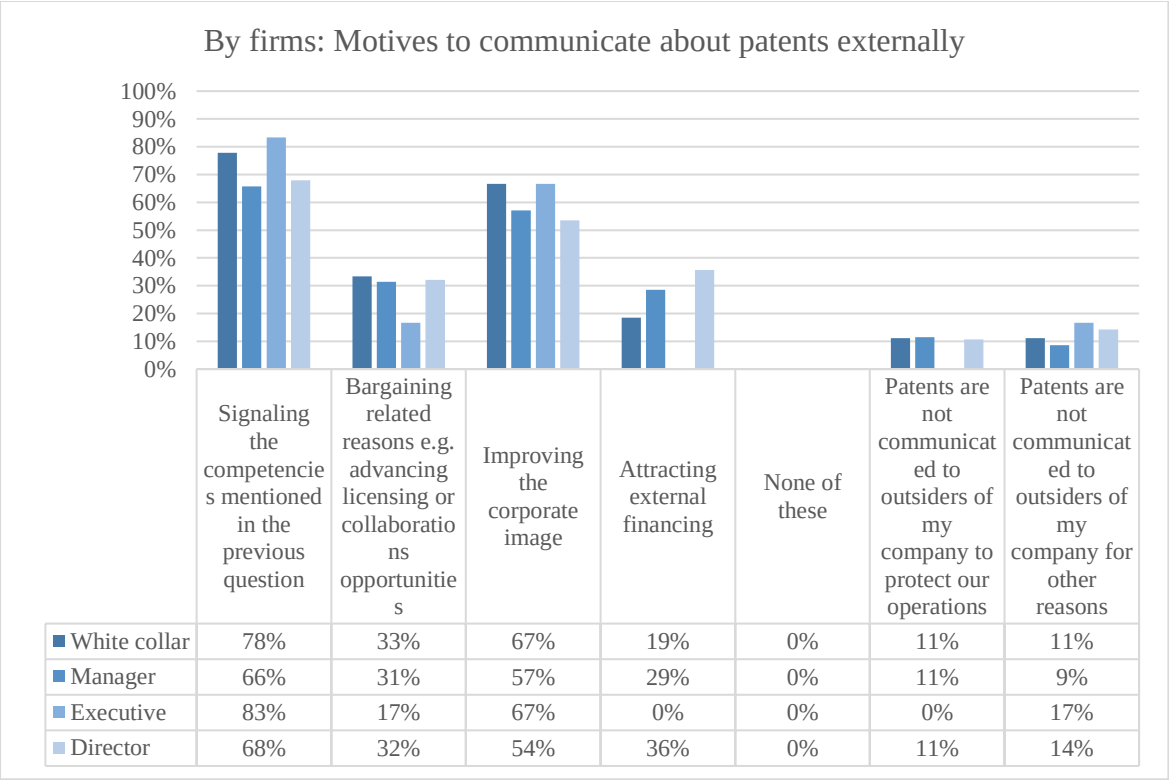
Figure 23. Motives to communicate about patents externally, answers by firms

Signaling was in the survey as one of the options of motives for both internal and external patent communications questions. When they are compared from an internal and external perspective, similarities are found. In both perspectives, they were popular options among the respondents: the most chosen in the external communication question, the second chosen in the internal communication question. Also, in firm C the respondents chose the option fewer times than others in both perspectives.

A majority of all respondents (59%) believed improving the corporate image is a reason for their firm to communicate externally about patents. In firm D 37% chose to improve the corporate image as a reason, while in other firms the percentage was considerably higher, like

Figure 22 shows. Comparing this to the question about internal communication, more respondents believed it is a reason to communicate externally (59%) than internally (47%). In every firm more respondents saw it as a motive in external communication, compared to the number of respondents who saw it as a motive in internal communication. The most drastic difference was in firm B's answers. Like said in the previous subchapter, only 13% of firm B saw improving corporate image as an internal motive. Yet 88% of firm B believed it is a motive to communicate externally.

31% of all respondents believed bargaining-related reasons work as a motive. In firm B, 75% of respondents saw it as a motive, which was remarkably higher than other firms' responses. In other firms, it varied from firm C's 13% to firm A's 40%, like Figure 16 displays. As mentioned before, firm B is the only firm of the respondents operating in the utilities sector and the different stance on bargaining-related reasons may be due to that. Nonetheless, it is worth mentioning again that there were only eight respondents, so excessive generalizations about the sector should be avoided based on just these respondents. Role-wise, seeing bargaining related reasons as a motive was fairly on the same level in the different groups: 33% of white collars 31% of managers and 32% of directors believed it is a motive. Only with executives, fewer respondents saw it as a motive: 17% chose the option.



	Signaling the competencies mentioned in the previous question	Bargaining related reasons e.g. advancing licensing or collaborations opportunities	Improving the corporate image	Attracting external financing	None of these	Patents are not communicated to outsiders of my company to protect our operations	Patents are not communicated to outsiders of my company for other reasons
White collar	78%	33%	67%	19%	0%	11%	11%
Manager	66%	31%	57%	29%	0%	11%	9%
Executive	83%	17%	67%	0%	0%	0%	17%
Director	68%	32%	54%	36%	0%	11%	14%

Figure 24. Motives to communicate about patents externally, answers by roles

26% of the respondents believed that attracting external financing is a reason to communicate about patents externally. In firm D 17% and firm E 14% concur that attracting external financing is a motive. Percentages were higher in other firms, and they were the highest in firm A and firm F: in both 40% of respondents believed it to be a motive. There isn't a clear common factor related to the background of firms D and E that would explain why they do not see it as an important motive as others. When this response option is explored at the role level, differences can be noticed here as well. Not a single executive saw attracting external financing as a motive. 19% of white collars believed it is a motive, and that is a bit lower percentage than with managers of which 29% considered it as motive and with directors of which 36% considered so. A possible explanation for managers' and directors' higher percentages is that white collars do not have that often responsibilities related to external financing in their job, while external financing may have a bigger role in managers' and directors' jobs.

Attracting external financing as a motive does not emerge in the survey question as to the most popular option or is not a particularly distinctly popular response option in any firm or role group. That is interesting, since like mentioned in chapter 2.2.1, other studies see patents as an important tool in signaling, and patents as signals that attract external funding. Though it is important to take into account the difference between the cases: the earlier studies focus on start-ups while in this study the participants are large established companies.

According to 10% of the respondents, patents are not communicated externally to protect their firm's operations, and 11% believed there is no external patent communication for other reasons. At the firm level, there were mostly one or two respondents in every company believing patents are not communicated externally. There were also no major differences between the roles, as Figure 24 shows.

Together these results in chapters 4.4.1 and 4.4.2 provide insights into motives driving internal and external patent communication and seek to answer the fourth research question of this study about what the main motives are behind companies' patent communication. From the internal viewpoint, there were three motives that the majority of all the respondents believed are reasons for their company to communicate about patents. Motivating employees to invent was seen as a motive the most often (72%), signaling was the second most often choice (65%)

and the third was providing a measure of R&D productivity (58%). Turning now to the external viewpoint, two motives were chosen by the majority. Signaling was the most selected option among all the respondents (71%) and it was seen slightly more often as an external motive than an internal motive. Also, improving the corporate image was considered by most to be a motive (59%). Less than half of the respondents (47%) saw it as a motive when asked about it from an internal communication perspective. Other motives that have been suggested to be important when obtaining patents in earlier studies, such as bargaining related reasons and attracting external financing were not considered as motives to communicate about patents by the majority of the respondents.

4.5 Satisfaction

To get a picture of the current state of how companies communicate about patents, the participants were asked how happy they are with the present way patent information is communicated to them. The questionnaire included questions concerning satisfaction in quantity, frequency, and ease of interpretation. As mentioned in chapter 2.1, patent information is versatile and useful for many purposes. According to Ernst (2003), patent information can be used to e.g., in R&D investments decisions, identification of patent infringers and assessment of technology users. Ernst (2003) also argued that competitor monitoring can reveal useful information such as patent activity, technology share, co-operation intensity, technological and economic quality of competitors' patent applications of competitors. Since patent information concerning the company's own patents as well as competitor patents are both beneficial to use in different functions, the questions were asked from two viewpoints: communication regarding the company's own patents and communication regarding competitor patents. Each of these questions was presented as statements and the answers were given using a 5-point Likert-type scale (1=strongly disagree, 5=strongly agree). The questions of earlier sections were asked mainly from the viewpoint of what the respondents think about their companies' patent communication in general, and some of the statements handle the topic at a general level too. However, the satisfaction part included many questions in which the respondents themselves are the recipients of the communication. This means that while the earlier sections covered both internal and external aspects, this part concentrates more but not exclusively on internal patent communication. These statements are covered in the first subchapter 4.5.1.

Patent information can be complex and need to be presented in suitable form with content that is relevant to the audience (Chiarello et al. 2018, Ernst 2003). Relevant information can mean different things to different respondents. To see what is seen as meaningful content for large firms, the participants were asked about what kind of information they want to get, their uses of patent information, preferred ways to obtain the information and possible improvements of patent communication. Subchapter 4.5.2. presents the findings to those multiple-choice questions.

4.5.1 Satisfaction and views on current patent communications

The surveyed firms were asked if they were happy with the frequency of patent information they receive, concerning both information about their own company's patents and competitor patents. The results can be found in Figure 25. 66% of respondents somewhat agreed or strongly agreed that they are satisfied with the frequency they receive information about their company's patents in their work. Firm C was more satisfied on average (M = 4.42, SD = 1.24) than all the firms observed altogether (M = 3.78, SD = 1.20), whereas firm D (M = 3.45, SD = 1.30) and F (M = 3.40, SD = .99) were slightly less happy with the frequency on average compared to others. Every firm was happier with the frequency of their own company's patent information they receive than with the frequency of competitor patent information. Firm C was the only company where the majority (67%) strongly agreed or somewhat agreed that they are satisfied with the frequency of competitor patent information they receive.

Looking by roles, managers (M = 3.91, SD = 1.1106837) were slightly more satisfied with the frequency of received information about own company's patents than white collars (M = 3.81, SD = 1.1106837), executives (M = 3.83, SD = 1.4719601) and directors (M = 3.56, SD = 1.2810252). On role level, too, every group was more satisfied in the frequency of received own company's patent information than competitor patent information. More detailed figures of answers on role level can be found in Appendix C, and means and standard deviations are presented in Appendix D.

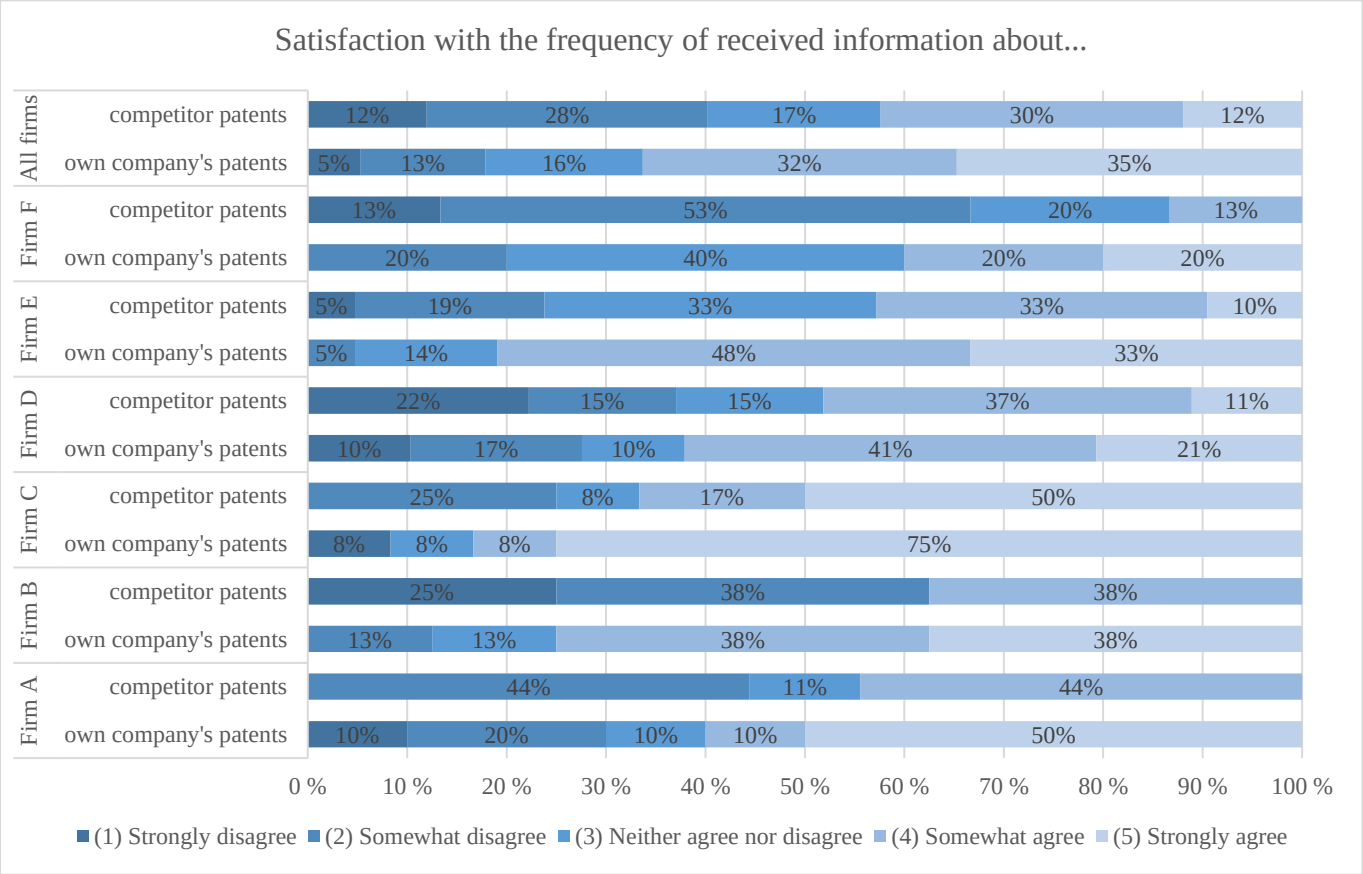


Figure 25. Satisfaction with the frequency of patent information regarding the company's patents and competitor patents received from the company, answers by firms

69% of all respondents somewhat agreed or strongly agreed that they are satisfied with the amount of information about their company's patents they receive. Again, firm B was more satisfied on average (M = 4.13, SD = .99) as well as firm E (M = 4.19, SD = .60) compared to all the firms' average (M = 3.68, SD = 1.16). The figure below illustrates the breakdown of answers by firms. The respondents' choices on the scale were very similar to the previous question on frequency. Also, as for amount, all firms expect firm C were more satisfied with their own company's patent information than competitor patent information. In firm C, the mean of answers were same on both questions (own patents: M = 3.83, SD = 1.267304, competitor patents: M = 3.83, SD = 1.193416). Firm F was the least satisfied of all the firms with the amount of received information about own company's patents (M = 3.4, SD = 1.121224) as well as with the amount of received competitor patent information (M = 2.4, SD = .910259).

Among the roles, white-collar workers (M = 3.63, SD = .97985405) were, on average, more satisfied with the amount of patent information they received than managers (M = 3.63, SD = 1.2387307), executives (M = 3.83, SD = 1.4719601) and directors (M = 3.44, SD = 1.1875422). All groups were less satisfied with the amount of competitor patent information, directors being least satisfied (M = 2.72, SD = 1.1733144).

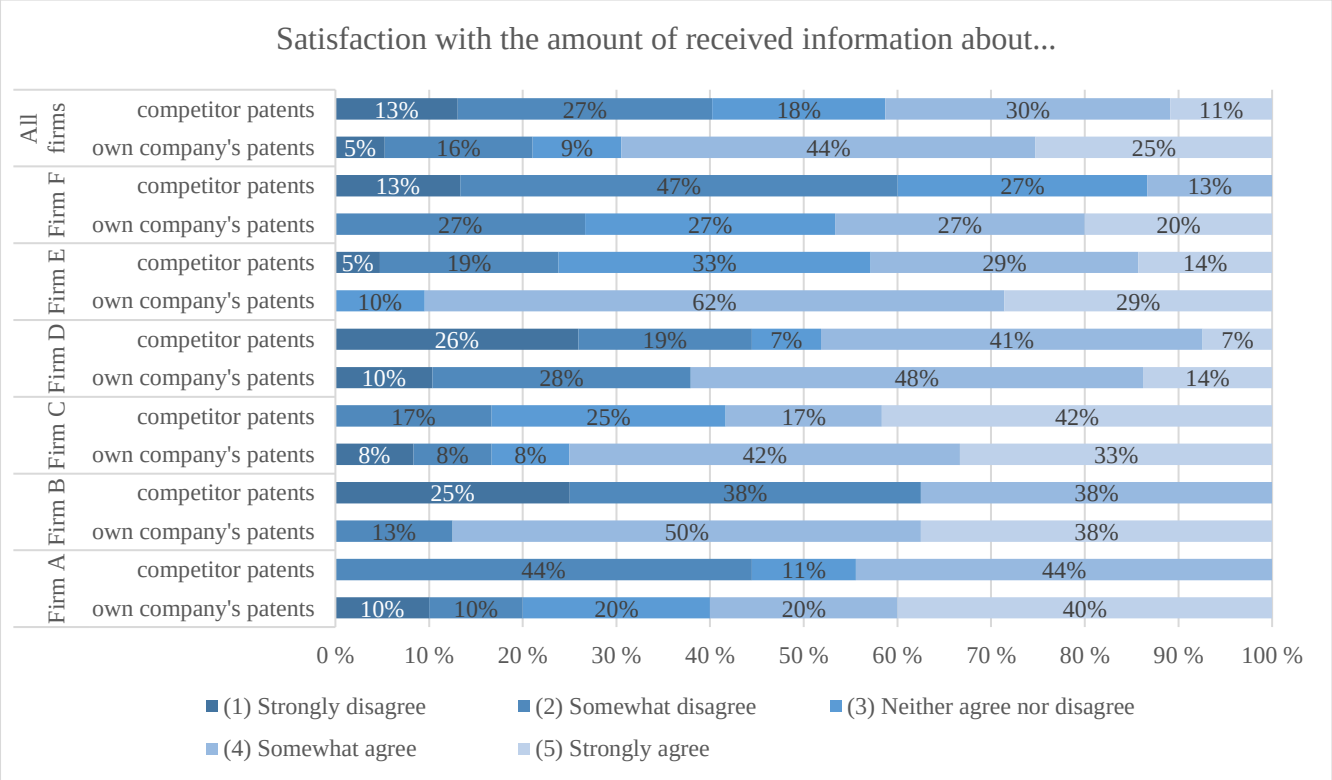


Figure 26. Satisfaction with the amount of patent information regarding the company's patents received from the company, answers by firms

The questionnaire also involved a statement “In the future, I hope to receive more information about patents than I currently do”. 64% of all respondents agreed with the statement. In all firms except in firm C, the majority somewhat agreed or strongly agreed they wish to receive more information (M = 3.76, SD = .8795309). In firm C, 58% chose the option “neither agree nor disagree” (M = 3.33, SD = .7784989) indicating that they are happy with the current information amount they receive. This is not surprising given that in the previous questions, firm C had higher satisfaction with the frequency of both own and competitor information and the amount of competitor patent information than the other companies.

Majority of the respondents found it easy to interpret information about their company’s patents (M = 3.64, SD = 1.07) and information about competitor patents (M = 3.30, SD = 1.17). It is worth nothing that out of 96 respondents, 91 people answered the question of interpretability

of own patent information, and 89 answered the question of interpretability of competitor patents. Skipping the question may indicate that the respondents do not receive any patent competitor information to interpret. Firm D and firm F did not find patent information as easy to interpret as others, both regarding own patent information (firm D: M = 3.48, SD = 1.051386, firm F: M = 3.43, SD = 1.2225) and competitor patent information (firm D: M = 3, SD = 1.215838, firm F: M = 3.07, SD = .099784). Figure 27 presents the answers of firms. Turning to roles, white collars (M = 3.74, SD = .98420576) and managers (M = 3.75, SD = .99798183) found own patent information slightly easier to interpret than executives (M = 3.67, SD = 1.0327956) and directors (M = 3.46, SD = 1.2721877). All groups find own patent information easer to interpret than competitor patent information.

