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# **Searching for a suitable patent system for Finnish SMEs**

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**TIIVISTELMÄ:**

Suomalaiset pienet ja keskisuuret yritykset (pk-yritykset) haluavat olla mukana maailmanlaajuisessa teknologisessa kehityksessä ja kasvattaa liiketoimintaansa erilaisten innovaatioiden avulla. Näitä innovaatioita pitää suojella kansallisesti ja kansainvälisesti. Lainsäädäntö on kehittänyt tätä varten immateriaalioikeudet, joista tässä työssä käsitellään patenttia. Patentti antaa yksinoikeuden keksintöön sekä suojaa teknisiä ja teollisia innovaatioita väärinkäytöltä. Samalla se voi rajata kilpailua. Monet suomalaiset pk-yritykset ovat kasvavassa määrin hyödyntämässä patenttisuojaa omiin innovaatioihinsa, mutta koko ajan lisääntyvä patenttidata ja -työkalujen määrä sekä hajanaisuus aiheuttavat haasteita oikean patenttijärjestelmän löytämiselle. Tässä työssä käsitellään neljää patenttijärjestelmää, kansainvälinen, eurooppa-, yhtenäis- ja kansallinen patenttijärjestelmä, koska ne antavat laajan vertailupohjan sekä ovat suomalaisten pk-yritysten innovaatioiden suojaamiseen mahdollisia järjestelmiä.

Patenttia suunnittelevien suomalaisten pk-yritysten olisi hyvä ymmärtää patenttilainsäädäntö sekä patenttijärjestelmät. Lisäksi niiden tulisi ottaa huomioon erilaiset ulkoiset tekijät, kuten ympäristönsuojelu ja muut lait. Yrityksellä pitäisi olla myös valmiina riittävän selkeä liiketoiminta- sekä taloudellinen suunnitelma. Tämä tutkielma pyrkii vastaamaan näihin haasteisiin tarjoamalla suomalaisille pk-yritykselle sopivat patenttityökalut oikean patenttijärjestelmän löytämiselle. Pk-yritysten liiketoimintaympäristön, koon ja innovaatiobudjetin vaihtelun vuoksi työ jättää yksittäiselle yritykselle mahdollisuuden itse valita tietty patenttijärjestelmä omien rajojensa puitteissa. Tutkielma on toteutettu oikeusdogmaattisena tutkimuksena laajan oikeudellisen aineiston, kuten lakien ja oikeuskirjallisuuden, avulla. Lisäksi siinä hyödynnetään monia kaupallistaloudellisia lähteitä, joita ovat esimerkiksi tieteelliset artikkelit, tutkimukset sekä tilastot.

Patenttityökaluja on monia, ja ne voidaan jakaa patenttijohtamisen, -strategian, taloudellisten laskelmien sekä patenttidataan pohjautuviin (prior art) työkaluihin. Näiden työkalujen avulla pk-yritykset saavat kokonais kuvan eri patenttinäkökulmista ja pystyvät valitsemaan itselleen sopivan patenttijärjestelmän laajasta patenttidatasta. Kaikki työkalut ovat tärkeitä, mutta niiden hyödyntämisen laajuutta tulee harkita jokaisessa yrityksessä erikseen, jotta yritysten omat tavoitteet voidaan saavuttaa. Tutkimustulokset tarjoavat paljon tärkeää tietoa patenttihakemuksesta. Taustatyö täytyy kuitenkin toteuttaa ensin huolellisesti, mikä tarkoittaa taloudellisen ja liiketoiminnallisen suunnittelun tärkeyttä ennen laajempien innovaatiosuunnitelmien täytäntöönpanoa. Toisaalta pk-yritysten tulee ottaa huomioon ulkoiset teknologiset, lainsäädännölliset, taloudelliset ja ympäristölliset tekijät. Patenttijärjestelmien näkökulmasta kustannukset, hakemusajat, oikeudenkäynnit, luottamus järjestelmään, maantieteellinen laajuus, saatavuus ja patenttihakemuksen vaatimukset vaikuttavat tutkimuksen lopputulokseen.

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**KEYWORDS:** SMEs, patent, patent tools, national patent, European patent, international patent, Unitary patent, patent law, IPR

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## Abbreviations

CPS	Cyber-Physical Systems
EIC	European Innovation Council
EISMEA	European Innovation Council and SMEs Executive Agency
EP	European Patent
EPC	European Patent Convention
EPO	European Patent Office
EU	European Union
G&A	General and Administrative
IoT	Internet of Things
IPEA	International Preliminary Examining Authority
IPR	Intellectual Property Rights
ICT	Information and Communication Technology
IT	Information Technology
ISA	International Searching Authority
ISR	International Search Report
KET	Key Enabling Technologies
OHIM	Office for Harmonization in the Internal Market
PCT	Patent Cooperation Treaty
PLT	Patent Law Treaty
PPC	Production, planning and control
PRV	Patent Office of Sweden
PRH	Finnish Patent and Registration Office
R&D	Research and Development

RO	Receiving Office
SME	Small and Medium-Sized Enterprise
SPC	Supplementary protection certificates
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UN	United Nations
UPCA	Unified Patent Court
WTO	World Trade Organization
WIPO	World Intellectual Property Organization

# 1 Introduction

## 1.1 Finnish SMEs in Patent Business

Currently the industrial environment is going through the fourth industrial revolution – “Industry 4.0” which is based on “production, information technology, and the internet”. Small and Medium-Sized Enterprises (SMEs) are facing these new challenges and they are forced to develop their business towards the changing consumer needs and uniqueness. In Europe, competition is growing its basis for introducing innovations and new strategies in digital environment. Thus, the fast, cheap, and high-quality products are no longer the only way to gain competitive advantage. Industry 4.0 environment is also focusing more on sustainability, and energy efficacy. Additionally, the development is changing product life cycles with customization, flexibility, transparency, and supply chain internationalization.<sup>1</sup>

Finland is one the leading countries in innovation internationally<sup>2</sup>. Furthermore, over 99.9% of all Finnish companies are SMEs and many of them are focusing on innovations and patents<sup>3</sup>. Patents are developing innovations by protecting the inventor from competitors globally. It is also a great competitive tool which increases innovational research and development. A patent is also a technological invention with industrial value and a part of Intellectual property rights.<sup>4</sup> Therefore, Finnish SMEs must consider several facts to secure their inventions properly.