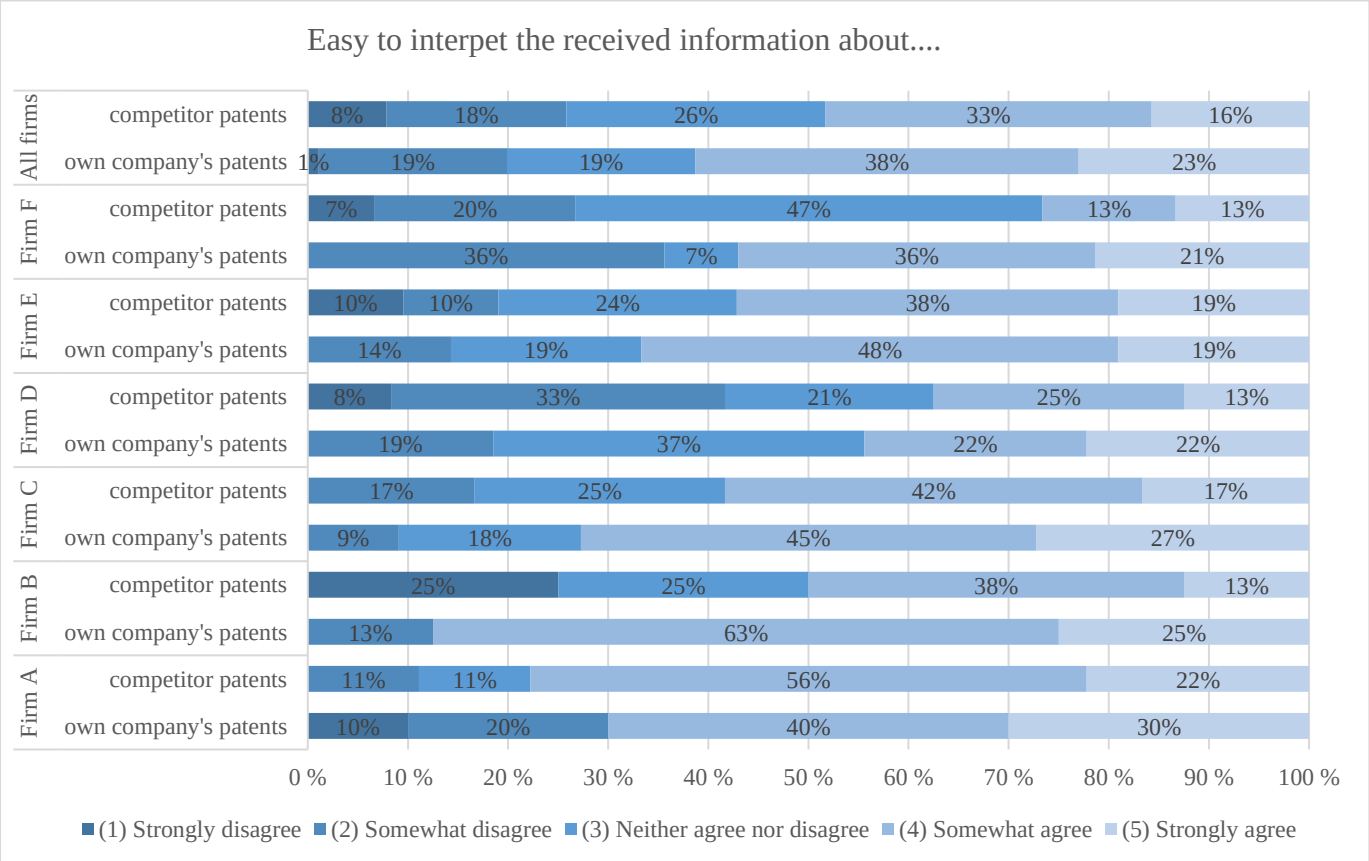


Figure 27. Easy to interpret the received information about own company's patents and competitor patents, answers by firms

The next statement was about the usefulness of communicated own patent information and competitor patent information. Both information about company's patents (M = 3.98, SD = 1.05) as well as information about competitor patents (M = 3.98, SD = 1.10) were considered useful by 79,12% of respondents and 75% of respondents, respectively. 91 chose to answer the

question of the usefulness of own patent information, 88 answered the question of the usefulness of competitor patent information. In almost every firm the clear majority agreed the communicated own patent information and competitor patent information is useful, like Figure 28 shows. The only exception was firm F as 40% of the firm's respondents agreed the competitor patent information communicated to them is useful. Firms B (M = 4.5, SD = 1.069045) and E (M = 4.41, SD = .853564) found the own patent information the more useful than others, while firms A (M = 4.56, SD = .7264832) and E (M = 4.58, SD = .5149287) found the competitor patent information more useful compared to the rest of the firms. Looking the answers by roles, white collars (M = 4.19, SD = .96225045) and managers (M = 4.09, SD = .89296082) found patent information more useful than executives (M = 3.83, SD = 1.4719601) and directors (M = 3.65, SD = 1.1980754). The differences in the perceived usefulness of own patent information and competitor patent information were very small.

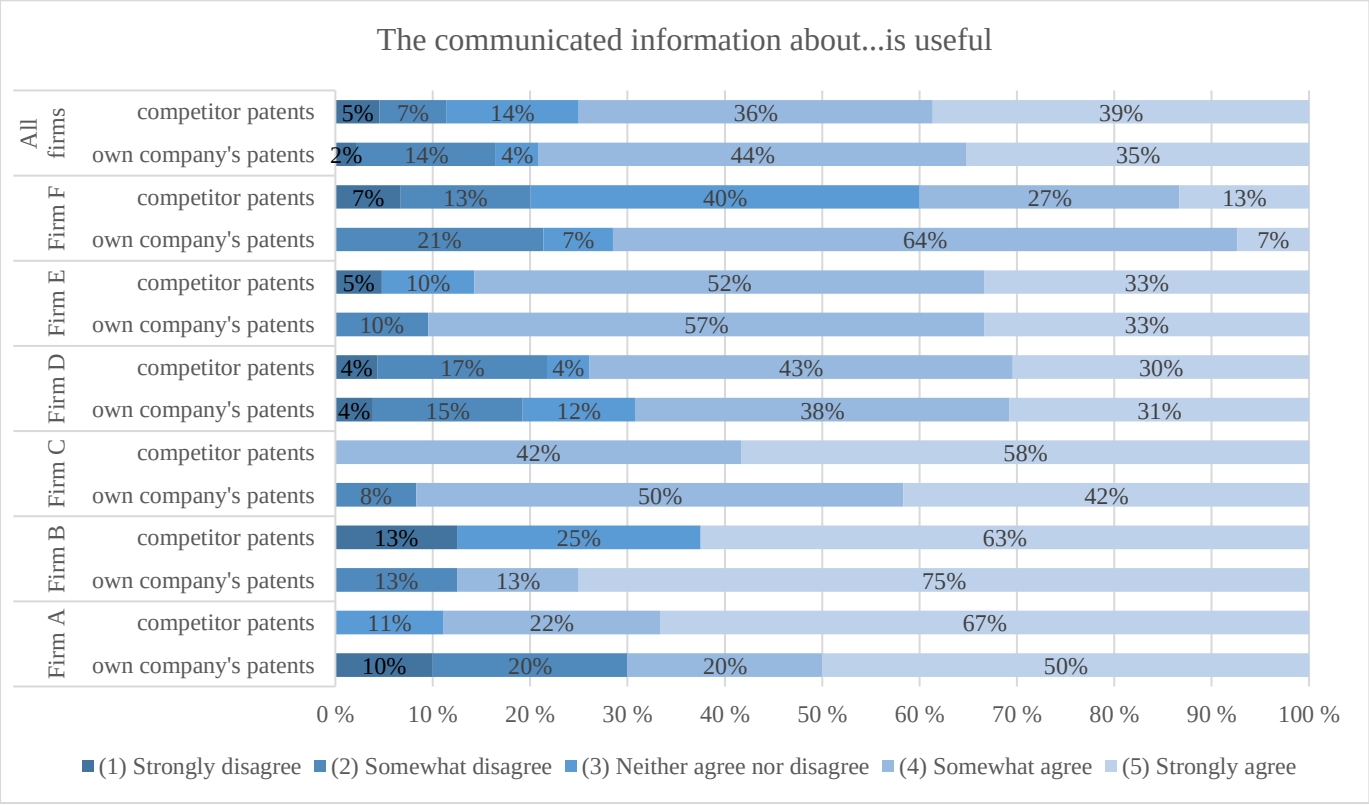


Figure 28. The usefulness of communicated information about own company's patents and competitor patents, answers by firms

In general, the respondents were happier with the ways their companies communicate about the company's patents (M = 3.67, SD = 1.20) than competitor patents (M = 3.14, SD = 1.19). Yet again firm B stood out from the rest, as they were the happiest with the current way information about the company's patents is communicated to them (M = 4.5, SD = 0.76), but

also it was one of the least happy firms with the current way competitor patent is communicated (M = 2.75, SD = 1.39) together with firm F (M = 2.73, SD = 1.162919). Firm D was the least happy with the current way its own patent information is communicated (M = 3.21, SD = 1.372675) even though almost half of the firm (49%) somewhat agreed or strongly agreed they are happy with the current way its own patent information is communicated. Also at the role level, all groups were happier with the ways their companies communicate about the company's patents than competitor patents.

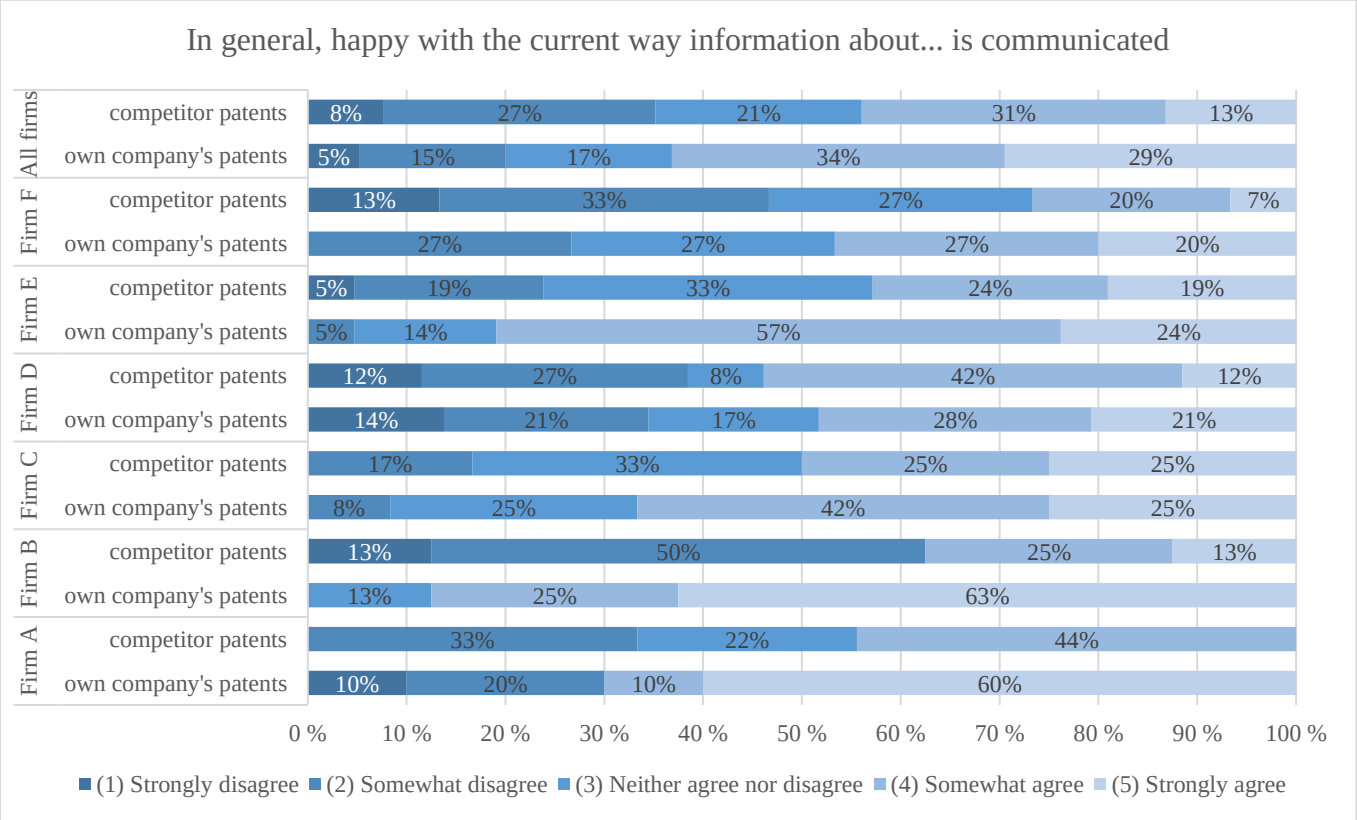


Figure 29. In general, happy with the current way information about own company's patents and competitor patents is communicated, answers by firms

73% somewhat agreed or strongly agreed that in the future, the company should communicate about their patents and patent-related activities more actively than they currently do internally. 20% did not agree nor disagree with the statement, indicating they feel the company communicates about patents enough. There was more dispersion on a statement whether their companies should communicate about patents and patent-related activities more actively externally. In total, 45% agreed with the statement and 37% did not agree nor disagree (M = 3.4, SD = 0.9486243). While most of the firm A agreed with the statement (M = 4, SD = .8660254), in firm E the clear majority (67%) did not agree nor disagree with the statement (M

= 2.9, SD = 0.5732115). The respondents were also asked to answer the statement that patents' role in communication in their company should increase in the future. 69% agreed with it (M = 3.90, SD = .90). In firm E, approximately half of the respondents did not agree nor disagree with the statement (M = 3.6, SD = 0.8106435) which may suggest that they believe the role of the patents is big enough at the moment. In other firms, the majority somewhat agreed or strongly agreed the role should increase.

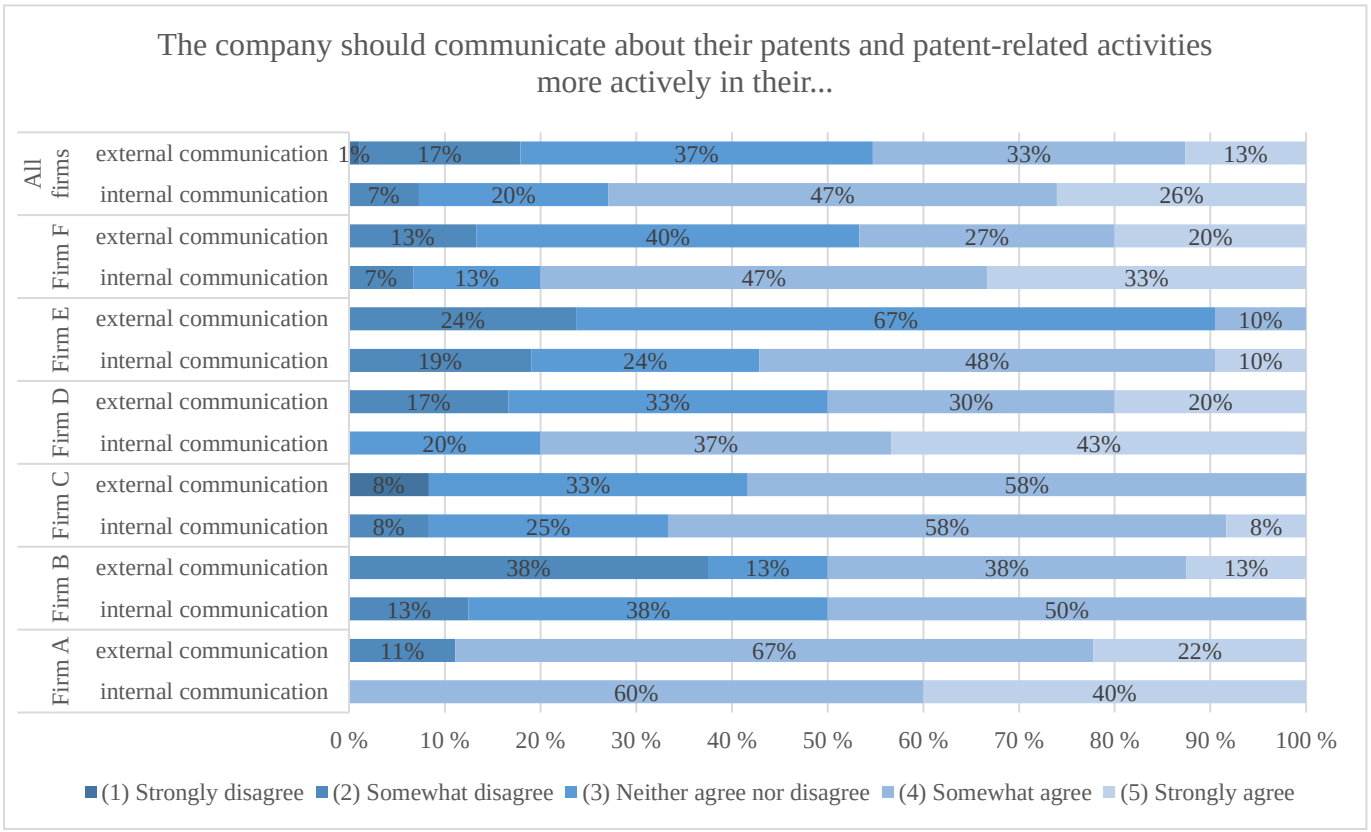


Figure 30. The company should communicate about their patents and patent-related activities more actively in their internal and external communication, answers by firms

Communicating about the company's patents inside the company was perceived as important quite unanimously (M = 4.50, SD = .666424) since 93% agreed with the statement. Externally, communicating about patents to investors were believed to be important by slightly more people (M = 4.1, SD = .8747391), than customers (M = 4.02, SD = .9942501) or partners (M = 3.61, SD = 1.01588) yet the majority agreed that all investors (82% agreeing), customers (74% agreeing), and partners (62% agreeing) are important, as was discussed in chapter 4.3.2.

Patents can be seen as competitive advantages and information about patents can be used when evaluating firms' competitiveness (Ernst 2003). As Figure 31 shows, of all the respondents, 32% somewhat agreed and 22% strongly agreed that their companies use patent information in

internal communication to send a message about a competitive advantage the company possess in a certain market. In total, 26% disagreed with the statement. Firm A had the most deviation in responses and they believed the least in the statement (M = 2.9, SD = 1.197219). Firm E was most in agreement with the statement (M = 3.65, SD = .933302) as 15% strongly agreed and 50% somewhat agreed with it. Of all respondents, 41% somewhat agreed and 22% strongly agreed that patents were communicated externally to send a message of competitive advantage, while 16% disagreed. As in the case of internal communications, firm A was again the least in agreement with the statement (M = 3, SD = 1.322876). Firm C had the highest mean of the firms (M = 3.91, SD = 1.044466).

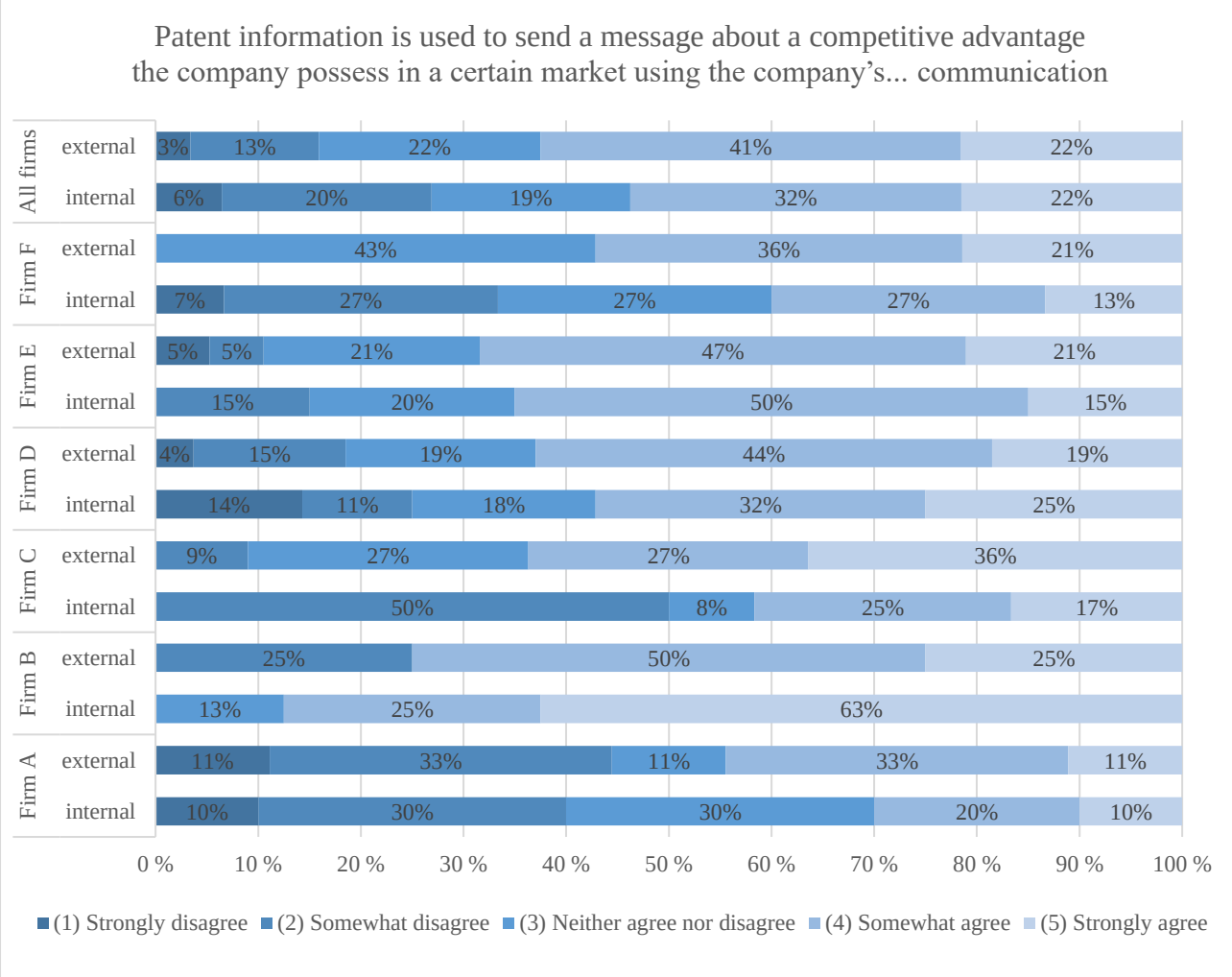
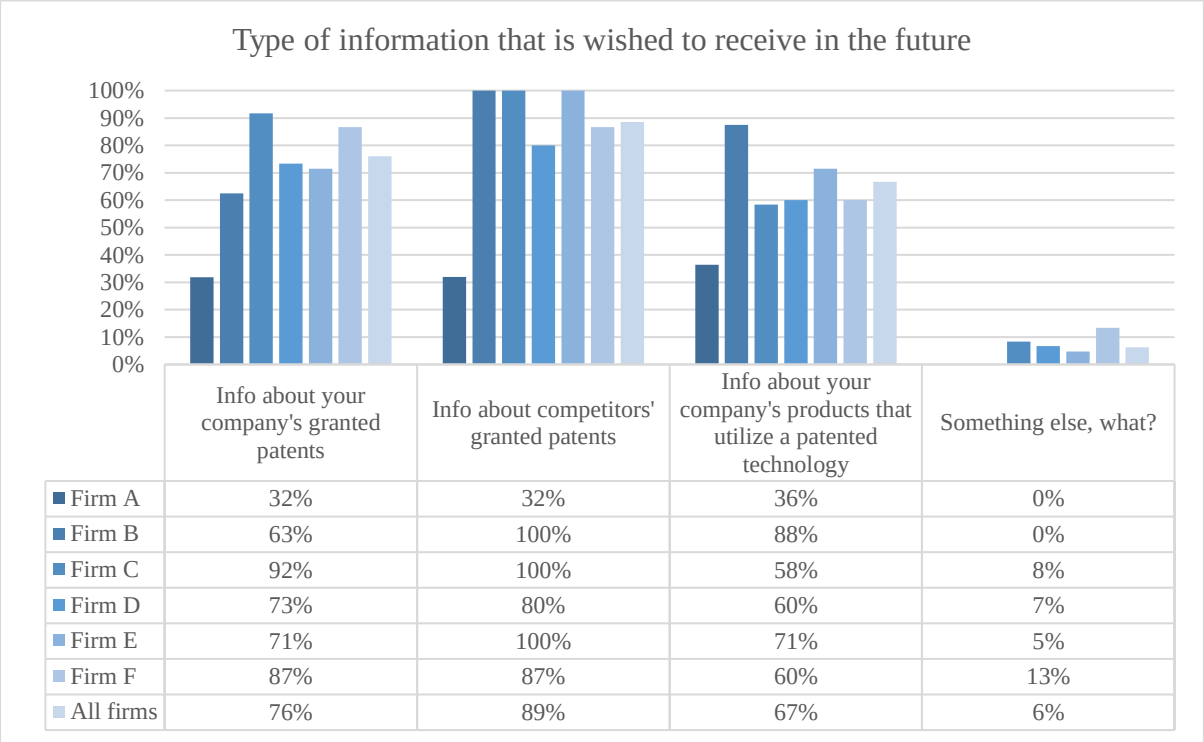


Figure 31. Patent information is used in the company's internal/external communication to send a message about a competitive advantage the company possess in a certain market, answers by firms

4.5.2 Use of patent information and communication practices

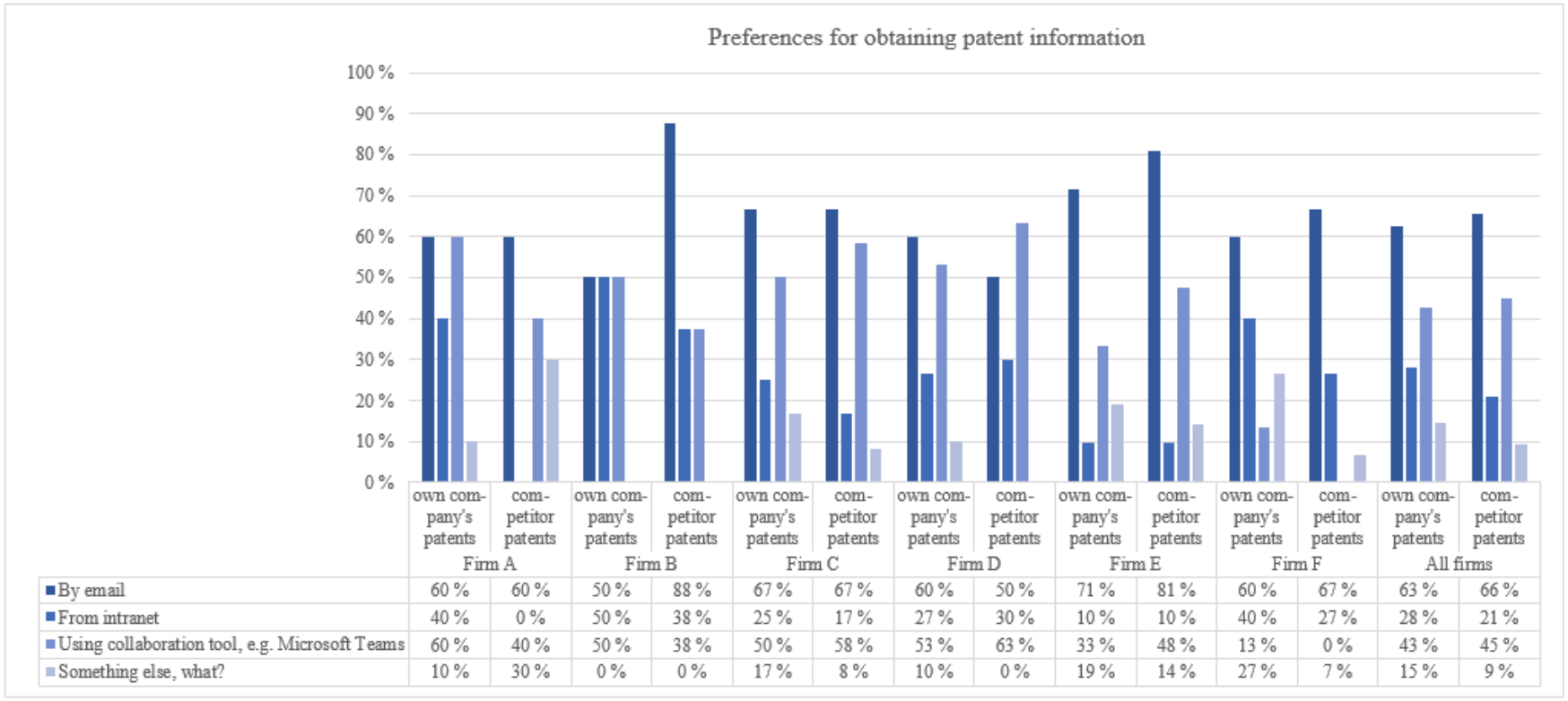
In addition to questions related to the quality of patent communications, the participants were asked about the content of the communications. It is important to know what kind of information they wish to receive in the first place. Information about competitor patents was the most popular choice in this multiple answer question. 89% of all respondents wished to receive information about competitors' granted patents. 76% chose the option information about their own company's granted patents, and 67% information about the company's products that utilize patented technology. Some gave open answers. Two persons wished they receive information that is relevant to them. The open answers included information about patent violation cases and "the landscape for technologies we are following". At the role level, information about competitors' granted patents was the most chosen option in every group.



	Info about your company's granted patents	Info about competitors' granted patents	Info about your company's products that utilize a patented technology	Something else, what?
Firm A	32%	32%	36%	0%
Firm B	63%	100%	88%	0%
Firm C	92%	100%	58%	8%
Firm D	73%	80%	60%	7%
Firm E	71%	100%	71%	5%
Firm F	87%	87%	60%	13%
All firms	76%	89%	67%	6%

Figure 32. Type of patent-related information that is wished to receive in the future, answers by firms

The respondents were asked in a multiple-choice question how they prefer patent information communicated to them. Most of the respondents wished that email would be used to receive patent information of corporate patents (63%) and competitor patents (66%). Using a collaboration tool was the second popular answer in both getting information about corporate patents (43%) and getting information about competitor patents (45%). Less than a third (28% regarding own patents and 21% regarding competitor patents) wanted to get the patent

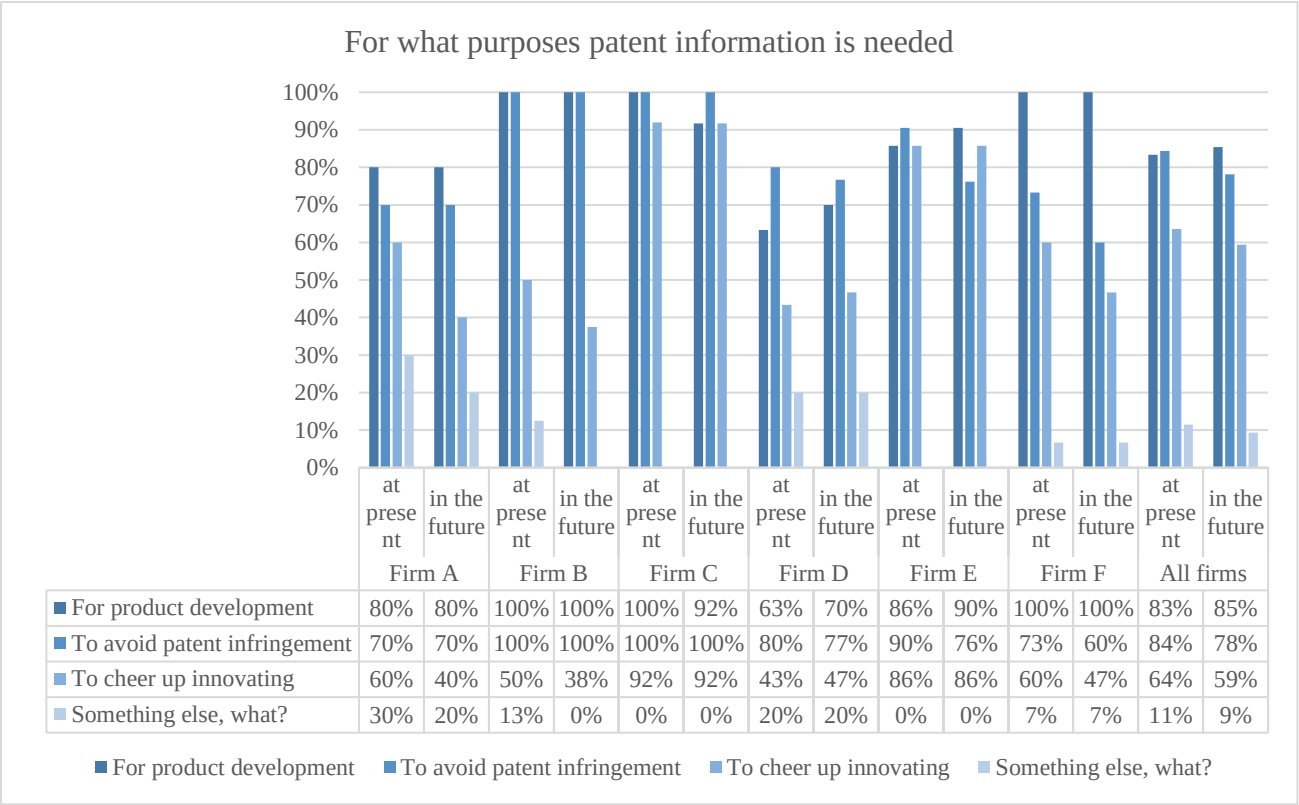


	Firm A		Firm B		Firm C		Firm D		Firm E		Firm F		All firms	
	own company's patents	competitor patents	own company's patents	competitor patents	own company's patents	competitor patents	own company's patents	competitor patents	own company's patents	competitor patents	own company's patents	competitor patents	own company's patents	competitor patents
By email	60 %	60 %	50 %	88 %	67 %	67 %	60 %	50 %	71 %	81 %	60 %	67 %	63 %	66 %
From intranet	40 %	0 %	50 %	38 %	25 %	17 %	27 %	30 %	10 %	10 %	40 %	27 %	28 %	21 %
Using collaboration tool, e.g. Microsoft Teams	60 %	40 %	50 %	38 %	50 %	58 %	53 %	63 %	33 %	48 %	13 %	0 %	43 %	45 %
Something else, what?	10 %	30 %	0 %	0 %	17 %	8 %	10 %	0 %	19 %	14 %	27 %	7 %	15 %	9 %

Figure 33. Preferences for obtaining own patent information and competitor patent information, answers by firms

information from the intranet. It may indicate that they want the information to come to them and not have to look for the information themselves. 15% of all respondents chose the option "something else, what?" regarding their own patents. Four respondents mentioned meetings, two mentioned discussion. Reports were mentioned twice, too. Other responses to this question included phone calls, patent applications, training, and monthly walkthrough sessions. One suggested that some innovation management tools could be used. Open answers were also given to the question of preferred competitor patents communication tools and 9% of all respondents chose the option "something else, what?". Meetings were suggested again, by four respondents. One of them specified that would like to get competitor patent information via technology review meetings. Discussions were mentioned twice in this question too. Patent applications were mentioned again, and one respondent suggested that their company could have quarterly or twice a year updates of their main competition.

The respondents were asked about purposes they need or use patent information for. Product development and avoiding patent infringement were both the most popular answers, as 83% chose the first one and 84% chose the latter in this multiple answer question. 63% use patent information to cheer up innovating. It was an especially popular reason in firms C (92%) and E (86%). The possibility to leave an open answer was also used. A respondent from firm A informed that they use patent information to improve employee engagement. Respondents from firm D answered that they need patent information "out of curiosity and to use it for customer communication", to monitor potential infringement by their competitor, for marketing, for commercial opportunities and for R&D planning. One respondent of firm F uses it to assess start-ups and companies. The same question about uses and needs of patent information was asked from a future perspective too, to see if the respondents believe there will be differences in current and future use. The respondents believed that product development will be the main reason for what they need patent information, as 85% chose that answer. 78% chose to avoid patent infringement and 59% believe they will use patent information to cheer up innovating in the future. A respondent of firm A wrote in their opens answer that in the future they will use it to promote the company's industry leadership position. Another open response from firm F mentioned that information is used for investing in start-ups and companies.

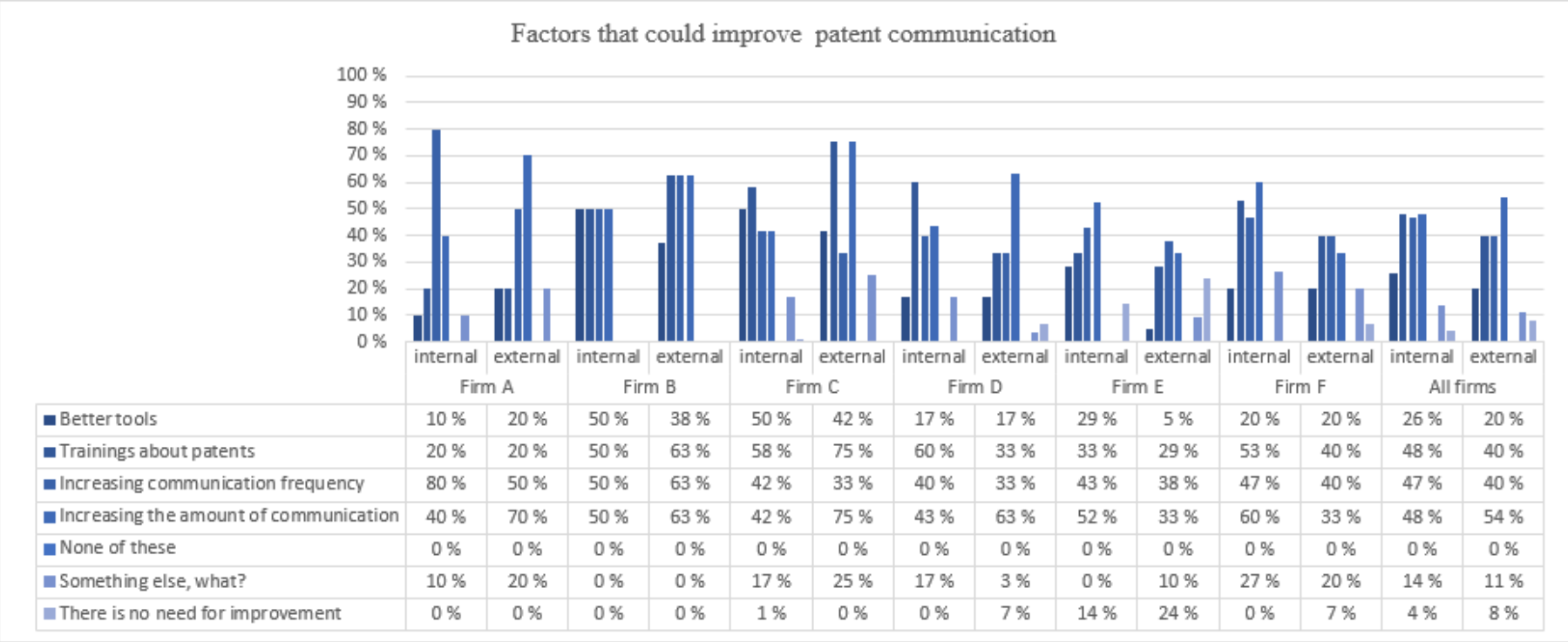


	Firm A		Firm B		Firm C		Firm D		Firm E		Firm F		All firms	
	at present	in the future	at present	in the future	at present	in the future	at present	in the future	at present	in the future	at present	in the future	at present	in the future
For product development	80%	80%	100%	100%	100%	92%	63%	70%	86%	90%	100%	100%	83%	85%
To avoid patent infringement	70%	70%	100%	100%	100%	100%	80%	77%	90%	76%	73%	60%	84%	78%
To cheer up innovating	60%	40%	50%	38%	92%	92%	43%	47%	86%	86%	60%	47%	64%	59%
Something else, what?	30%	20%	13%	0%	0%	0%	20%	20%	0%	0%	7%	7%	11%	9%

Figure 34. For what purposes patent information is needed currently and in the future, answers by firms

The questionnaire included two questions about improvement. The respondents were asked to choose all the options that in their opinion could improve current internal and external patent communication. First, the factors that could improve internal communication are reviewed. Three different factors were approximately equally popular. In total, 48% believed training about patents and increasing the amount of communication can possibly improve patent communication. 47% chose the option of increasing the amount of communication. About a quarter (26%) supposed that better tools would make current internal patent communication better. "None of these" option was chosen by no one, while 4% of all respondents believed there is no need for improvement. The differences in answers between firms are presented in Figure 35.