There are already many different tools for analyzing and generating patent information for a patent application. The decision of applying for a patent requires consideration from multiple different aspects as it is an essential part of a company’s business processes. First, the enterprise should focus on business planning from the financial and

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<sup>1</sup> Matt, Modrák & Zsifkonvits, 2020. pp. 3–6 have cited Baum & Sendler, 2013: BMBF, 2012: Manhart, 2013: Kagermann et al., 2013: Hartbrich, 2014: Spath et al., 2013: Modrak et al., 2014.

<sup>2</sup> Neufeld, 2022.

<sup>3</sup> Tilastokeskus, n.d. -a: Tilastokeskus, n.d. -e: Tilastokeskus, n.d. -g: Tilastokeskus, n.d. -j.

<sup>4</sup> Haarmann, 2014: PRH, 2022.

product perspective. Even though the background business planning should be clear before entering patent development, elaborating them together is still possible. Additionally, the competitive environment of the possible patentable innovation should be examined. Next, one of the most important parts is to follow the patent and competition law policies. Furthermore, the company should also decide on whether they are concentrating on national or international markets. These can be done by using patent tools that focus on specific areas. Finally, an examination and comparison of different patent systems can be done. These phases are both viewed from business and law perspectives.

## 1.2 Research Questions and Limitations

The research concentrates on Finnish Small and Medium-Sized Enterprises (SMEs) and their patent processes. This study aims to answer the following research questions:

- What are the important parts and tools of an innovation process for Finnish SMEs who are interested in applying a patent for their invention?
- Are they useful for SMEs or not?

Thus, this study aims to provide essential patent process tools for Finnish SMEs who are planning to file a patent for their invention. As Finnish SMEs vary for example in their size, innovation processes, and finances, the study cannot reveal a right patent system that would work for all SMEs. Additionally, the study focuses on the small and medium-sized enterprises, and thus excludes micro-enterprises from the results. Nonetheless, this study may discover processes that are profitable for micro-companies, as well. There are also several other limitations in the study. For example, there are different intellectual property rights, yet this study only concentrates on patents. Patents are a great competitive advantage in constantly developing business environments, and to reach the demands in current competitive environment, innovational development is necessary<sup>5</sup>. In

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<sup>5</sup> PRH, 2022.



addition, technology is evolving, and patents provide security for business and technical inventions. To conclude, the benefits and challenges of the different patent systems are examined with the help of patent tools. This study may exclude some patent tools as there are an extensive number of them. However, by examining broad patent tool data, there are several tools that provide a multi-dimensional perspective of patents and thus helps the SMEs to find the correct patent system.

The patent systems are limited to Finnish national patent, European Patent, Unitary Patent, and International Patent (PCT). This limitation has been set because the focus is on Finnish SMEs who are considering a patent for their innovation. Furthermore, these selected patent systems can be applied in Finland. The litigation of patents is being discussed, yet the focus is more on the possible litigation actions. The process is not highlighted in this study because the application process is not directly affected by the litigation. This presents itself in the application process only if there is a threat of litigation with the possible patentable invention.

The focus country of the study is Finland as it is one of the leading innovative countries globally, and the legislation and business environment function well. Additionally, there are very low levels of bureaucracy and corruption, and companies can depend on government, public support, and protection.<sup>6</sup> Finland is also a part of the European union (EU) where legislation is widely harmonized, and the competition is secured from misuse of innovation rights<sup>7</sup>. Finnish SME business environment is chosen to be the main research subject. Thus, other SMEs in other countries and larger companies are excluded from this study. The study also limits the scale to SMEs because most Finnish companies are SMEs. Additionally, the SMEs are well protected and supported on the European union level<sup>8</sup>. These companies also possess great and growing competitive opportunities in the innovation environment. Moreover, SMEs are generally more adaptable, flexible, and entrepreneurial with broad resources for innovations than larger firms. On the other

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<sup>6</sup> Neufeld, 2022.

<sup>7</sup> European Commission, n.d. -a.

<sup>8</sup> European Commission, n.d. -e.

hand, SMEs may face more challenges in reaching the industry 4.0 competition levels.<sup>9</sup> Due to the limitations, the study is performed with the help of Finnish, EU, and international business and legal data.

### **1.3 Research Structure, Execution, and Literature**

This research attempts to provide a solid basis for Finnish Small and medium-sized Enterprises for planning and applying a patent. The research aims to find the right tools and process parts for finding a right patent system with the help of legislation, legal and business sources as well as business models and analyses. That is why the study begins in the first part with explaining the SMEs' innovational business environment in Finland and Europe. In the next part, the study focuses on explaining patents as a part of intellectual property rights (IPR). It also enlarges on the patent systems and provides information about their opportunities and challenges. Then the focal point moves to the third part which is the SMEs' patent process environment. The business models and analyses for patent application are listed, as well. These parts are the basis for the more extensive examination.