The option "something else, what?" was chosen by 14% of respondents and gave rise to many open comments. One respondent suggested that quality of communication, i.e., more processed and analyzed information could improve it. This view was echoed by another respondent, who wrote that simplifying and crystallizing the key messages can improve internal patent communication. Other open responses included "specific short news about patents", "smart and direct information", "focus areas for IPR" and "regular processes to keep topic on the table".



	internal	external	internal	external	internal	external	internal	external	internal	external	internal	external	internal	external
	Firm A		Firm B		Firm C		Firm D		Firm E		Firm F		All firms	
Better tools	10 %	20 %	50 %	38 %	50 %	42 %	17 %	17 %	29 %	5 %	20 %	20 %	26 %	20 %
Trainings about patents	20 %	20 %	50 %	63 %	58 %	75 %	60 %	33 %	33 %	29 %	53 %	40 %	48 %	40 %
Increasing communication frequency	80 %	50 %	50 %	63 %	42 %	33 %	40 %	33 %	43 %	38 %	47 %	40 %	47 %	40 %
Increasing the amount of communication	40 %	70 %	50 %	63 %	42 %	75 %	43 %	63 %	52 %	33 %	60 %	33 %	48 %	54 %
None of these	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %
Something else, what?	10 %	20 %	0 %	0 %	17 %	25 %	17 %	3 %	0 %	10 %	27 %	20 %	14 %	11 %
There is no need for improvement	0 %	0 %	0 %	0 %	1 %	0 %	0 %	7 %	14 %	24 %	0 %	7 %	4 %	8 %

Figure 35. Factors that could improve internal and external patent information, answers by firms

Two respondents wrote that a database could improve communication. Patent reports from certain fields including information about newly granted patents and new applications were suggested. Even though the training was already one of the given answer options, one of the respondents suggested that more training, especially for managers, would make an improvement. One person felt that changing attitude towards more innovative company culture could improve communication, whereas another suggested that increasing visibility of the people behind patent developments could help. A respondent commented that there should be increased activity on the topic in general.

As mentioned earlier, the surveyed were also asked about the improvement of external patent communication. The answer options were the same as for the question of improving internal communication. 54% of all respondents believed that increasing the amount of communication could improve external patent communication. It was the most often selected option, and the only option chosen by the majority. 40% of respondents chose the options "training about patents" and "increasing the communication frequency", while 20% thought better tools could improve external patent communication. The response rates and the most popular responses were thus similar to the internal communication answers. None of these was in this question too chosen by one, and 8% believed there is no need for improvement.

11% of the respondents chose the option "something else, what?". Similarly to the question of improving internal patent communication, many respondents wanted to add their own suggestions. Alike to the question of improving internal communications, one respondent wrote that increasing the personal visibility of R&D leaders in the company could improve external communication.

Some answers were similar to the answers given to the question about internal communication. The answers included increasing the personal visibility of R&D leaders in the company and having focused communication. In addition to these, the following responses were given: "Coordinated planning workshops between patent teams and external communication teams", "more channels e.g. LinkedIn", "Technical articles about patented technology", "really don't know" and "patents to be included in other material" and "increased patenting activity".

The last supporting research question strove for discovering if the firms are satisfied with current ways of patent communication and how they view it. The firms were mainly happy with the current way patent information is communicated about them, but the responses between firms varied. The communicated patent information was found very useful. The firms

are more satisfied with the ways they receive patent information about their own company's patents than competitor patents. Yet almost all respondents wish they would receive competitor patent information, and they wanted it even more than information about their company's own patents. Increasing patent communication could make the firms happier, and the general opinion was that both internal and external patent communication should be increased. The respondents believe email is the best way to receive patent information. The information is used for product development, to avoid patent infringement and to cheer up innovating. A little less than half of the respondents believed that patent-related training and increasing the amount and frequency would improve internal communication, and the majority thought that external patent communication would be improved if the amount of communication increased.

5 Discussion and conclusions

The purpose of the current study was to examine patent information communication from a company perspective with the goal to add knowledge on the topic. This study has identified what large companies consider as important stakeholders, signals and motives when communicating about patents. Moreover, the results of the questionnaire show what large companies think about current ways of communicating patents and their preferences and needs for patent information. A brief summary of findings is presented in Figure 36.

Patent information communication by large companies

Stakeholders	**Signals**
Internal: R&D, management, marketing and sales	Internal: innovativeness, valuable inventions, valuable technology, new technological opportunities
External: investors, customers, partners	External: innovativeness, valuable technology
Motives	**Satisfaction**
Internal: motivation for employees to invent, signaling, measure of R&D productivity	Present situation: content is useful, more pleased with own patent information than competitor patent information
External: signaling, corporate image improvement	Improvements: increasing patent communication, more active internal communication, more focus on competitor patent information

Figure 36. Stakeholders, signals, motives, and satisfaction of patent information communication from a firm perspective

This chapter consists of three parts. First, answers to research questions are provided. The results are compared to the existing literature. That is followed by managerial recommendations, proposing types of action regarding what companies should consider when communicating about patents. The last part consists of limitations and suggestions for further research.

5.1 Theoretical contributions

The main research question "*How large companies perceive communicating patent information?*" is wide, and it will be answered by going through the supporting research

questions and their findings to get a comprehensive picture of patent information communication in large companies.

The first supporting research question concerned stakeholders for communication of patent information. The findings of this study show that Finnish large companies believe that R&D, management and marketing and sales are important internal stakeholders in patent information communication. The responses were consistent with the perspectives of previous studies. Ernst (2017) noted that the intellectual property department and R&D are traditionally tied together and multiple studies have addressed the importance of the two departments' relationship. Patents are based on inventions often created by R&D, so it is no wonder that according to the surveyed firms, R&D is the most important internal stakeholder to communicate patent information. Most of the surveyed firms believe it is important to share patent information with management too. In total, 72% of respondents stated that their role is manager, director or executive meaning they can themselves been seen as a part of the management. Most of the respondents could therefore lean on personal experience. The involvement of management with patent information has been addressed by many researchers and has probably gained more attention in research than other stakeholders. For example, Ernst (2003) wrote about patent information usage from a strategic technology management perspective. Agostini et al. (2019) argue patent management involvement with top management is one way to measure if patent management is cross-functional, while Ernst et al. (2016) studied if technology management is affected by patent information management. Marketing & sales was the third and last internal stakeholder group chosen by the majority of respondents. Agostini et al. (2019) have mentioned marketing departments' importance and Daizadeh et al. (2002) were in the opinion that patents can be used in marketing to excite potential customers, investors, or partners.

A company that wants to focus its resources on important issues can do so by identifying important stakeholders and ignoring less irrelevant groups (Podnar & Jancic 2006). It is possible that these top survey responses, i.e., R&D, management, marketing and sales represent the most relevant stakeholders. However, earlier studies have disclosed many other stakeholders who can benefit from patent information even though they have received less attention than R&D or management. It is possible that the firms think only the most self-evident stakeholders are important because communicating patent information is not usually the priority of firms or something that is given that much thought to. Brem and Viardot (2015) argue that stakeholders are not taken into account broadly enough when integrating marketing

strategy and innovation strategy, and the strategies have too narrow perspectives. The current view of the surveyed firms might be limited, as the full potential of communicating patent information is not utilized in companies because communicating patent information does not seem to be a researched topic or sparking conversations.

Turning to external stakeholders, Daizadeh et al. (2002) suggest that potential customers, investors, and partners can be receivers of patent information, whereas Ernst (2003) proposes that patents should be involved in the communication strategy to external stakeholders. Each surveyed firm perceived customers, investors, and partners as important. The investors were considered most often important, yet the firms use patent information more to communicate with partners than to communicate with customers or investors. The finding that respondents see investors as the most important is in line with prior research that seems to consider this external stakeholder equally important, as previous research has focused on inventors or mentions them only when discussing external stakeholders (Ernst 2003). Signaling, another theme of this thesis, has been also looked at from the viewpoint of financing. Conti et al. (2013) argue that patents are used to attract new investors, especially in start-ups. Veer and Jell (2012) list signaling as a motive to obtain patents, and they see signaling as convincing investors of the value of inventions. In addition, according to Long (2002) patents can only include true statements or it would cause costs to a firm and that is why patents can be convincing transmitters of information.

Unlike earlier studies, the questionnaire in this study allowed firms to define themselves who they consider as important stakeholders. The previous research, e.g., Ernst (2003), studied patent information for strategic technology using literature as well as research by Ernst et al. (2016) on intellectual property and management. Agostini et al. (2019) interviewed IP professionals, but the discussion was about patent management on a general level. Further research could be undertaken to investigate why certain stakeholders are considered important and others are not.

The second supporting research question concerned perceived signals of patent communication. Finnish large firms believe that patents can signal innovativeness in internal and external communication. Patents originate from inventions and innovation, so the opinion of the firms is not surprising. The respondents were asked to think which competencies their company can communicate through patent communication from four perspectives: what their

company can communicate through 1) internal patent communication 2) external patent communication and what their company wants to communicate using 3) internal patent communication and 4) external patent communication. Innovativeness was the most selected option in all for questions. Long (2002) and Comino and Graziano (2015) have stated that patents can reveal if a company is innovative or not, and the surveyed firms agree that patent information can reveal that too.

According to the findings, Finnish companies can signal possession of valuable inventions using their internal patent communication. This is in line with Conti et al. (2013) and Veer and Jell (2012) who argue that patents can signal value on an invention. Mann (2015) found that patents signal valuable technology and the surveyed firms also believed that is something their company can signal internally in patent communication. Most of the firms believed that new technological opportunities can be signaled, which is consonant with Yoon's (2011) findings. The respondents believed that the companies want to signal the same competencies in their internal patent communication. The only competence that the majority believed their company wants to communicate but did not think their company can, was the ability to grow in the future. Patents signaling growth is an idea presented by Hall (2019).

The companies believe they can communicate more competencies through internal patent communication than external. In addition to innovativeness, the only trait they can and want to signal through external patent communication is possession of valuable technology. The results of this study do not explain why the signals are so perceived differently in internal and external patent communication, and that is something future research could look into. Furthermore, internal signaling is a novel topic. The literature on the topic concentrates on signals sent outside the companies, and therefore these results cannot be compared to earlier findings. One more interesting finding of the questions of signaling is that quality is a trait that multiple researchers, such as Hoenen et al. (2014), Long (2002) and Hsu and Ziedonis (2013), believe firms can signal with patents. However, the majority of the firms did not seem to believe it is something that is signaled through either internal or external patent communication.

The third supporting research question concerned the main motives driving companies to communicate about patents. While there has been literature concentrating on reasons to obtain patents, this study aims to shed light if there are similar motives when companies communicate about patents. The literature review on motives concentrated on three studies by Holgersson

and Grandstrand (2017), Blind et al. (2018) and Veer and Jell (2012). Veer and Jell (2012) were the only ones suggesting that signaling can act as a motive to obtain patents. In this study, the surveyed firms believed it is the second most important reason to communicate about patents internally and the most important externally. It is a rather surprising result that signaling was the most selected motive to communicate about patents externally, considering that the majority believed their companies want and can signal only two traits: innovativeness and possession of valuable technology.

The firms believe motivating employees to invent is the motive most often behind internal patent communication, and after signaling as the third most selected option comes providing a measure of R&D productivity. As 97% of respondents believe R&D is an important stakeholder in patent communication, choosing these motives that are tightly linked to the department is comprehensible. The firms have the same internal motives to communicate about patents as Holgersson and Granstrand (2017) argue are internal motives to obtain patents.

According to the surveyed firms, improving corporate image is a reason to communicate about patents externally. This finding supports the argument by Holgersson and Granstrand (2017) that a firm may obtain a patent to improve corporate image toward investors, collaborators, customers, suppliers, or local government. Also, Blind et al. (2005) believe a firm can obtain a patent to improve its reputation. Controlling the company image is a marketing objective (Barch & Kotler 1991), and out of all the response options, this was the only clearly marketing-related motive. The other external motives to obtain patents by Holgersson and Granstrand (2017) include bargaining-related reasons, concerning e.g., license selling, cross-licensing, or facilitation of R&D collaborations, and helping to receive financing. The firms did not believe that these two motives are the main reasons to communicate about patents externally. It is interesting that the respondents consider the investors as the most important external stakeholder in patent communication, yet they do not believe financing attraction is a significant motive to communicate about patents.

Informing stakeholders about patents is not straightforward, even though patents are valuable and patent information can convey messages about important issues revolving around innovations, technologies, and products of a firm. Certain secrecy floats around patents. Patents require to disclose an invention entirely, and that can make firms fear information leaking to outsiders (Arundel 2001). Therefore, it is understandable if firms do not want to communicate

about patents or are uncertain how to do it without harming business activities. The surveyed firms did not seem to be too worried about that. From an internal perspective, it was not a popular view, and around a tenth believed their company do not communicate about patents externally to protect their operations or for other reasons.

The final supporting research question concerned companies' satisfaction with the current state of their patent communication. The firms are mainly satisfied with the amount and frequency of patent information they receive. Still, there is a distinct urge for more active patent communication, especially internal. The information communicated to the respondents is useful and easy to interpret. Chiarello et al. (2018) noted that it is a challenge to present patent information containing technical jargon understandably. The surveyed firm seem to have overcome that obstacle. The collected data highlight the importance of information about competitor patents. The firms were less happy in general, as well as with the frequency and amount of received competitor patent information than own patent information, yet competitor patent information was the type of information the firms wanted to receive the most. Ernst (2003) noted that competitor patent information is versatile and can be used to reveal competitors' patent activity, quality of patent applications, technological strength, and co-operation intensity, to name a few. If the firms are aware of those many uses, it is understandable they wish to receive more competitor patent information. Based on the findings, communicating competitor information is not something the companies are currently focusing on, but it has demand. According to Holgersson and Granstrand (2017) blocking competitors from certain technology areas and creating retaliatory power against competitors are important reasons to obtain patents in large firms. If these surveyed have similar motives to obtain patents, it is understandable they feel they could use competitor patent information more.

The surveyed firms hope to receive patent information by email. Product development is the most popular usage of patent information but is used widely to avoid patent infringement and to cheer up innovating too. Patent infringers is also a topic that Ernst et al. (2016) listed as one of the uses of patent information. Organizing patent training and increasing communication frequency could improve patent communication, according to the firms. It was also believed that increasing the amount of communication would benefit especially external communication. As it has often been mentioned, patents from a communication point of view have not gained attention in research. Because large firms or any firms have not been asked

about this theme before, the findings give novel information about what firms think about communicating patents, what they prefer and how they use it.

5.2 Managerial recommendations

Literature has not given a great deal of attention to the communicative importance of patents. In addition, businesses may struggle to identify the communicative importance. Based on the findings of this study, recommendations can be given to help businesses to design functional patent information exchange. Firms use plenty of time and resources to maintain their patent families, and the patent-related achievements should be communicated boldly, especially internally. Employees wish to receive patent information. Patent information is seen as useful, and therefore more active communication is desired. Businesses should take an advantage of the receptive audience. In addition to increasing communication, attention must be paid to the content of the communication. While there is great interest in information about companies' own patents, there is even more interest in getting competitor patent information. Large businesses should consider developing a communication strategy that actively and regularly communicates their own and competitors 'patents.

The messages about patents need to reach the right audience. Businesses have to make sure that at least R&D, management and marketing and sales are aware of what is going on with patenting activities. Externally, partners, investors, and customers all should get relevant information. A noteworthy aspect for large businesses to consider is that the patent tells about more than just a protected invention. They can send signals of competencies such as innovativeness, and possession of valuable technology and new technological opportunities. These signals should be utilized and understood when planning how to combine patent information and marketing communication.

5.3 Limitations and further research

This study concentrates on large Finnish companies and their patent communication. The results might be different if the target companies were medium or small-sized, and patents role in those companies could differ from large companies. Another limitation is the rather small sample in the study. In total, 96 respondents from six different companies answered the questionnaire. In addition, the companies were Finnish, even though none of them operates only in Finland. Although via questionnaire it was possible to collect opinions from a larger

number of people, it would also be interesting to study this topic using qualitative methods and give respondents more opportunities to explain their views.

This thesis covered several themes related to patent communication in a novel way, and new unanswered questions emerged. The role of patents and patent information in communication deserves more attention as research on the subject has been almost non-existing. Further research could investigate why certain stakeholders are considered important in patent communication and gain an understanding of the underlying reasons. In addition, the perceived signals in internal and external communication could be studied more closely, to understand their differences better and to understand how to utilize the signals purposefully in communication activities. Literature on motives to obtain patents have compared the motives between different-sized firms. A similar comparison of motives, but from a communication perspective focusing on different-sized companies would be an intriguing perspective. Finally, satisfaction issues could also be explored more broadly, with a larger sample including a diverse range of people from different departments. In this study, the respondents were employees who in their work interact with patents or patent teams. If respondents were selected more broadly from the company, more diverse views could be obtained on the importance of patent communication and perspectives on ways of communicating patents. The role of competitor patent information could be less significant among other respondents.

LIST OF REFERENCES

Agostini, L., Nosella, A. & Teshome, M. B. (2019) Towards the development of scales to measure patent management. *World patent information.* [Online] 58101909–.

Alberts, D. Yang, C. B., Fobare-DePonio, D., Koubek, K., Robins, S., Rodgers, M., Simmons, E., DeMarco, D. (2017) 'Introduction to Patent Searching: Practical Experience and Requirements for Searching the Patent Space', in Lupu, M., Mayer, K., Kando, N. & Trippe, A. J. (eds.) *Current Challenges in Patent Information Retrieval*. [Online]. Berlin, Heidelberg: Springer Berlin Heidelberg. pp. 3–45.

Angue, K., Ayerbe, C. & Mitkova, L. (2014) A method using two dimensions of the patent classification for measuring the technological proximity: an application in identifying a potential R&D partner in biotechnology. *The Journal of technology transfer.* [Online] 39 (5), 716–747.

Arundel, A. (2001) The relative effectiveness of patents and secrecy for appropriation. *Research policy.* [Online] 30 (4), 611–624.