The last two parts of the study are comparison along with discussion and conclusions, and they are highly important to the solution of this study. These parts help compare different patent systems, tools, and how they work with Finnish SMEs. In the discussion and conclusions, the discovered facts and findings are discussed and summarized. These two parts collect the previous information and provide a solution for the research.

This paper is a business law study of patent systems that Finnish SMEs can consider using when planning to file a patent. It is executed as legal-dogmatic research, yet it also covers the subject from a theoretical business approach. The research is produced by using an extensive amount of legal and business literature as well as national, EU, and

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<sup>9</sup> Matt & Rauch, 2020. pp. 3–6: Boughton & Arokiam, 2000: Deloitte, 2015: Matt, 2007: Sommer, 2015.

international legislation. The legal and business aspects are compared separately and together to conclude a solid outcome. The research literature is broad as the goal is to achieve a reliable and well-designed solution. Most of the sources are in English. Nonetheless, as the angle of the study is Finnish SMEs, some of the literature is also in Finnish, yet translated in English.

The subject is also covered through different sources. The study requires many legal sources. Literature consists of several official sites and articles, legislation, and legal studies. To provide background for the research subject, these legal sources are mainly European or Finnish sources. Therefore, Finnish and EU laws are widely utilized. As the EU law is generally implemented to the Finnish legislation, the Finnish national law is used as a priority option. There are also some international sources, such as World Intellectual Property Organization (WIPO) or World Trade Organization (WTO). Thus, the literature provides a strong basis for the study because it is concentrated on legal-dogmatic approach with the help of theoretical business methods.

In addition to legal sources, the business perspective is highlighted with different business sources. Business articles and books provide a good understanding of the business innovations, strategy, and management. Moreover, the business literature offers an SME approach. Different business models and analyses are essential for the study because they help to provide solutions for Finnish SMEs and their patentable inventions. Especially Statistics Finland (Tilastokeskus) is a solid ground for the research and provides required information about the innovational and SME environments.

## 2 SMEs from the Innovational Business Perspective

### 2.1 SMEs doing Innovational Business

#### 2.1.1 Business Planning and designing

Behind all companies, there is plenty of business planning and designing. These parts are closely connected to financial and economic planning as well as management. All the decisions made in the planning procedures are parts of a company's strategic and operative actions.<sup>10</sup> Small and medium-sized enterprises (SMEs) can be seen closely competing in the international and national environment and trying to find the perfect innovation solutions with the help of financial management and business planning<sup>11</sup>, as well.

It has also been shown that SMEs can survive financial crises better than large, global enterprises. That is because SMEs are more flexible, entrepreneurial, and have innovation resources. Moreover, they are focusing more on innovational manufacturing processes, business operations and are more adaptable for new digital implementations. However, the smaller SMEs can have challenges to reach the competitive goals of Industry 4.0 for example because of the lack of business and technical action plans directed to SMEs.<sup>12</sup>

Business planning from financial, product, and production perspective can be seen important for Finnish SMEs. These business aspects should be ready before the SMEs start to focus on the patent filing options and therefore, business planning is used as a basis for all the innovational procedures. Nevertheless, business planning could be executed simultaneously with the patent planning and both parts can support each other. Especially financial planning is important in every step of the innovational development.<sup>13</sup>

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<sup>10</sup> Koski, 2017, pp. 11–17.

<sup>11</sup> Koski, 2017, pp. 11–17.

<sup>12</sup> Matt & Rauch, 2020. pp. 3–6: Boughton & Arokiam, 2000: Deloitte, 2015: Matt, 2007: Sommer, 2015.

<sup>13</sup> E.g. Koski, 2017, pp. 11–17: Brown, Matt, Rauch & Vickery, 2020. pp. 39–66.

### **2.1.2 Business Planning from the financial perspective**

One of the most important parts of the business and financial planning is to recognize the business possibilities. This possibility is generally a good or a technology. The company must also attempt to find benefits for the client from the value-adding perspective. Additionally, the overall competition environment is important to understand. The company should focus on current and future investing calculations of the good and capitalize on its development. For example, brand development could be a key focus point in the beginning.<sup>14</sup>

After recognizing the business opportunities, the company should concentrate on the competitive position of the good in the markets. Segmentation is the most valuable asset when evaluating the markets for competition. It means that the markets are divided or segmented in different yet similar groups based on the customer needs. This grouping helps the company to calculate and forecast the economic and financial position better and enables a cost-effective planning. The next step in the planning is to provide market potential and competition position forecasts and analyses for every segment. Trading and sales processes are also essential for the companies and should be discovered rather quickly and thoroughly by the corporate management. This step also includes a cash flow statement. This helps the company to provide income and balance sheet statements that again provides valuable information about the company's "liquidity, profitability, and financial solidity".<sup>15</sup>

The next phase is to plan the company's financing if necessary. Capital observation is important because companies cannot fully function with negative property. The corporate management, or board, is responsible for following the financial position of the company. When considering financing opportunities, the value, and how the value is being built in the company, should be evaluated. The owners, management and key staff

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<sup>14</sup> Koski, 2017, pp. 11–17.

<sup>15</sup> Koski, 2017, pp. 11–17.

should all be a part of the company's business processes since financial management is impossible to execute only by one sector. "The business designing begins with the strategic planning and ends up with operative actions". Thus, the financial calculations are essential for a successful business process.<sup>16</sup>

### **2.1.3 Business Planning from the Production and Product Perspective**

To succeed in the current business environment, companies, and especially SMEs, should concentrate on planning different "concepts of smart manufacturing" and logistics<sup>17</sup>. This can be seen as an important part of the current business planning. Smart manufacturing is seen as the revolution 4.0 or 14.0 where the company should integrate information, communications systems, and "advanced industrial technologies" into Cyber-Physical Systems (CPS). These are systems that combine technical entities to the physical environment. This provides a foundation for "a digital, intelligent, and sustainable factory" as well as data-access and data processes for the companies. The aim is to connect these different systems, technologies and goods to the business environment as well as to information technology (IT) and internet. This is also called a smart production strategy, and it offers long-term competitive advantage globally. However, CPS will not succeed without self-organizational and self-control capabilities.<sup>18</sup>

Smart manufacturing and production help maintain competitiveness, lead times, flexibility, and the production for different size batches. Functionality and customization should also be considered because they offer "flexibility, transparency, and globalization for the supply chain". However, this challenges the manufacturing processes as the company should be ready to respond to customer needs quickly. This is only possible for companies that have "agile and highly adaptable manufacturing" processes. Smart manufacturing still brings challenges for SMEs because of the physical and informational

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<sup>16</sup> Koski, 2017, pp. 11–17.

<sup>17</sup> Brown, Matt, Rauch & Vickery, 2020. pp. 39–66: Brown, Dallasega, Tippayawong, Woschank & Zsifkovits, 2020, pp. 147–159.

<sup>18</sup> Brown, Matt, Rauch & Vickery, 2020. pp. 39–66. have cited Rajkumar et al., 2010: Laperrire & Reinhart, 2014.

restrictions in implementation, especially for smaller companies. The implementation is hard because smart manufacturing requires constant innovational and technological developing. SMEs need both help from different business models and analyses, and policy makers to provide strategies and support for SMEs to execute more technological and innovational production.<sup>19</sup>

In smart manufacturing, Internet of Things (IoT), automation, Human-Machine Interfaces (HMI), and Advanced Manufacturing should be considered. IoT is an “an intelligent connectivity of anything, anytime, any- where”, and it provides the basis for “connection, communication, computing, and control”. This assists with real-time information of all the company processes and enables cost-savings in production. Automation would provide flexibility for manufacturing if the different parts of the processes were automated. The automation and different processes and operations can be connected with HMI. Additionally, it can assist with technological or “intelligent user interface” challenges. Advanced manufacturing includes for example “high-precision machining, reconfigurable manufacturing units, additive manufacturing (3D)”. These technologies also provide strategies for production development, manufacturing, and process systems.<sup>20</sup> These technological upgrades are helping with the efficiency of production and provide the management the chance to focus on profitability with the important information offered by these systems. Moreover, the decision-making is also easier and cost-saving.<sup>21</sup>

The development of IT environment is also affecting the logistics of SMEs. Cyber-physical systems are also a part of logistics. These systems provide real-time information and large data acquisition opportunities. Additionally, they lead to more beneficial production planning and control (PPC) and more information for successful logistics. The

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<sup>19</sup> Brown, Matt, Rauch & Vickery, 2020. pp. 39–66. have cited Spath et al., 2013: Matt & Rauch, 2013a: Baum, 2013: Zawadzki & Żywicki, 2016: Kagermann et al., 2013: Matt et al., 2014: Wuest et al., 2018: Zambon et al., 2019.

<sup>20</sup> Brown, Matt, Rauch & Vickery, 2020. pp. 39–66. have cited Federal Ministry of Education and Research, 2013: Atzori et al., 2010: Tao et al., 2014: Spath et al., 2013: Gneuss, 2014: Kraemer-Eis and Passaris, 2015: Rießmann et al., 2015: Gorecky, 2014: Chen et al., 2018: Frank et al., 2019: Rauch et al., 2018.

<sup>21</sup> Brown, Matt, Rauch & Vickery, 2020. pp. 39–66.

challenge for SMEs is the implementation of the CPS. This may be due to poor standardization processes, or poorly designed and dysfunctional business strategies. Additionally, the lack of education and qualification of the staff could complicate the implementation. These issues could be reduced by following “customized implementation strategies, approaches, concepts, and technological solutions that have been appropriately adopted”.<sup>22</sup>

All these production and product development systems should be a standard for SMEs. If the basis for business planning is shorthanded, the innovation processes are more difficult to carry out successfully. The smart manufacturing and logistics systems could also help with the innovations. These business planning and designing solutions could be seen as a basis for SMEs’ innovation development. Yet, there is a need for more patent-specific development if SMEs are interested in filing a patent for their invention.

## **2.2 SMEs in the European Innovational Business Environment**

Small and medium-Sized Enterprises have a great position in Europe as they cover 99 % of the entire business activities in the European Union (EU). These SMEs are currently employing almost 100 million citizens, and these enterprises represent over a half of the European GDP. As these companies are divided in different business sectors, they are also valuable for the whole EU economy, and competition. Additionally, the SMEs are a part of sustainable, environmental, efficient, digital, and social development and innovation.<sup>23</sup>

SMEs are defined similarly in the EU legislation<sup>24</sup> which covers the staff, turnover, and/or balance sheet total. The staff can be maximum of 250 employees. In contrast, the

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<sup>22</sup> Brown, Dallasega, Tippayawong, Woschank & Zsifkovits, 2020, pp. 147–159. have cited Spath et al., 2013, Rauch et al., 2016ab: Dallasega et al., 2015ab: Glass et al., 2018: Maasouman & Demirli, 2015: Schumacher et al., 2016: Qin et al., 2016: Benešová & Tupa, 2017: Luthra & Mangla, 2018.

<sup>23</sup> European Commission, n.d. -d.