Ashton, W. B. & Sen, R. K. (1988) Using Patent Information in Technology Business Planning-I. *Research technology management.* [Online] 31 (6), 42–46.

Atal, V. & Bar, T. (2014) Patent Quality and a Two-tiered Patent System. *The Journal of industrial economics.* [Online] 62 (3), 503–540

Ballantyne, D. & Varey, R. J. (2006) Creating value-in-use through marketing interaction: the exchange logic of relating, communicating and knowing. *Marketing theory*. [Online] 6 (3), 335–348.

Blind, K., Cremers, K. & Mueller, E. (2009) The influence of strategic patenting on companies' patent portfolios. *Research policy*. [Online] 38 (2), 428–436.

Blind, K., Edler, J., Frietsch, R. & Schmoch, U. (2006) Motives to patent: Empirical evidence from Germany. *Research policy.* [Online] 35 (5), 655–672.

Blind, K., Pohlisch, J., & Zi, A. (2018) Publishing, patenting, and standardization: Motives and barriers of scientists. *Research policy*. [Online] 47 (7), 1185–1197.

Brem, A. & Viardot, E. (2015) *Adoption of Innovation: Balancing Internal and External Stakeholders in the Marketing of Innovation.* [Online]. Cham: Springer International Publishing.

Cambridge Dictionary (2020a) internal stakeholder. [online]. Available at: https://dictionary.cambridge.org/dictionary/english/internal-stakeholder (Accessed 2 December 2020)

Cambridge Dictionary (2020b) external stakeholder. [online]. Available at: https://dictionary.cambridge.org/dictionary/english/external-stakeholder (Accessed 2 December 2020)

Chiarello, F., Cimino, A. Fantoni, G. & Dell'Orletta, F. (2018) Automatic users extraction from patents. *World patent information.* [Online] 5428–38.

Chung, W., & Kalnins, A. (2001) Agglomeration effects and performance: A test of the Texas lodging industry. *Strategic Management Journal.* [Online] 22, 969-988.

Cockburn, I. M. & MacGarvie, M. J. (2009) Patents, Thickets and the Financing of Early-Stage Firms: Evidence from the Software Industry. *Journal of economics & management strategy.* [Online] 18 (3), 729–773.

Comino, S. & Graziano, C. (2015) How many patents does it take to signal innovation quality? *International journal of industrial organization*. [Online] 4366–79.

Conley, J. G., Bican P. M., & Ernst, H. (2013) Value Articulation: A Framework for the Strategic Management of Intellectual Property. *California management review.* [Online] 55 (4), 102–120.

Connelly, B. L., Ketchen, D. J. & Slater, S. F. (2010) Toward a 'theoretical toolbox' for sustainability research in marketing. *Journal of the Academy of Marketing Science.* [Online] 39 (1), 86–100.

Connelly, B., Certo, S., Ireland, R., & Reutzel, C. (2011) Signaling Theory: A Review and Assessment. *Journal of management.* [Online] 37 (1), 39–67.

Conti, A., Thursby, J. & Thursby, M. (2013) Patents as Signals for Startup Financing. *The Journal of industrial economics.* [Online] 61 (3), 592–622.

Daizadeh, I., Miller, D., Glowalla, A., Leamer, M., Nandi, R. &Numark, C. I. (2002) A general approach for determining when to patent, publish, or protect information as a trade secret. *Nature biotechnology.* [Online] 20 (10), 1053–1054.

de Rassenfosse, G. (2011) How SMEs exploit their intellectual property assets: evidence from survey data. *Small business economics*. [Online] 39 (2), 437–452.

Dernis H., Gkotsis P., Grassano N., Nakazato S., Squicciarini M., van Beuzekom B. & Vezzani A. (2019). World Corporate Top R&D investors: Shaping the Future of Technologies and of AI. A joint JRC and OECD report. Luxembourg: Publications Office of the European Union. [online] Available at: (Accessed 4 November 2020)

Elfenbein, D. W. (2007) Publications, patents, and the market for university inventions. *Journal of economic behavior & organization.* [Online] 63 (4), 688–715.

Encaoua, D. & Madiès, T. (2013) "Dysfunctions of the patent system and their effects on competition" in Prager, J.-C., Guellec, D., & Madiès, T. (eds.) Patent Markets in the Global Knowledge Economy: Theory, Empirics and Public Policy Implications. Cambridge: Cambridge University Press.

Ernst, H. (2003) Patent information for strategic technology management. World patent information. [Online] 25 (3), 233–242.

Ernst, H. (2017) Intellectual Property as a Management Discipline. *Technology and innovation*. [Online] 19 (2), 481–492.

Ernst, H., Conley, J., & Omland, N. (2016) How to create commercial value from patents: the role of patent management. *R & D management.* [Online] 46 (S2), 677–690.

EPO (2019) European companies and inventors file more patent applications in 2018 [Online]. Available at: https://www.epo.org/news-events/news/2019/20190312.html (Accessed: 8 October 2020)

EPO & EUIPO (2019) IPR-intensive industries and economic performance in the European Union. Industry-Level Analysis Report, September 2019 Third edition. [online] Available at: http://documents.epo.org/projects/babylon/eponet.nsf/0/9208BDA62793D113C125847A00500CAA/$File/IPR-intensive_industries_and_economic_performance_in_the_EU_2019_en.pdf (Accessed 4 November 2020)

EPO (2020) First time here? [Online]. Available at: https://www.epo.org/searching-for-patents/helpful-resources/first-time-here.html (Accessed: 2 November 2020)

EUIPO & EPO (2021) Intellectual property rights and firm performance in the European Union. Firm-level analysis report, February 2021. [online] Available at: https://documents.epo.org/projects/babylon/eponet.nsf/0/7120D0280636B3E6C1258673004A8698/$File/ipr_performance_study_en.pdf (Accessed 1 March 2021)

European Commission (2020) User Guide to the SME definition. Luxembourg: Publications Office of the European Union. [Online]. Available at: https://op.europa.eu/en/publication-detail/-/publication/756d9260-ee54-11ea-991b-01aa75ed71a1/language-en (Accessed 23 November 2020)

Freeman, R. E. (2010) Strategic management: a stakeholder approach. Cambridge: Cambridge University Press.

Freeman, R. E., Wicks, A. C. & Harrison, J. S. (2008) Managing for Stakeholders : Survival, Reputation, and Success. [Online]. New Haven, CT: Yale University Press

Friedman, A. L. & Miles, S. (2006) *Stakeholders: Theory and Practice*. Oxford: Oxford University Press, Incorporated.

Ghauri, P. & Grønhaug, K. (2010) Research methods in business studies. 4th ed. Harlow: Pearson.

Grigoroudis, E. & Siskos, Y. (2010*) Customer Satisfaction Evaluation Methods for Measuring and Implementing Service Quality*. [Online]. Boston, MA: Springer.

Grimaldi, M., Cricelli, L., Di Giovanni, M., & Rogo, F. (2015) The patent portfolio value analysis: A new framework to leverage patent information for strategic technology planning. *Technological forecasting & social change.* [Online] 94286–302.

Grimaldi, M., Cricelli, L., & Rogo, F. (2018) Valuating and analyzing the patent portfolio: the patent portfolio value index. *European journal of innovation management.* [Online] 21 (2), 174–205.

Guellec, D. & Ménière, Y. (2013) "Markets for patents: actors, workings and recent trends" in Prager, J.-C., Guellec, D., & Madiès, T. (eds.) Patent Markets in the Global Knowledge Economy: Theory, Empirics and Public Policy Implications. Cambridge: Cambridge University Press.

Haas, M. R. & Hansen, M. T. (2007) Different knowledge, different benefits: toward a productivity perspective on knowledge sharing in organizations. *Strategic management journal*. [Online] 28 (11), 1133–1153.

Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005) Market Value and Patent Citations. *The Rand journal of economics.* 36 (1), 16–38.

Hall, B. H. (2019) Is there a role for patents in the financing of new innovative firms? *Industrial and Corporate Change.* [Online] 28 (3), 657–680.

Harrer, R. and Lackner, M. (2014) Integrated marketing communications in the commercialisation of intellectual property, Int. J. *Intellectual Property Management*, Vol. 7, Nos. 1/2, pp.47–56.

Hecht, M. L. (1978) Measures of communication satisfaction. *Human Communication Research*. [Online] 4:350-368

Hoenen, S., Kolympiris, C., Schoenmakers, W. & Kalaitzandonakes, N. (2014) The Diminishing Signaling Value of Patents between Early Rounds of Venture Capital Financing. *Research Policy*. 10.1016/j.respol.2014.01.006.

Hoenen, S., Kolympiris, C., & Kalaitzandonakes, N. (2018) Geographic distance between venture capitalists and target firms and the value of quality signals. *Industrial and corporate change.* [Online] 27 (1), 189–220.

Hoenig, D. & Henkel, J. (2015) Quality signals? The role of patents, alliances, and team experience in venture capital financing. *Research policy.* [Online] 44 (5), 1049–1064.

Holgersson, M. (2013) Patent management in entrepreneurial SMEs: a literature review and an empirical study of innovation appropriation, patent propensity, and motives. *R & D management*. [Online] 43 (1), 21–36.

Holgersson, M. & Granstrand, O. (2017) Patenting motives, technology strategies, and open innovation. *Management Decision.* [Online] 55 (6), 1265–1284.

Hottenrott, H., Hall, B. & Czarnitzki, D. (2015) Patents as quality signals? The implications for financing constraints on R&D. *Economics of innovation and new technology.* [Online] 25 (3), 197–217.

Hsieh, C. (2013) Patent value assessment and commercialization strategy. *Technological forecasting & social change.* [Online] 80 (2), 307–319.

Hsu, D. H. & Ziedonis, R. H. (2013) Resources as dual sources of advantage: Implications for valuing entrepreneurial-firm patents. *Strategic management journal*. [Online] 34 (7), 761–781.

Ko, N., Jeong, B., Yoon, J. & Son, C. (2020) Patent-trademark linking framework for business competition analysis. *Computers in industry*. [Online] 122103242–.

Kotler, P. & Keller, K. L. (2015) *Marketing management*. 15th edition, global edition. Boston: Pearson.

Lee, M. & Lee, S. (2017) Identifying new business opportunities from competitor intelligence: An integrated use of patent and trademark databases. *Technological forecasting & social change*. [Online] 119170–183.

Levitas, E. & McFadyen, M. A. (2009) Managing liquidity in research-intensive firms: signaling and cash flow effects of patents and alliance activities. *Strategic management journal*. [Online] 30 (6), 659–678.

Long, C. (2002) Patent Signals. *The University of Chicago law review*. [Online] 69 (2), 625–679.

Mann, R. J. (2005) Do patents facilitate financing in the software industry? *Texas law review*. 83 (4), 961–.

Manu, F. A & Sriram, V. (1996) Innovation, marketing strategy, environment, and performance. *Journal of business research.* [Online] 35 (1), 79–91.

Martín-Sempere, M. J., Garzón-García, B. & Rey-Rocha, J. (2008) Scientists' motivation to communicate science and technology to the public: surveying participants at the Madrid Science Fair. *Public understanding of science (Bristol, England).* [Online] 17 (3), 349–367.

Martínez, C. (2010) Patent families: When do different definitions really matter? *Scientometrics.* [Online] 86 (1), 39–63.

Mavlanova, T., Benbunan-Fich, R. & Lang, G. (2016) The role of external and internal signals in E-commerce. *Decision Support Systems.* [Online] 8759–68.

Mendonça, S., Pereira, T. S. & Godinho, M. M. (2004) Trademarks as an indicator of innovation and industrial change. Research Policy. [Online] 33 (9)

Miller, T., & Triana, M. D. C. (2009) Demographic diversity in the boardroom: Mediators of the board diversity—firm performance relationship. *Journal of Management Studies.* [Online] 46, 755-786.

MSCI (2021) The Global Industry Classification Standard (GICS®) [Online]. Available at: https://www.msci.com/gics (Accessed 2 June 2021)

Mueller, H. & Nyfeler, T. (2011) Quality in patent information retrieval – Communication as the key factor. *World patent information.* [Online] 33 (4), 383–388.

Ndofor, H. A. & Levitas, E. (2016) Signaling the Strategic Value of Knowledge. *Journal of management.* [Online] 30 (5), 685–702.

Osterloh, M. & Frey, B. S. (2000) Motivation, Knowledge Transfer, and Organizational Forms. *Organization science (Providence, R.I.).* [Online] 11 (5), 538–550.

Parchomovsky, G. & Wagner, R. P. (2005) Patent Portfolios. *University of Pennsylvania law review.* [Online] 154 (1), 1–77.

Park, N. K., & Mezias, J. M. (2005) Before and after the technology sector crash: The effect of environmental munificence on stock market response to alliances of e-commerce firms. *Strategic Management Journal.* [Online] 26, 987-1007.

Percy, L. (2008) Strategic Integrated Marketing Communications: Theory and Practice. Burlington: Taylor & Francis Group.

Peeters, C. & van Pottelsberghe de la Potterie, B. (2006) Innovation strategy and the patenting behavior of firms. *Journal of evolutionary economics*. [Online] 16 (1), 109–135.

PRH (2019) What is a patent? [Online]. Available at: https://www.prh.fi/en/patentit/theabcofpatenting/whatisapatent.html (Accessed 2 November 2020)

PRH (2020) PRH:een tehdyt patenttihakemukset [Online]. Available at: https://www.prh.fi/fi/patentit/tilastoja/yrit_yksit.html (Accessed: 8 October 2020)

PRH (2021) PRH:een tehdyt patenttihakemukset kuukausittain [Online]. Available at: https://www.prh.fi/fi/patentit/tilastoja/patenttihakemukset.html (Accessed: 27 January 2021)

Prager, J., Guellec, D., & Madiès, T. (2014) Patent markets in the global knowledge economy: theory, empirics and public policy implications. Cambridge: Cambridge University Press.

Reitzig, M. (2003) What determines patent value? *Research policy.* [Online] 32 (1), 13–26.

Sapsalis, E., van Pottelsberghe de la Potterie, B., & Navon, R. (2006) Academic versus industry patenting: An in-depth analysis of what determines patent value. *Research policy.* [Online] 35 (10), 1631–1645.

Sauermann, H. & Wesley, M. C. (2010) What Makes Them Tick? Employee Motives and Firm Innovation. *Management science.* [Online] 56 (12), 2134–2153.

Saunders, M., Lewis, P., & Thornhill, A. (2016) Research methods for business students. Seventh edition. Harlow, Essex: Pearson Education.

Schmidt, M. (2013) Patent strategies in the process-related industries: outline of the problems. *R & D management*. [Online] 43 (3), 242–251.

Simmons, E. (2009) 'Black sheep' in the patent family. *World patent information*. [Online] 31 (1), 11–18.

Spence, M. (1973) Job Market Signaling. *The Quarterly Journal of Economics.* [Online] 87(3), 355-374.

Srivastava, J. (2001) The role of inferences in sequential bargaining with one-sided incomplete information: Some experimental evidence. *Organizational Behavior and Human Decision Processes.* [Online] 85, 166-187.

Stiglitz, J. E. (2000) The contributions of the economics of information to twentieth century economics. *Quarterly Journal of Economics*, 115: 1441-1478.

Striukova, L. (2007) Patents and corporate value creation: theoretical approach. *Journal of Intellectual Capital.* [Online] 8 (3), 431–443.

Trajtenberg, M. (1990) A Penny for Your Quotes: Patent Citations and the Value of Innovations. *The Rand journal of economics*. [Online] 21 (1), 172–187.

Tsai, M., Chuang, S. & Hsieh, W. (2009) An integrated process model of communication satisfaction and organizational outcomes. *Social behavior and personality*. [Online] 37 (6), 825–834.

van Zeebroeck, N. (2011) The puzzle of patent value indicators. *Economics of innovation and new technology.* [Online] 20 (1), 33–62.

van Zeebroeck, N. & van Pottelsberghe de la Potterie, B. (2011) The vulnerability of patent value determinants. *Economics of Innovation and New Technology*. [Online] 20 (3), 283–308.

Varey, R. (2002) Marketing communication: principles and practice. Routledge.

Veer, T. & Jell, F. (2012) Contributing to markets for technology? A comparison of patent filing motives of individual inventors, small companies and universities. *Technovation.* [Online] 32 (9-10), 513–522.

WIPO (2019a) Patent Cooperation Treaty Yearly Review 2019. [online] Geneva: WIPO, 18-32. Available at: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_901_2019.pdf. (Accessed: 8 October 2020)

WIPO (2019b) WIPO 2018 IP Services: Innovators File Record Number of International Patent Applications, With Asia Now Leading. [Online]. Available at: https://www.wipo.int/pressroom/en/articles/2019/article_0004.html (Accessed: 8 October 2020)

WIPO (2020a) Patents. [Online]. Available: https://www.wipo.int/patents/en/ (Accessed 2 November 2020)

WIPO (2020b) Summary of 2019/2020 PCT User Satisfaction Survey Results. [Online]. Available at: https://www.wipo.int/export/sites/www/pct/en/activity/pct_user_survey_2019_2020.pdf. (Accessed 1 December 2020)

Wu, Y., Welch, E., & Huang, W. (2015) Commercialization of university inventions: Individual and institutional factors affecting licensing of university patents. *Technovation.* [Online] 36-3712–25.

Yoon, K. (2011) Detecting signals of new technological opportunities using semantic patent analysis and outlier detection. *Scientometrics*. [Online] 90 (2), 445–461.

Zhou, H., Sandner, P. G., Martinelli, S. L. & Block, J. H. (2016) Patents, trademarks, and their complementarity in venture capital funding. *Technovation.* [Online] 4714–22.

APPENDICES

Appendix A. Questionnaire

BACKGROUND

Q1 What is your role in your company?

- Blue collar
- Manager
- Director
- Executive
- Something else, what?

Q2 Have you ever been in the role of inventor in a patent or patent application?

- Yes
- No

Q3 How do you assess your understanding of the purposes and uses of patents?

- Very good understanding
- Good understanding
- Fair understanding
- Poor understanding
- Very poor understanding

Q4 How do you rate your knowledge of your company's patents and patenting activities?

- Very good knowledge
- Good knowledge
- Fair knowledge
- Poor knowledge
- Very poor knowledge

Q5 In your work, how often are your tasks related to patents?

- Daily
- Weekly
- Monthly
- Yearly
- Less than yearly

PRESENT – OWN COMPANY

Select an answer (or answers) that best represents *your personal opinion*. Please note that questions in this section concern only your company's patents (not competitor patents).

Please indicate how strongly you agree or disagree with the following statements. (Questions 6-10)

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q6 I am satisfied with the frequency of the patent information I receive from my company.

Q7 I am satisfied with the amount of the patent information I receive from my company.

Q8 I find it easy do you find to interpret the patent information communicated to me.

Q9 The patent information communicated to me is useful.

Q10 In general, I am happy with the current way patent information is communicated to me.

Q11 How do you prefer to get information about patents? **You can choose one or more options.**

- By email
- From intranet
- Using a collaboration tool, e.g. Microsoft Teams
- Something else, what?

PRESENT – COMPETITORS

Select an answer (or answers) that best represents *your personal opinion*. Please note that questions in this section concern only your competitor patents (not your company's own patents).

Please indicate how strongly you agree or disagree with the following statements. (Questions 12-16)

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q12 I am satisfied with the frequency of the competitor patent information I receive from my company.

Q13 I am satisfied with the amount of the competitor patent information I receive from my company.

Q14 I find it easy do you find to interpret the competitor patent information communicated to me.

Q15 The competitor patent information communicated to me is useful.

Q16 In general, I am happy with the current way competitor patent information is communicated to me.

Q17 How do you prefer to get information about competitor patents? **You can choose one or more options.**

- By email
- From intranet
- Using a collaboration tool, e.g. Microsoft Teams
- Something else, what?

FUTURE COMMUNICATION

Select an answer (or answers) that best represents *your personal opinion.*

Please indicate how strongly you agree or disagree with the following statements. (Questions 18-21)

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q18 I believe patents' role in communication in my company should increase in the future.

Q19 In the future, I hope to receive more information about patents than I currently do.

Q20 In the future, the company should tell about their patents and patent-related activities more actively than they currently do in their internal communication (e.g. to employees).

Q21 In the future, the company should tell about their patents and patent-related activities more actively than they currently do in their external communication (e.g. to investors, partners, customers)

Q22 In the future, what kind of information do you wish to receive? **You can choose one or more options.**

- Information about your company's granted patents
- Information about competitors' granted patents
- Information about your company's products that utilize a patented technology
- Something else, what?

Q23 For what purposes you believe you may need information about patents in the future? **You can choose one or more options.**

- Product development
- To avoid patent infringement
- To cheer up innovating
- Something else, what?

INTERNAL COMMUNICATION

Select an answer (or answers) that best represents *your personal opinion.* Please note that questions in this section concerns only internal communication, i.e., communication that happen between or among employees in your company.

Q24 For what internal purposes do you need patent information? (you can choose one or more options) **You can choose one or more options.**

- Product development
- To avoid patent infringement
- To cheer up innovating
- Other, what?

Please indicate how strongly you agree or disagree with the following statements. (Questions 25-26)

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q25 It is important to communicate about the company's patents inside the company.

Q26 Patent information is used in my company's internal communication to send a message about a competitive advantage the company possess in a certain market.

Q27 Which of the following factors could improve the current internal patent communication, if any? You can choose one or more options.

- Better tools
- Trainings about patents
- Increasing communication frequency
- Increasing amount of communication
- None of these
- Something else, what
- There is no need for improvement

Q28 With which of the following departments is it important to share patent information? **You can choose one or more options.**

- Management
- R&D
- Production
- Marketing & sales
- Human resource
- Legal
- Accounting and finance
- None of these
- Someone else, who

Q29 Which of the following competencies is your company able to communicate through internal patent communication? You can choose or more options. **You can choose one or more options.**

- Innovativeness
- Possess of inventions that are valuable
- Able to grow in the future
- Being a high-quality firm
- Possess of valuable technology
- Having new technological opportunities

- Something else, what?
- None of these
- My company does not communicate about patents inside the company

Q30 Which of the following competencies does your company want to communicate through internal patent communication? **You can choose one or more options.**

- Innovativeness
- Possess of inventions that are valuable
- Able to grow in the future
- Being a high-quality firm
- Possess of valuable technology
- Having new technological opportunities
- Something else, what?
- None of these
- My company does not communicate about patents inside the company

Q31 Which of the following are reasons for your company to communicate about patents internally? **You can choose one or more options.**

- Signaling the competencies mentioned in the previous question
- Improving the corporate image
- Providing motivation for employees to invent
- Providing a measure of R&D productivity
- Something else, what?
- None of these
- Patents are not communicated inside the company to protect our operations
- Patents are not communicated inside the company for other reasons

EXTERNAL COMMUNICATION

Select an answer (or answers) that best represents *your personal opinion.* Please note that questions in this section concerns only external communication, i.e., communication where one party represents your company and the other party represents someone outside of your company.

Q32 For what external purposes do you need the patent information?

- To communicate with partners
- To communicate with customers
- To communicate with investors
- Other, what?

Please indicate how strongly you agree or disagree with the following statements. (Questions 33-36)

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

Q33 It is important to communicate about the company's patents to your company's partners.

Q34 It is important to communicate about the company's patents to your company's investors.

Q35 It is important to communicate about the company's patents to your company's customers.

Q36 Patent information is used in my company's external communication to send a message about a competitive advantage the company possess in a certain market.

Q37 Which of the following factors could improve the current internal patent communication, if any? **You can choose one or more options.**

- Better tools
- Trainings about patents
- Increasing communication frequency
- Increasing amount of communication
- None of these
- Something else, what
- There is no need for improvement

Q38 Which of the following competencies is your company able to communicate through external patent communication? **You can choose one or more options.**

- Innovativeness
- Possess of valuable inventions
- Able to grow in the future
- Being a high-quality firm
- Possess of valuable technology
- Having new technological opportunities
- Something else, what?
- None of these
- Patents are not communicated to outsiders

Q39 Which of the following competencies does your company want to communicate through external patent communication? **You can choose one or more options.**

- Innovativeness
- Possess of valuable inventions
- Able to grow in the future
- Being a high-quality firm
- Possess of valuable technology
- Having new technological opportunities
- Something else, what?
- None of these
- Patents are not communicated to outsiders

Q40 Which of the following are reasons for your company to communicate about patents externally? **You can choose one or more options.**

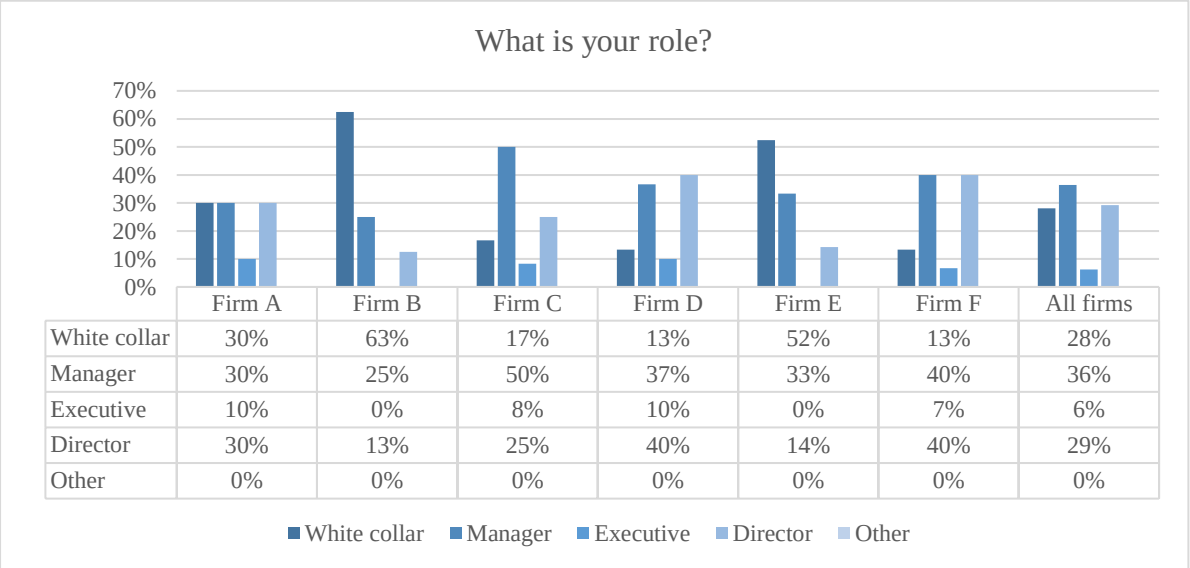
- Signaling the competencies mentioned in the previous question
- Bargaining related reasons e.g. advancing licensing or collaborations opportunities
- Improving the corporate image
- Attracting external financing
- Patents are not communicated to outsiders of my company to protect our operations
- Patents are not communicated to outsiders of my company for other reasons
- None of these

Appendix B. Survey questions linked to the topics of the study and research questions

Topic	Survey questions	Research question
Background	Q1-Q5	-
Stakeholders	Q28, Q32-Q35	RQ2
Value signaling	Q29-Q30, Q38-Q39	RQ3
Motives	Q31, Q40	RQ4
Satisfaction	Q6-Q27, Q36-Q37	RQ5

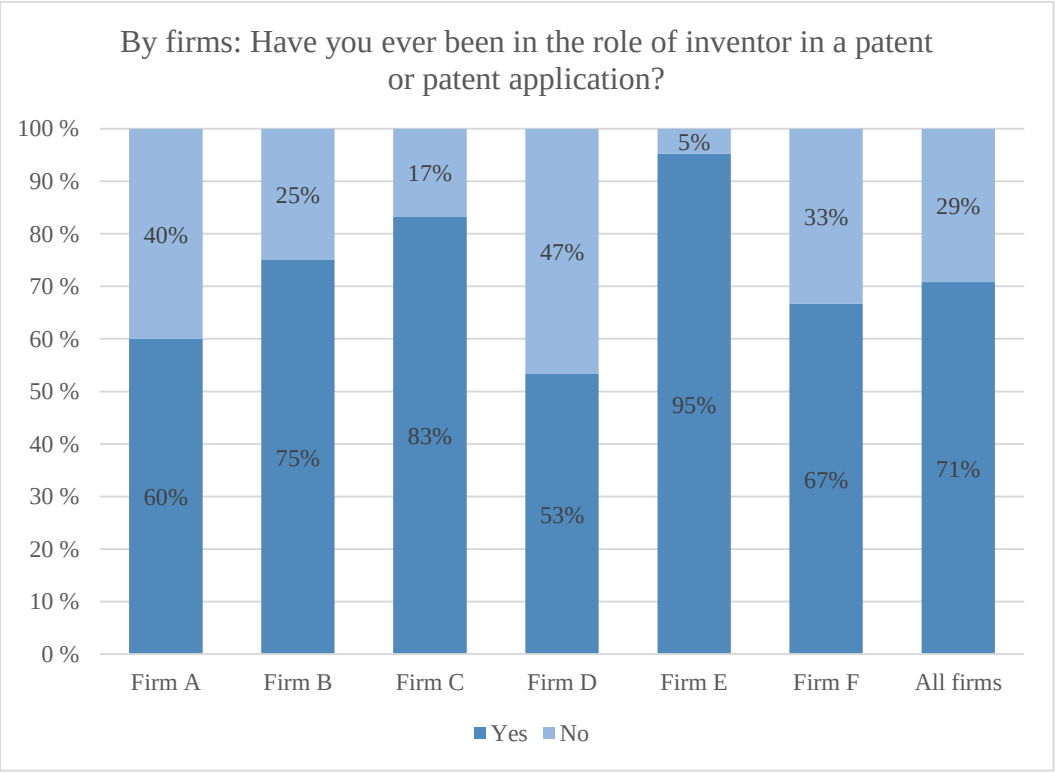
Appendix C. Figures of selected questionnaire responses

I Background questions, answers by firms

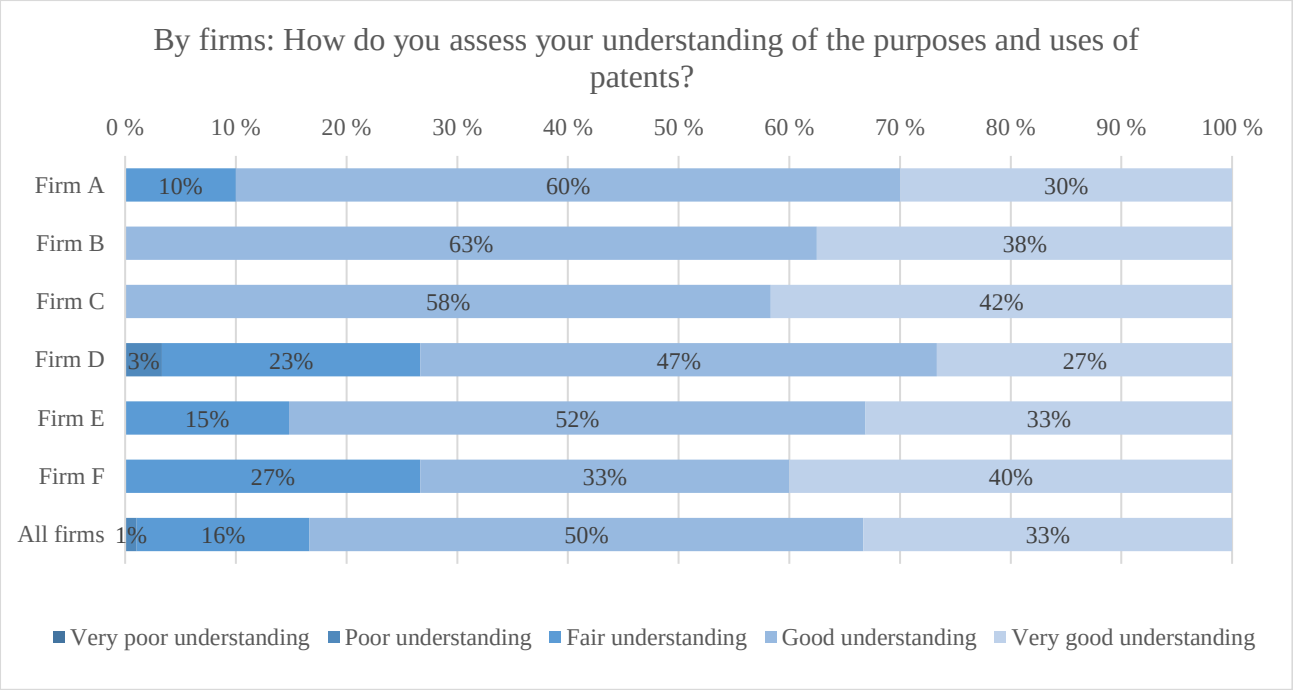


	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	All firms
White collar	30%	63%	17%	13%	52%	13%	28%
Manager	30%	25%	50%	37%	33%	40%	36%
Executive	10%	0%	8%	10%	0%	7%	6%
Director	30%	13%	25%	40%	14%	40%	29%
Other	0%	0%	0%	0%	0%	0%	0%

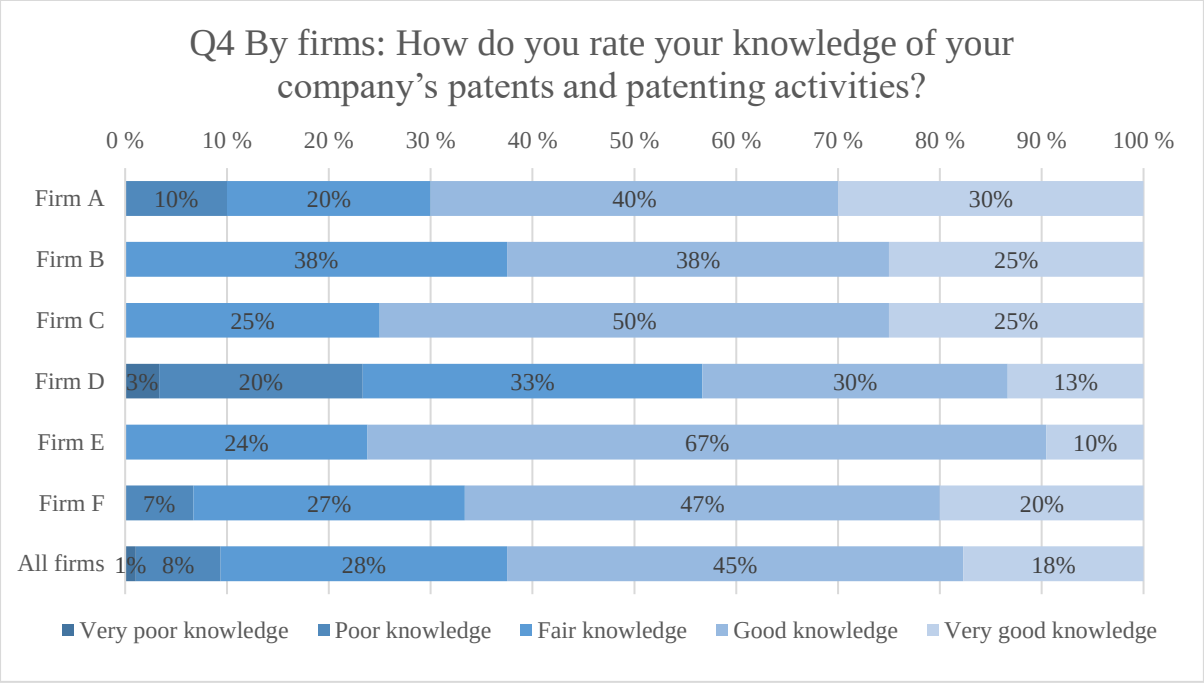
C1. Roles of the respondents, by firms



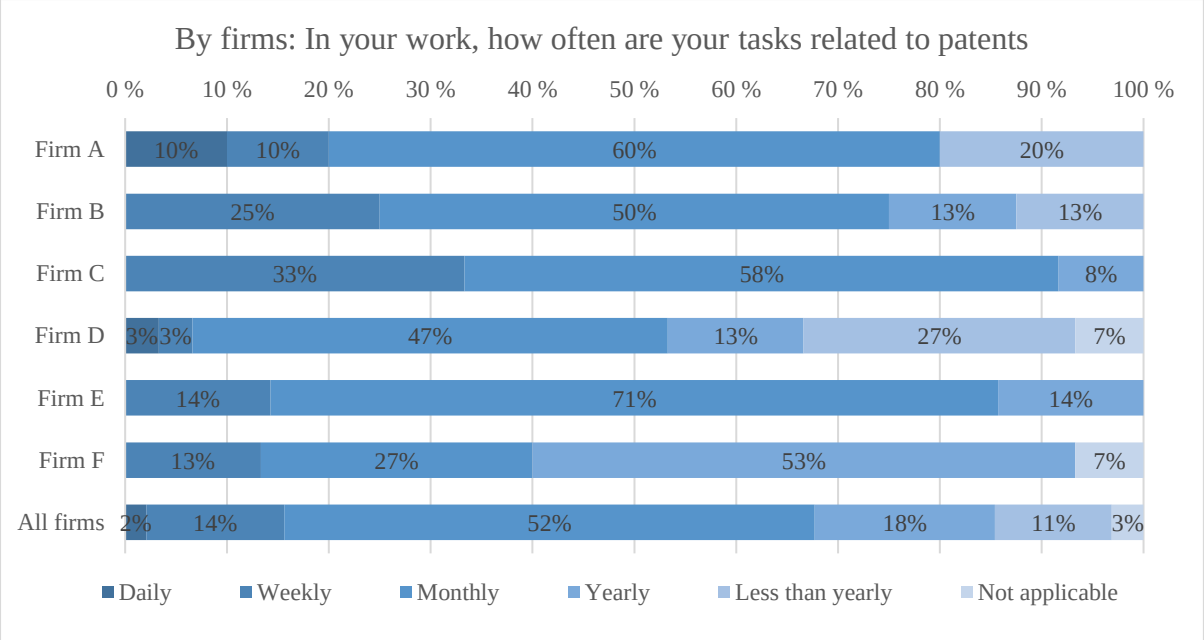
C2. Have you ever been in the role of inventor in a patent or patent application? – Firm-level responses



C3. How do you assess your understanding of the purposes and uses of patents? – Firm-level responses

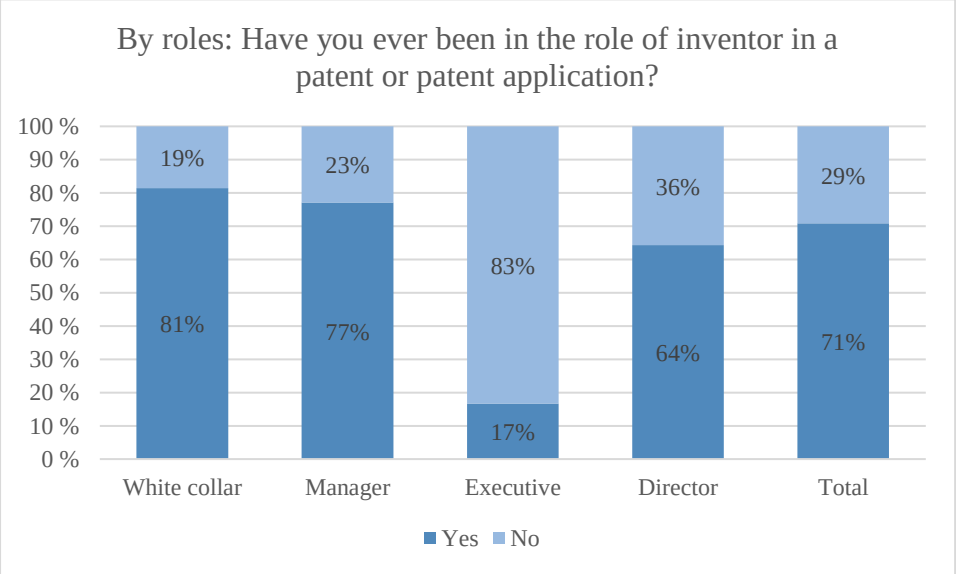


C4. How do you rate your knowledge of your company's patents and patenting activities? – Firm-level responses