<sup>24</sup> EU recommendation 2003/361.



turnover must be no more than 50 million euros annually. The balance sheet total can reach up to 43 million in a year. SMEs also include three different-sized enterprises. These are micro, small, and medium-sized, and these all have their own limits. The maximum factors listed above are also the numbers for a medium-sized enterprise. Micro enterprises' staff headcount can be up to 10 people, turnover up to 10 million euros, and balance sheet total up to 2 million euros. As against, small enterprises' staff can reach to 50 people, turnover to 10 million euros, and balance sheet total to 10 million euros.<sup>25</sup> Finland has also implemented the same limits for its national legislation<sup>26</sup>.

European union and European Commission have established a European Innovation Council and SMEs Executive Agency (EISMEA) for supporting SMEs in innovations and in the European single markets. EISMEA agency is responsible for all the different programs, such as "SMEs support, innovation ecosystems, single market, consumer policy, and interregional innovation investments". The European Innovation Council (EIC) is also a part of the agency's agenda.<sup>27</sup>

### **2.3 SMEs in the Finnish Innovative Business Environment**

In 2021, there were approximately 379 thousand SMEs in Finland whose total turnover was 272.2 billion euros. SMEs employed almost 893 thousand people in the same year. Of those 379 thousand SMEs, approximately 79 thousand are specialized in primary production fishing, agriculture, and forestry. The rest of the SMEs are for example focused on industry, construction, trading, and services. The SMEs cover over 99.9 percent of the total number of Finnish companies. However, the turnover is more even as the SMEs provide just around 56 percent of the total turnover of 487.3 billion euros.<sup>28</sup> Most of the statistics exclude Finnish micro-enterprises<sup>29</sup>.

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<sup>25</sup> European Commission, n.d. -d.

<sup>26</sup> Euroopan unionin julkaisutoimisto, 2015.

<sup>27</sup> European Commission, n.d. -e.

<sup>28</sup> Tilastokeskus, n.d. -a.

<sup>29</sup> E.g. Tilastokeskus, n.d. -h.

There are plenty of other statistics of the Finnish companies and their innovation environment. This study focuses on the most recent statistical years 2018 and 2020. There are some differences during these two years and the largest impact has been from the Covid-19 pandemic that started in 2020. However, it has not affected negatively, as the number of companies and innovations has increased over the inspected two years. In 2020, 8.3 percent of all the companies have made a patent application and in numbers that is 747 patent applications. These numbers were 7.4 percent and a total of 643 applications in 2018. Most of the companies are focusing on innovation and development. Yet, there are a few thousand enterprises that are not fully technological development companies but have applied for a patent.<sup>30</sup> From the SMEs perspective, 16.6 percent of SMEs that employ over ten people, applied for a patent in Finland in 2018. The same number in 2020 was 16.7 percent.<sup>31</sup> SMEs introduced a vast majority of all Finnish innovations to the markets in 2018 and 2020<sup>32</sup>.

From the SMEs' point of view, from 2018 to 2020 there is a slight increase in the number of innovation-oriented enterprises. These statistics are concentrating on SMEs that have over ten employees and thus, exclude the micro-enterprises. In the period, the number of all innovation-oriented companies grew by 600 from 2018, resulting to a total of 8900 companies in 2020. This also means that 96 percent of all innovations were invented by SMEs in 2018 whereas the percentage in 2020 was 95.<sup>33</sup>

Finnish companies use a great deal of their assets to innovation development and are constantly growing their digitalization and data acquisition opportunities. In 2018, the total amount of these assets was 6.79 billion euros. In contrast, the innovation contingencies were 6.80 billion euros in 2020.<sup>34</sup> The majority of all the companies, including SMEs, utilize data and digitalization in their business practices. The data acquisition is on

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<sup>30</sup> Tilastokeskus, n.d. -b.

<sup>31</sup> Tilastokeskus, n.d. -i.

<sup>32</sup> Tilastokeskus, n.d. -j.

<sup>33</sup> Tilastokeskus, n.d. -e.

<sup>34</sup> Tilastokeskus, n.d. -g.

a similar level as the digitalization. SMEs are generally employing data and digitalization services on a passable level, yet many are also using them much more. Only a small percentage, around 10 percent of the companies are not utilizing these services.<sup>35</sup>

The companies must often apply for different types of financing, such as capital, debt, or public funding, when developing innovations. Generally, under 10 percent of all Finnish companies have utilized some type of funding instrument for their innovation development in 2018. Nevertheless, there were two exceptions, governmental and public financing services, that were used in over 10 percent of all companies in Finland. The public funding was the largest financial basis for innovations in 2018, and it is used by almost 20 percent of all the Finnish companies. However, the Covid-19 impacts could be seen in governmental and public fundings. In 2020, these two categories were doubled compared to the year 2018. In addition, other financial services were also utilized more.<sup>36</sup> This provides very important information. On one hand, the companies have been affected negatively by the Covid-19 pandemic and are possibly needing more financial support for innovation. On the other hand, these statistics could mean that the Covid-19 has changed the business environment and provided a larger foundation for innovations.

Innovations are heavily affected by legislation. Thus, there are product, consumer, environment, Intellectual Property Rights (IPRs), tax, labor, social, data protection, health, and traffic legislation that can affect in a differing manner to innovations in enterprises. Comparing the years 2018 and 2020, the promoting legislation for innovations increased. The damaging legislation varied slightly but stayed under the positive and advancing effects. Overall, most of the legislation has no impact on innovations.<sup>37</sup>

The environmental impacts are also very important in today's innovation companies. The largest effects in 2020 were in the use of water and materials, energy efficiency and carbon footprints, the pollution in soil, water, and air, the change in more sustainable

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<sup>35</sup> Tilastokeskus, n.d. -h.

<sup>36</sup> Tilastokeskus, n.d. -c.

<sup>37</sup> Tilastokeskus, n.d. -d.

materials, the change from fossil to renewable sources of energy as well as the recycling of water and materials. However, around 68 to 86 percent of all companies in these sectors did not execute positive actions regarding environmental protection. Only a fraction of the companies developed their processes towards more sustainable and environmentally friendly practices.<sup>38</sup> Environmentally friendly business processes are constantly increasing their basis on international and national levels and especially Finnish companies are focusing on the environmental protection. The companies are not the only ones, as governments have also a large responsibility over the environment. The Finnish environmental legislation is providing objectives for carbon neutrality and Finland is trying to achieve full neutrality by 2035. This objective is also possible because of the increased awareness of consumers and the willingness of Finnish companies to concentrate on environmental protection.<sup>39</sup> This is executed for example by “green processes and product development”<sup>40</sup>.

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<sup>38</sup> Tilastokeskus, n.d. -f.

<sup>39</sup> Energiapolitiikka.fi, 2021.

<sup>40</sup> Albino, Balice & Dangelico, 2009.

## 3 Patent as an Intellectual Property Right

### 3.1 Intellectual Property rights

#### 3.1.1 Background for IPRs

Intellectual Property Rights are legislative tools for executing business and competition. From the Continental European regulations' perspective, the IPRs can be seen as excluding laws that help the creator to prohibit others from their intangible products. This prohibition is a method for "protecting their personhood or their financial and spiritual autonomy, or in recognition of their self-ownership". Yet, the common law environment considers the intellectual property to be a feasible tool of protecting "social and economic" purposes.<sup>41</sup> On the other hand, intellectual property rights can also be seen as "codified knowledge of its owners"<sup>42</sup>.

In legal scope, the intellectual property rights are a part of property law regulation. Economic value is created from granted rights and sanctions. This means that the creator has an opportunity to regulate the distribution of their IPRs and if somebody utilized the creator's work without permission, they would be punished, and the creator would have a right to a claim for damages.<sup>43</sup> Intellectual Property rights also limit the prohibitions for variable time periods. Some of the rights must singly be applied whereas some of them are available automatically.<sup>44</sup> There are two main categories in IPRs. They are copyright and industrial rights which are shown in Figure 1.<sup>45</sup>

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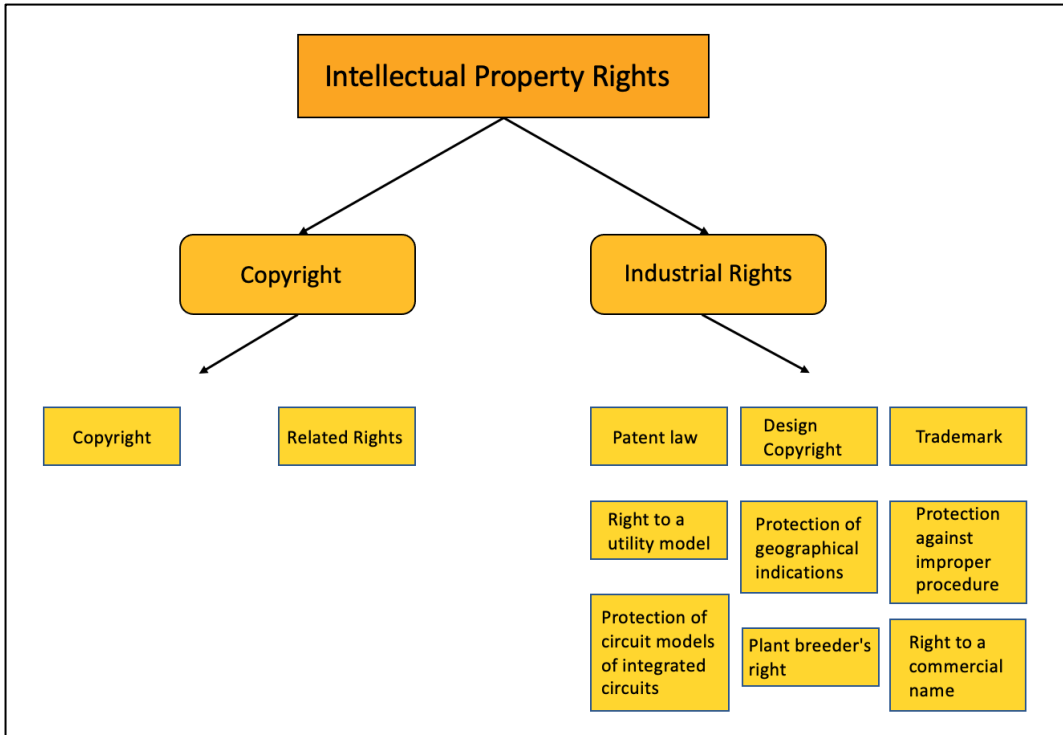
<sup>41</sup> Dreyfuss & Pila, 2017: 3–22.

<sup>42</sup> Sullivan, 2005.

<sup>43</sup> Haarmann, 2014.

<sup>44</sup> Dreyfuss & Pila, 2017: 3–22.

<sup>45</sup> Haarmann, 2014.



**Figure 1.** Intellectual Property Rights.

Copyright includes copyright and related rights. These rights protect for example the creations of “author, visual artist, composer, architect, and creator of a computer program”. Instead, the industrial rights are categorized in patent law, design copyright, trademark, utility model right, protection of geographical indications, against improper procedure, and circuit models of integrated circuits as well as plant breeder’s right and right to a commercial name.<sup>46</sup> These categories can also be seen in Figure 1.