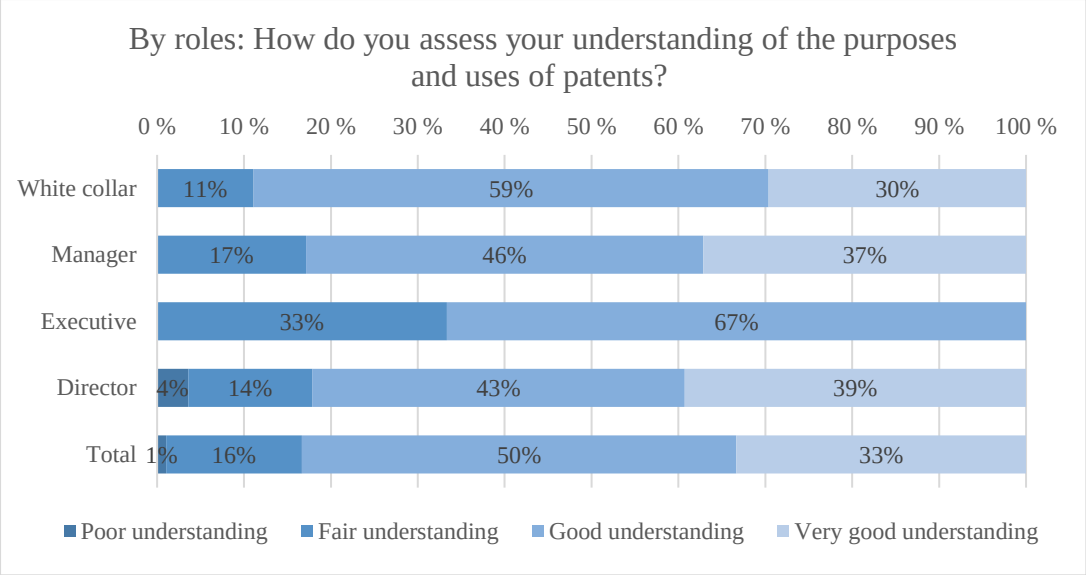


C5. In your work, how often are your tasks related to patents? – Firm-level responses

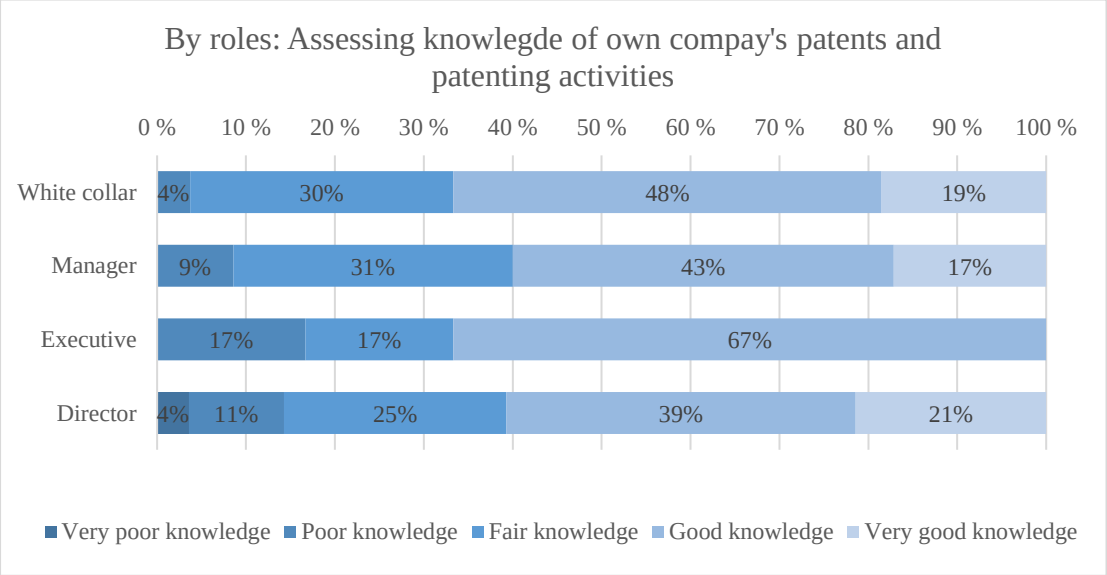
II Background questions, answers by roles



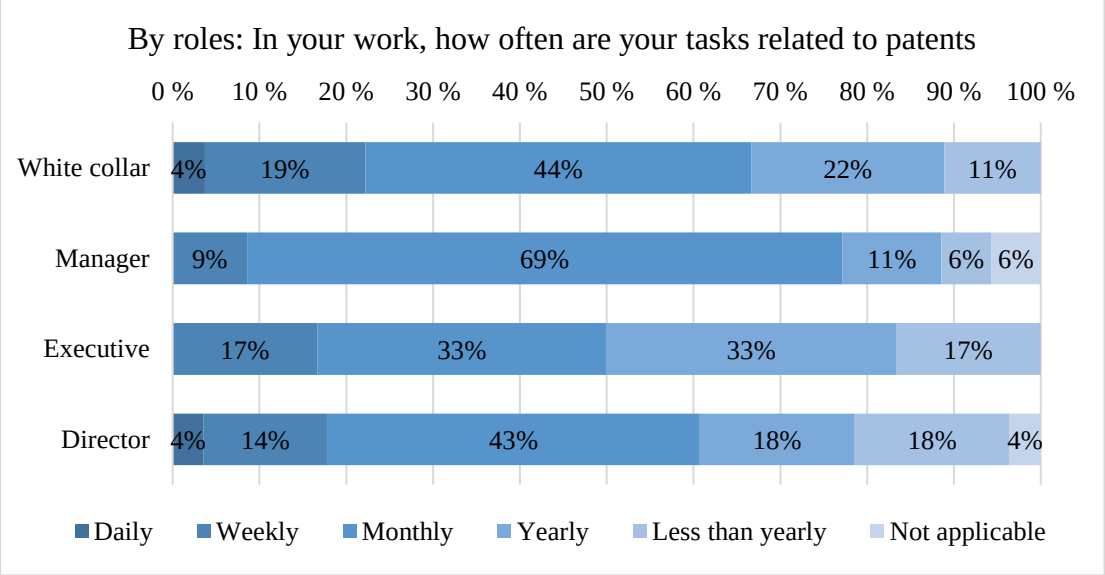
C6. Have you ever been in the role of inventor in a patent or patent application? – Role-level responses



C7. How do you assess your understanding of the purposes and uses of patents? – Role-level responses

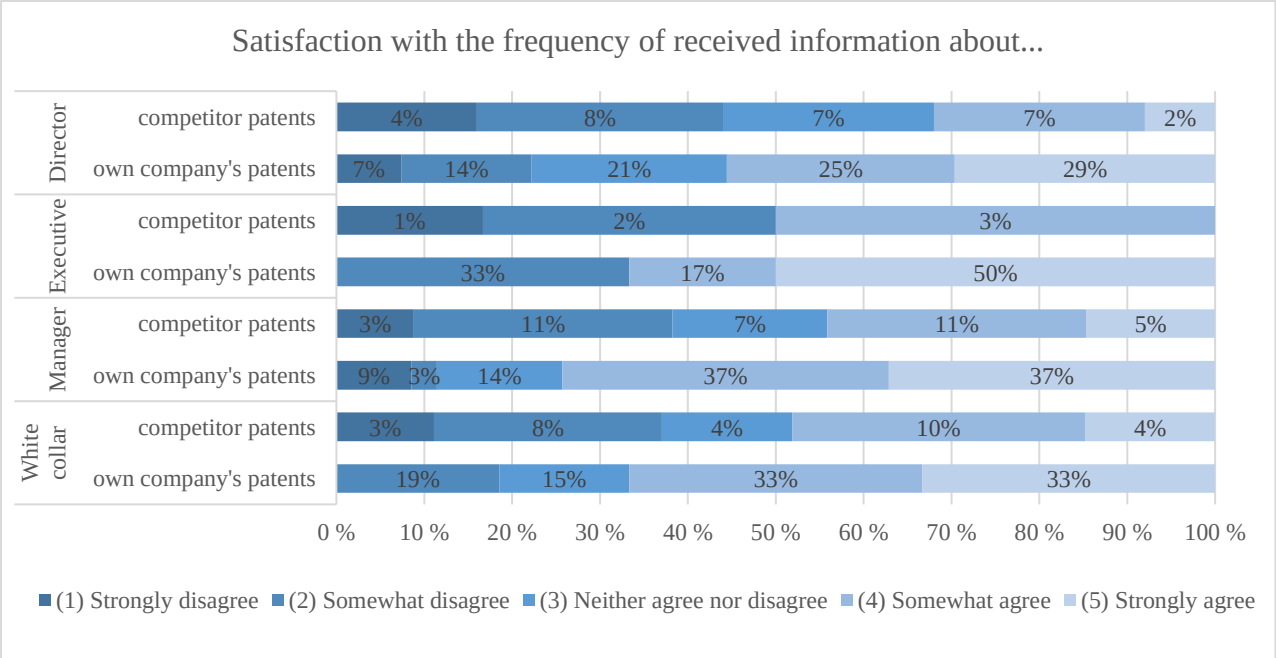


C8. How do you rate your knowledge of your company's patents and patenting activities? – Role-level responses

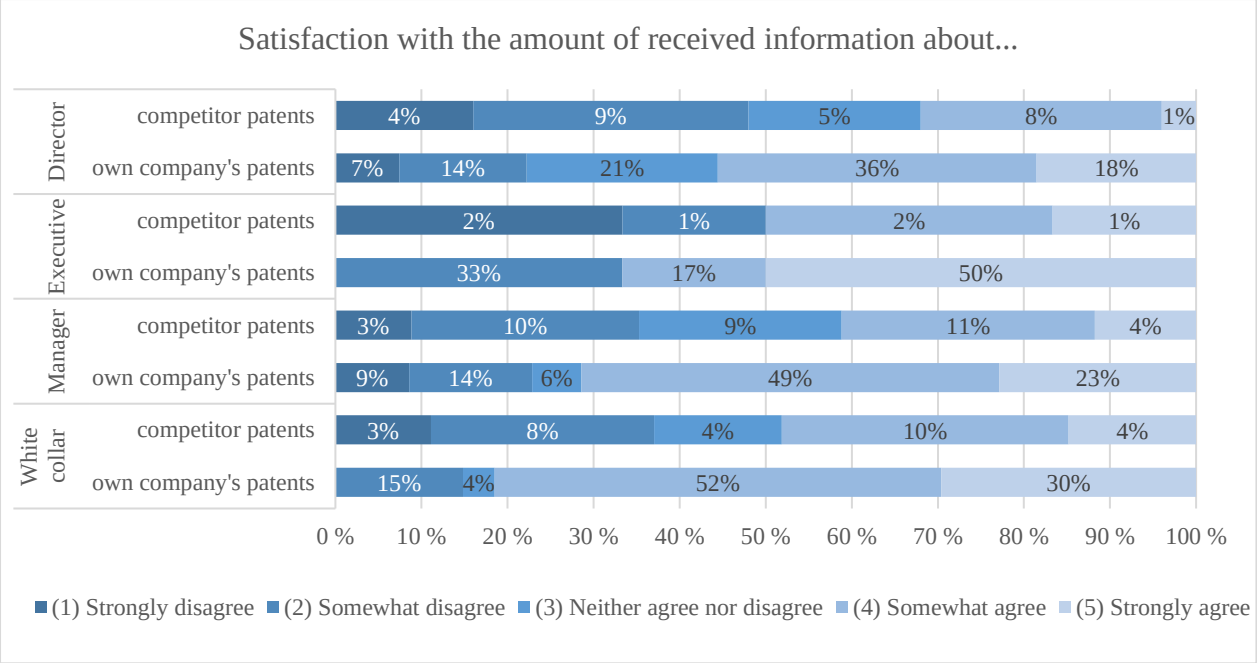


C9. In your work, how often are your tasks related to patents? – Role-level responses

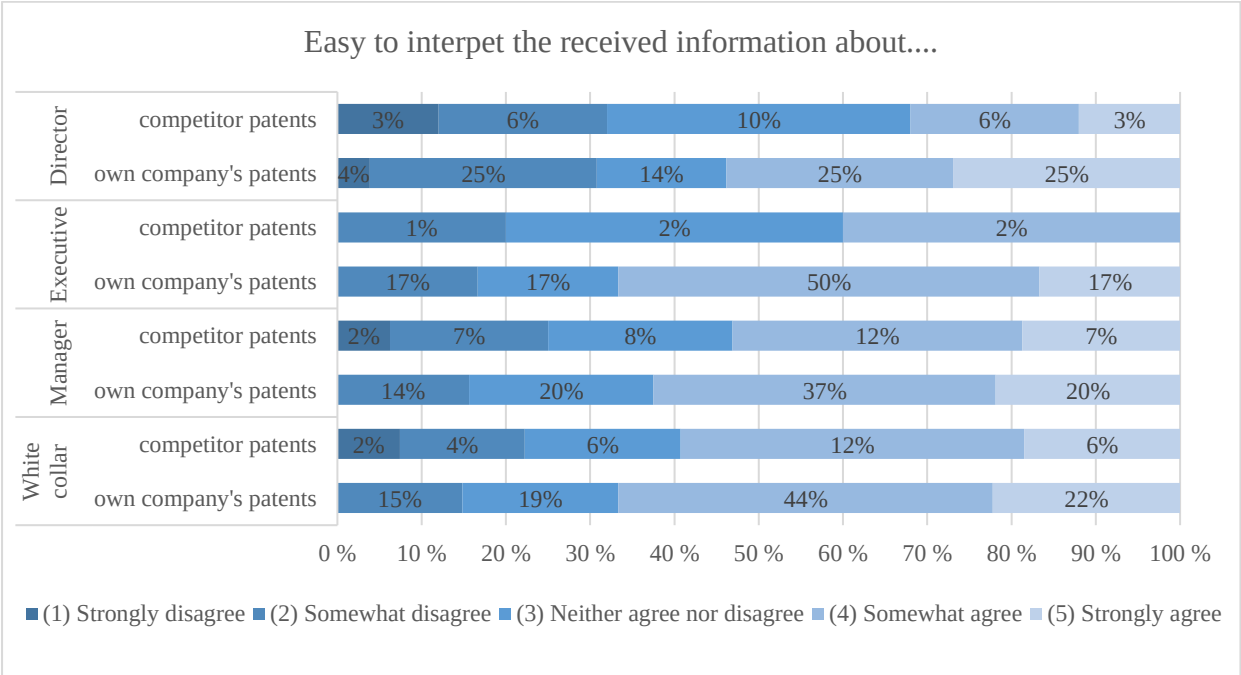
III Satisfaction questions, answers by roles



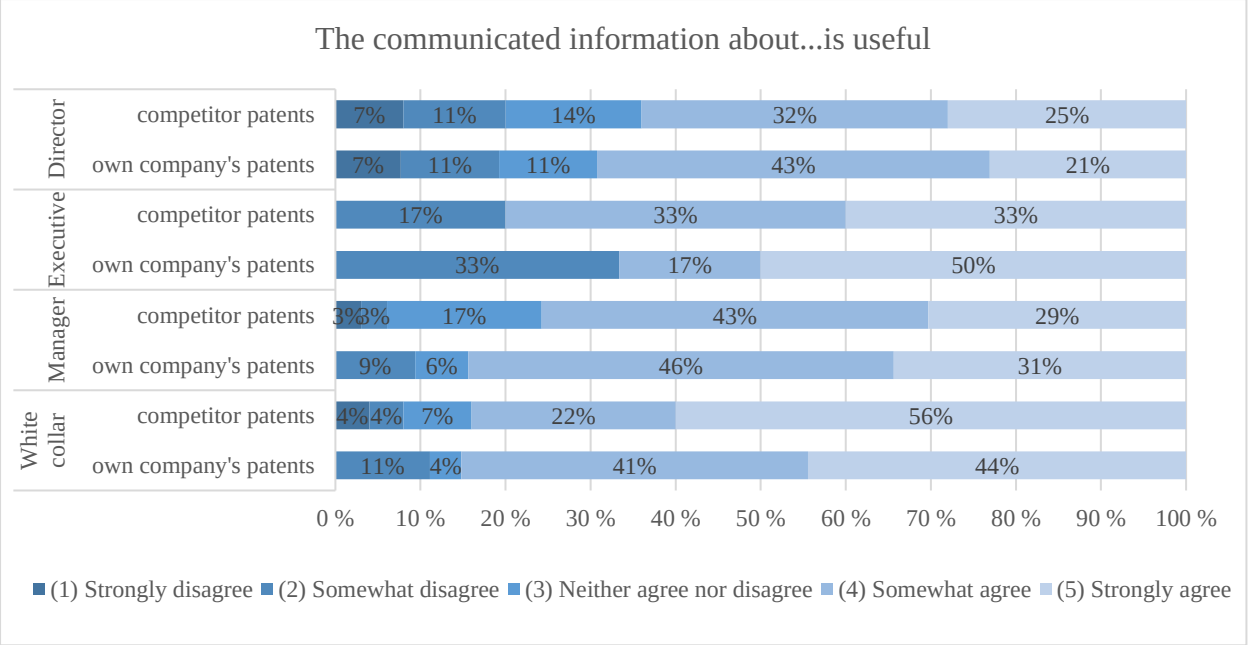
C10. Satisfaction with the frequency of patent information regarding the company's patents and competitor patents received from the company, answers by roles



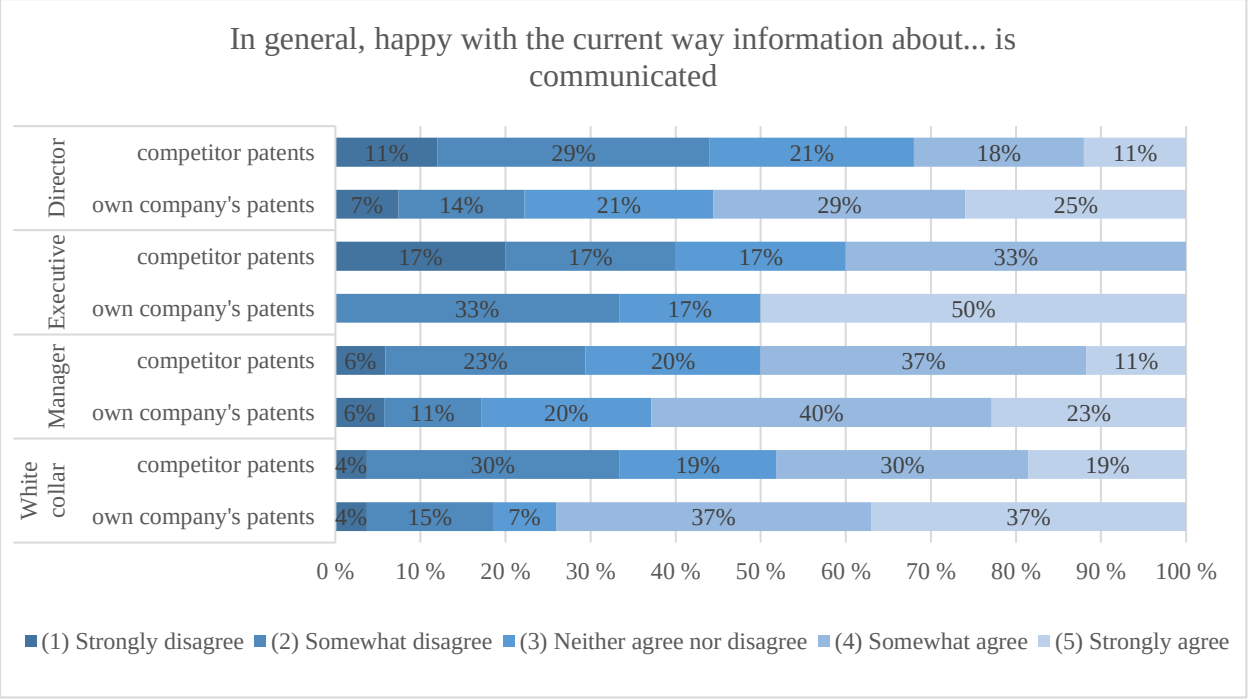
C11. Satisfaction with the amount of patent information regarding the company's patents and competitor patents received from the company, answers by roles