In addition to the property legislation, competition policy can affect innovation processes as well as economic growth and welfare<sup>47</sup>. As IPRs are focused on innovational processes by protecting the inventions from unfair competition, these rights have also an impact on the competition. This means that intellectual property rights are pro-competitive as they aim to secure “differentiated, intangible business assets”. Thus, the competition policy can influence in intellectual property rights.<sup>48</sup>

<sup>46</sup> Haarmann, 2014.

<sup>47</sup> Manne & Wright, 2011.

<sup>48</sup> WIPO, n.d. -h.

Generally, the competition policies are most clearly shown when there is too much or too little intellectual property protection. On one hand, if the IP protection is excessively high, it lowers competition and decreases differentiation in the market goods. This could be found in a situation where a technical feature without the qualification to be a patent has been granted with a protection. On the other hand, too little protection of innovation leads to misuse and copying of goods. There should be enough efficacy enforcement means in the markets. Additionally, a situation where there is a suitable number of IPRs in the market can affect the consumers' free choice negatively. This emerges when IPRs are misused or used with illegal actions. Unexpectedly, the suitable number of patents can also lead to circumstances that impede or prevent further innovation developments of the competitors. In the patent markets, this is for example shown when the patented innovations turn into industrial standards.<sup>49</sup>

### **3.1.2 Patent in General**

The global environment has aimed to find a solution to increase inventions and industrial development and thus, has created patents. Patent Law works around "do ut des" or complementarity which means that the creator has a temporary right for the creation due to the vast disclosure of the information about the creation.<sup>50</sup> Patent is generally in effect for 20 years<sup>51</sup>. The patent provides security for technical innovations if they can be utilized in industry environment<sup>52</sup>. Patents are used to limit operations of competitors as it provides an exclusive right. Thus, it also puts the applicant to a better position as the competitors and offers more designing time. Patents may also be used for defending or obtaining market share. Additionally, competitors might have to spend more money to new investments in the same market. Patent is a part of property law, and it gives the applicant the right to sell and license it commercially with the price chosen by the applicant. Patent can also be seen providing value from advertisement and improving overall

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<sup>49</sup> WIPO, n.d. -h.

<sup>50</sup> Haarmann, 2014, s. 172–254.

<sup>51</sup> Dreyfuss & Pila, 2017: 461–486.

<sup>52</sup> Haarmann, 2014, s. 172–254.

image. The patent offers information about the company and may increase its high-tech value and sales.<sup>53</sup>

Nevertheless, there are requirements that must be fulfilled before the innovation or creation will receive the patent protection. The first one is that the invention must be “technical by character”. The second requires that the invention must be a new technical innovation and should sufficiently vary from earlier innovations. In addition, it must have technical impact and it must be possible to “replicate”.<sup>54</sup>

## **3.2 Patent Law**

### **3.2.1 International Agreements on Patent Law**

There are several international organizations that have published international patent agreements. One of the most essential organizations is the World Intellectual Property Organization (WIPO). It works as a part of the United Nations (UN) and is an international forum for intellectual properties. The aim of this organization is to enable globally unified collaboration, policies, and information.<sup>55</sup> WIPO and member countries have decided on different agreements on patents. First, “General standards of protection” are provided in the Paris Convention and Patent Law Treaty (PLT). Next, “Filing and deposit” policies are listed in the Patent Cooperation Treaty (PCT) and the Budapest Treaty. Last, policy on invention and patent classification is in the Strasbourg Agreement Concerning the International Patent Classification.<sup>56</sup>

Paris Convention for the Protection of Industrial Property has been created for protecting inventors and their inventions globally for example from unfair competition<sup>57</sup>. PLT is

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<sup>53</sup> PRH, 2022.

<sup>54</sup> Haarmann, 2014, s. 172–254: Patenttilaki 550/1967.

<sup>55</sup> WIPO, n.d. -a.

<sup>56</sup> WIPO, n.d. -b.

<sup>57</sup> WIPO, n.d. -c.



used to harmonize formal mechanisms for using patents nationally and regionally. A user-friendly approach is established, as well. The treaty includes some exceptions from “filing date requirements”, yet it also covers a maximum number of requirements for a contracting party to voluntarily utilize in the patent agreements.<sup>58</sup> PCT provides tools for applying an international patent protection for PCT contracting parties<sup>59</sup>. Instead, the Budapest Treaty covers patent processes for micro-organisms<sup>60</sup>. The Strasbourg Agreement provides several classification groups for international patents<sup>61</sup>.

Another important global organization is World Trade Organization (WTO). It focuses on international trading rules between member countries. WTO has many international agreements that are accepted and ratified in the member nations’ governments. WTO’s main objective is “to help producers of goods and services, exporters, and importers conduct their business”.<sup>62</sup> The organization has enlarged its power to intellectual property rights with an Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). It has been invented because of the high importance of innovations in global business environment. The agreement aims to facilitate trade and innovation as well as secure the innovation flow in member countries. There are also common minimum requirements of protection that member countries’ governments must follow.<sup>63</sup>

### **3.2.2 European Patent Law**

European Union has an extensive IPR legislation. The main reason is that IPRs enable and develop innovation but also protect investments. European Union’s goal is to harmonize the intellectual property legislation to help EU member countries to survive with their inventions on international level as well. Protection would also enhance research, development, and economy within the EU. In addition, the quality of the protected products can be held on a higher level. Therefore, the European Union has implemented a five-

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<sup>58</sup> WIPO, n.d. -d.

<sup>59</sup> WIPO, n.d. -e.

<sup>60</sup> WIPO, n.d. -f.

<sup>61</sup> WIPO, n.d. -g.

<sup>62</sup> WTO, 2023a.