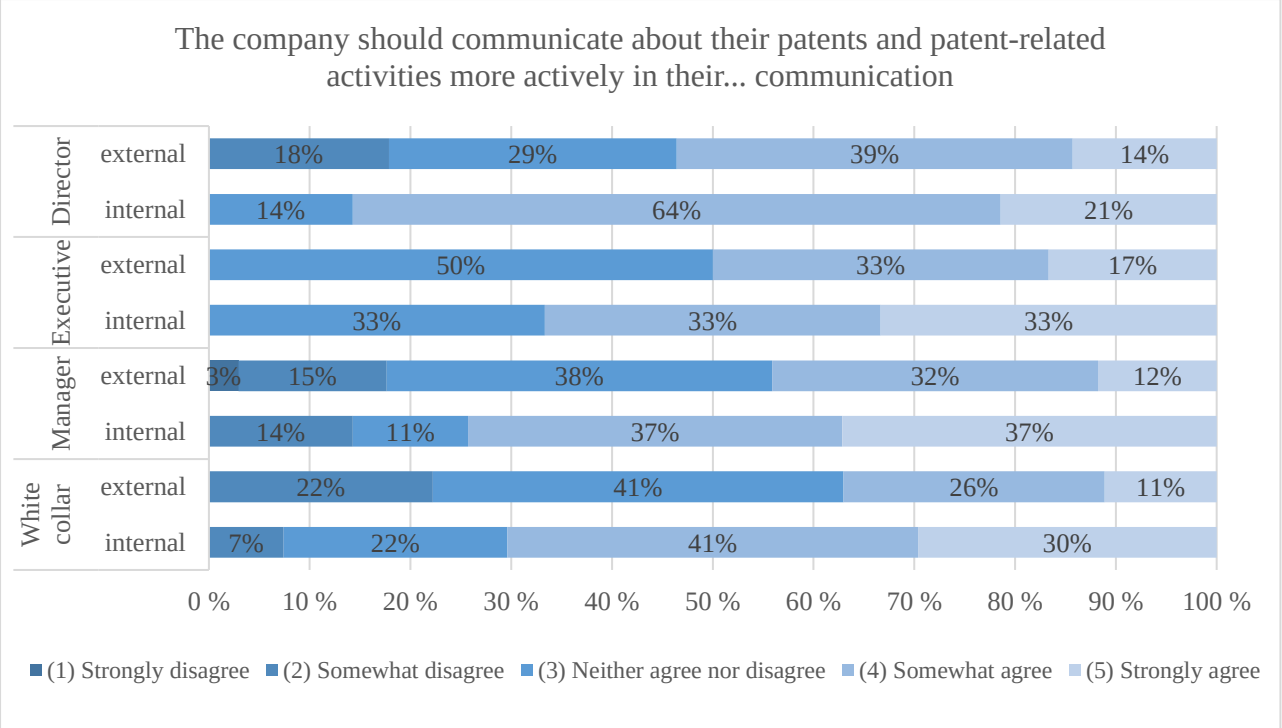
C12. Easy to interpret the received information about own company's patents and competitor patents, answers by roles



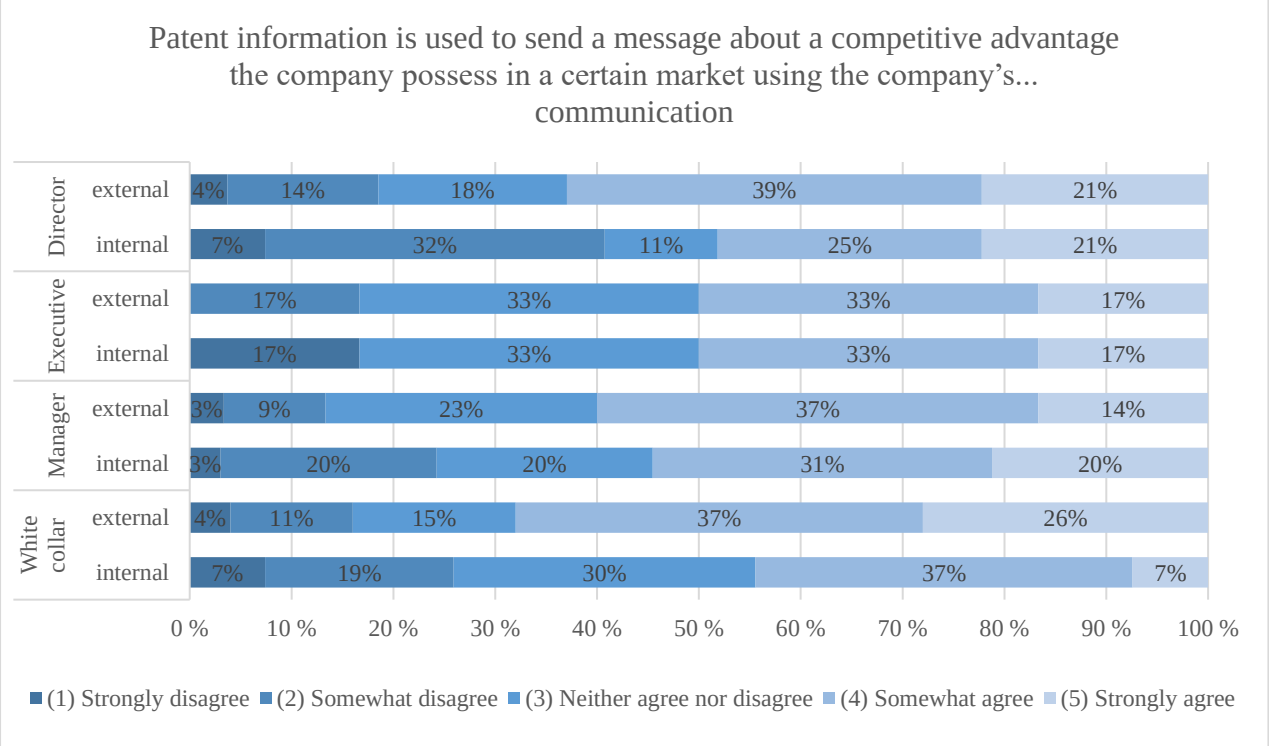
C13. The usefulness of communicated information about own company's patents and competitor patents, answers by roles



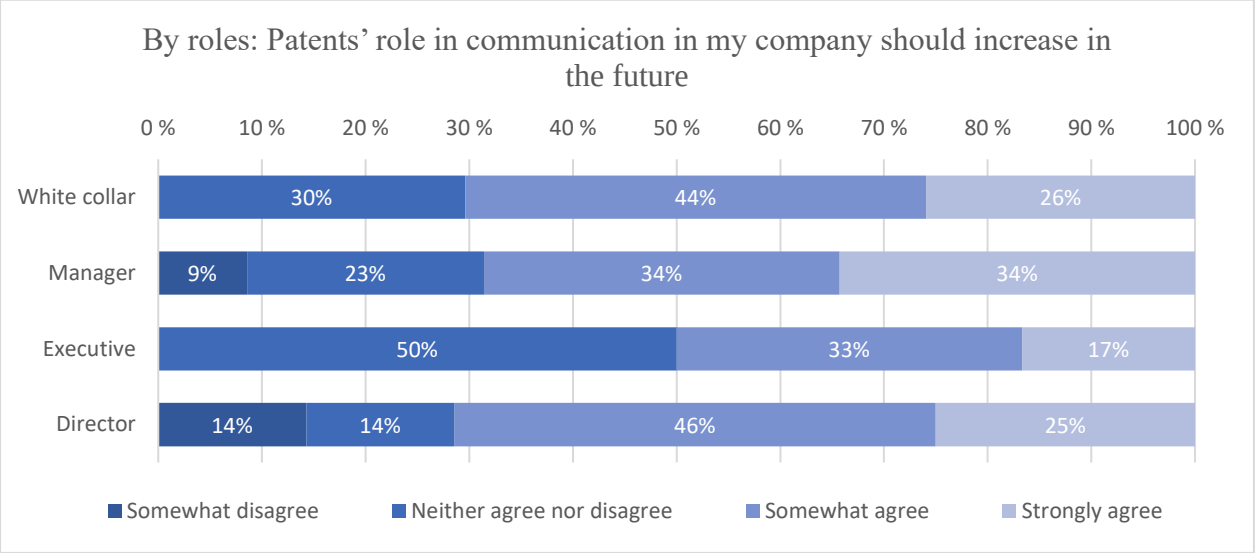
C14. In general, happy with the current way information about own company's patents and competitor patents is communicated, answers by roles



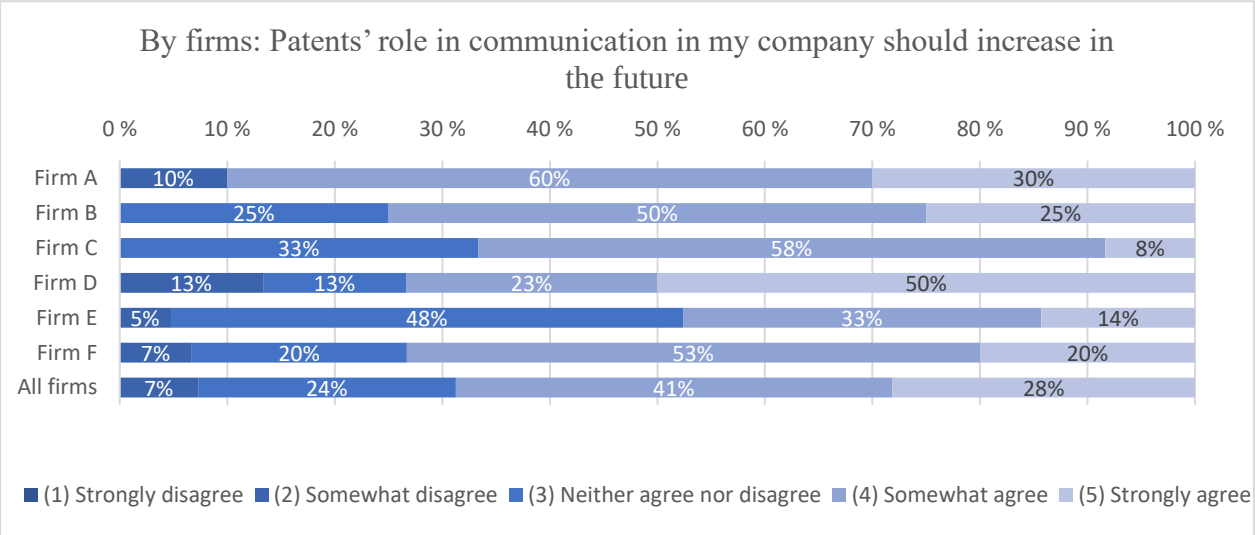
C15. The company should communicate about their patents and patent-related activities more actively in their internal and external communication, answers by roles



C16. Patent information is used in the company's internal/external communication to send a message about a competitive advantage the company possess in a certain market, answers by roles



C17. Patents' role in communication in my company should increase in the future– Role-level responses



C17. Patents' role in communication in my company should increase in the future– Firm-level responses

Appendix D. Means and standard deviations of ordinal scale questions

Question	(1 Strongly disagree – 5 Strongly agree)	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	White collars	Managers	Executives	Directors	All
Q6 I am satisfied with the frequency of the patent information I receive from my company. – own patent information	Mean	3.7	4	4.42	3.45	4.10	3.4	3.81	3.91	3.83	3.56	3.78
	Standard deviation	1.567021	1.069045	1.240112	1.297971	.830949	1.055597	1.1106837	1.197336	1.4719601	1.2810252	1.204415
Q7 I am satisfied with the amount of the patent information I receive from my company. – own patent information	Mean	3.70	4.13	3.83	3.28	4.20	3.4	3.96	3.63	3.83	3.44	3.68
	Standard deviation	1.418136	.9910312	1.267304	1.306483	.6015852	1.121224	.97985405	1.2387307	1.4719601	1.1875422	1.169317
Q8 I find it easy do you find to interpret the patent information communicated to me. – own patent information	Mean	3.6	4	3.91	3.48	.3.71	3.43	3.74	3.75	3.67	3.46	3.64
	Standard deviation	1.429841	.9258201	.9438798	1.051386	.9561829	1.2225	.98420576	.99798183	1.0327956	1.2721877	1.069958
Q9 The patent information communicated to me is useful. – own patent information	Mean	4	4.5	4.25	3.77	4.41	3.57	4.19	4.09	3.83	3.65	3.98
	Standard deviation	1.333333	1.069045	.8660254	1.176697	.853564	.9376145	.96225045	.89296082	1.4719601	1.1980754	1.053861
Q10 In general, I am happy with the current way patent information is communicated to me. – own patent information	Mean	3.9	4.5	3.83	3.21	4	3.4	3.89	3.63	3.67	3.52	3.67
	Standard deviation	1.595131	.7559289	.7559289	1.372675	.7745967	1.121224	1.1875422	1.1398069	1.5055453	1.2517794	1.197889

Question	(1 Strongly disagree – 5 Strongly agree)	**Firm A**	**Firm B**	**Firm C**	**Firm D**	**Firm E**	**Firm F**	**White collars**	**Managers**	**Executives**	**Directors**	**All**
Q12 I am satisfied with the frequency of the competitor patent information I receive from my company. - competitor patent information	Mean	3	2.5	3.92	3	3.24	2.33	3.15	3.12	2.83	2.8	3.02
	Standard deviation	1	1.309307	1.311372	1.38675	1.044259	.8997354	1.2920974	1.2495989	1.3291601	1.2247449	1.248984
Q13 I am satisfied with the amount of the competitor patent information I receive from my company. - competitor patent information	Mean	3	2.5	3.83	2.85	3.26	2.4	3.15	3.09	2.83	2.72	2.99
	Standard deviation	1	1.309307	1.193416	1.406132	1.101946	.910259	1.2920974	1.1900509	1.7224014	1.1733144	1.244721
Q14 I find it easy do you find to interpret the competitor patent information communicated to me. -competitor patent information	Mean	3.89	3.13	3.58	3	3.48	3.07	3.48	3.41	3.2	3	3.30
	Standard deviation	.9279607	1.457738	.9962049	1.215838	1.209093	1.099784	1.1887411	1.1875531	.83666003	1.1902381	1.171678
Q15 The competitor patent information communicated to me is useful. -competitor patent information	Mean	4.56	4	4.58	3.78	4.10	3.27	4.32	3.97	4	3.64	3.98
	Standard deviation	.7264832	1.511858	.5149287	1.204406	.9436505	1.099784	1.0692677	.95147414	1.2247449	1.2543258	1.103571
Q16 In general, I am happy with the current way competitor patent information is communicated to me. - competitor patent information	Mean	3.11	2.75	3.58	3.15	3.33	2.73	3.3	3.26	2.8	2.88	3.14
	Standard deviation	.9279607	1.38873	1.083625	1.286618	1.154701	1.162919	1.2030351	1.1364171	1.3038405	1.2355835	1.18857

Question	(1 Strongly disagree – 5 Strongly agree)	**Firm A**	**Firm B**	**Firm C**	**Firm D**	**Firm E**	**Firm F**	**White collars**	**Managers**	**Executives**	**Directors**	**All**
Q18 I believe patents' role in communication in my company should increase in the future.	Mean	4.1	4	3.75	4.1	3.57	3.87	3.96	3.94	3.67	3.82	3.90
	Standard deviation	.875595	.7559289	.6215816	1.09387	.8106435	.8338094	.75861622	.96840855	.81649658	.98332661	.9000487
Q19 In the future, I hope to receive more information about patents than I currently do.	Mean	3.7	3.88	3.33	3.9	3.57	4.07	3.85	3.86	3.67	3.57	3.76
	Standard deviation	.9486833	.6408699	.7784989	.9948141	.9258201	.5936168	.90739287	.87926631	.81649658	.87891227	.8795309
Q20 In the future, the company should tell about their patents and patent-related activities more actively than they currently do in their internal communication (e.g. to employees).	Mean	4.4	4.25	3.67	4.23	3.48	4.07	3.93	3.97	4	4.07	3.99
	Standard deviation	.5163978	1.035098	.7784989	.7738544	.9283883	.8837151	.91676379	1.0427823	.89442719	.60421798	.8765337
Q21 In the future, the company should tell about their patents and patent-related activities more actively than they currently do in their external communication (e.g. to investors, partners, customers)	Mean	4	3.25	3.42	3.53	2.86	3.53	3.26	3.35	3.67	3.5	3.39
	Standard deviation	.8660254	1.164965	.9003366	1.008014	.5732115	.9904304	.94431874	.98110491	.81649658	.96225045	.9486243
Q25 It is important to communicate about the company's patents inside the company.	Mean	4.9	4.5	4.92	4.34	4.48	4.2	4.56	4.56	4.17	4.43	4.50
	Standard deviation	.3162278	.7559289	.2886751	.8567322	.6015852	.4140393	.64051262	.61255434	.98319208	.69006556	.666424

Question	(1 Strongly disagree – 5 Strongly agree)	**Firm A**	**Firm B**	**Firm C**	**Firm D**	**Firm E**	**Firm F**	**White collars**	**Managers**	**Executives**	**Directors**	**All**
Q26 Patent information is used in my company's internal communication to send a message about a competitive advantage the company possess in a certain market.	Mean	2.9	3.25	3.08	3.43	3.65	3.13	3.19	3.48	3.33	3.22	3.31
	Standard deviation	1.197219	1.035098	1.240112	1.372442	.933302	1.187234	1.0754976	1.1489455	1.3662601	1.3397283	1.188518
Q33 It is important to communicate about the company's patents to your company's partners.	Mean	4.56	3.88	3.42	3.39	3.45	3.67	3.85	3.5	3.67	3.5	3.61
	Standard deviation	.5270463	.9910312	1.1645	1.196887	.8870412	.6172134	.96715284	.87988269	1.2110601	1.1706282	1.01588
Q34 It is important to communicate about the company's patents to your company's investors.	Mean	4.67	4.43	4.5	3.96	3.8	3.93	3.92	4.32	3.67	4.11	4.1
	Standard deviation	.5	.5345225	.797724	1.055443	.7677719	.7988086	.93479739	.7910793	1.2110601	.80064077	.8747391
Q35 It is important to communicate about the company's patents to your company's customers.	Mean	4.44	4.63	4.25	3.64	4.4	3.47	4.19	4.03	3.83	3.89	4.02
	Standard deviation	.8819171	.5175492	.6215816	1.193013	.88258	.7432234	1.0590271	.86077141	1.1690452	1.0659472	.9942501
Q36 Patent information is used in my company's external communication to send a message about a competitive advantage the company possess in a certain market	Mean	3	3.75	3.91	3.59	3.74	3.79	3.76	3.6	3.5	3.63	3.65
	Standard deviation	1.322876	1.164965	1.044466	1.083416	1.045738	.8017837	1.1284207	1.0034424	1.0488088	1.1145247	1.061768