<sup>63</sup> WTO, 2023b.

step action plan for IPRs. It includes higher level of protection, increasing help for the SMEs, facilitating licensing, developing execution, preventing infringement, and helping enterprises to survive in international markets.<sup>64</sup>

European Commission has an important role in intellectual property protection, as it is responsible for the reliable frameworks and legislative work<sup>65</sup>. The European Commission is also responsible for patenting within the EU. Their mission is to improve cost-savings and efficiency by unified patent protection. EU has stated that “a patent is a legal title that can be granted for any invention having a technical character provided that it is new, involves an “inventive step”, and is susceptible to industrial application.” Patent can protect the work, components, how it is made, or how it works. In addition, the application can be done by anybody. Patent provides the inventor permission to decide who can use it or to whom to sell it. At present, European Union member countries’ residents can protect their inventions with national and European patents.<sup>66</sup>

European patent law is currently focusing on inventing its own “European patent with unitary effect and new patent court”. This Unitary Patent would provide transnational protection within the EU area and have its own patent specified court. This change is necessary for cost-saving and lowering the administrative burdens.<sup>67</sup> Another option is the European patent (EP) which is based on an international agreement “European Patent Convention” (EPC). However, the EU countries first need to apply for a membership of EPC or European Patent Organization.<sup>68</sup> European Union is also trying to improve patent exploitation especially for SMEs. Moreover, the union has a designing project that aims to create a policy instrument for increasing “business development based upon external IP acquisition - -”.<sup>69</sup>

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<sup>64</sup> European Commission, n.d. -a.

<sup>65</sup> European Commission, n.d. -a.

<sup>66</sup> European Commission, n.d. -b.

<sup>67</sup> European Commission, n.d. -b.

<sup>68</sup> PRH, 2020a.

<sup>69</sup> European Commission, n.d. -b.

In European Patent Law, utility model, supplementary protection certificates (SPCs), and biotechnological inventions are also seen as very similar to patent and considered to be under the protection of the European patent law. The utility model provides security for technical inventions, yet in the EU, there is no transnational protection for them. In contrast, SPC is seen as an enlargement to a patent, and it is mainly used for “pharmaceutical and plant protection” inventions. The legislation of biotechnological inventions is stated in the Directive 98/44/EC on the legal protection of biotechnological inventions. These inventions must include some type of biological material and may be patented if all the other patent requirements are realized.<sup>70</sup>

### 3.2.3 National Patent Law – Finland

Finnish national patent law is a mix of European, Nordic cooperation, and international agreements<sup>71</sup>. In Finland, Patents Act<sup>72</sup> covers national, international, and European patents in the form of Patent Setting<sup>73</sup>. A patent can be sought if “anyone who has, in any field of technology, made an invention which is susceptible of industrial application, or his or her successor in title, is entitled, on application, to a patent and thereby to the exclusive right to exploit the invention commercially, in accordance with this Act”<sup>74</sup>.

To be accepted, patents must fulfill several demands in Finland. First, it must have a technical feasibility. This means that the invention should solve a technical error. Second, the technical feasibility must have efficiency. This reflects the fact that the invention should help with a specific technical problem and not include unclear intentions. Third, the technical invention must be repeatable. Fourth, the level of novelty of the invention must be highly clear, and it must fundamentally be separable from previous inventions to reach inventiveness. The national patent can be applied in written form from the Finnish Patent and Registration Office (PRH).<sup>75</sup>

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<sup>70</sup> European Commission, n.d. -b.

<sup>71</sup> Haarmann, 2014.

<sup>72</sup> Patenttilaki 1967/550.

<sup>73</sup> Finlex, 2023a: Finlex, 2023b.

<sup>74</sup> Finlex, 2023a: PRH, 2014.

<sup>75</sup> Finlex, 2023a: Haarmann, 2014: PRH, 2014.

### 3.3 Patent Systems: functionality, opportunities, and challenges

#### 3.3.1 European Patent

European Patent Convention maintains the European patent system as a single process. The system is created for enabling “a uniform body of substantive patent law” in one application and is accepted by the European Patent Office.<sup>76</sup> Generally, the EPC agreement only obliges the EPC countries. However, there are some exceptions such as Montenegro and Morocco, where the patents may be effective. Accepted application in different countries provide the same amount of protection than the original applicant’s country would offer. Infringements are handled in national courts and by national laws. European patent is valid for 20 years from the filing date. There are some exceptions for longer-term security, yet it is usually granted for inventions with a supplementary protection certificate.<sup>77</sup>

EPC is founded in different international agreements. The EPC agreement is strongly based on the Paris Convention for the Protection of Industrial Rights. Thus, the “principles of the Paris Convention” must be followed in the European patent processes. Moreover, the TRIPS agreement of WTO is mainly used in EP as almost every EPC country is a part of that agreement. EP can concurrently be issued from the international application PCT. If so, the first stage is fully covered with PCT. Another option is a national patent application where the applicant can seek patents from one country at a time. This may lead to different extents of protection, but generally the patent law is quite harmonized in the EPC countries.<sup>78</sup>

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<sup>76</sup> European Commission, n.d. -b: European Patent Office, 2022a.

<sup>77</sup> European Patent Office, 2022a.

<sup>78</sup> European Patent Office, 2022a.

The European patent system examines the application and invention and aims to find the needed requirements and validity through national courts. “The extent of the protection conferred by the European patent is determined uniformly for all the contracting states”. The application grant process and examination are done by the Receiving Section of the European Patent Office (EPO). A negative decision can be appealed by the applicant. Nevertheless, if the application is accepted, the next nine months are given for third parties to provide optional “notice of opposition” which may affect the outcome. After granting the patent, the applicant can apply “a request for limitation or revocation”.<sup>79</sup>

The application fees are divided in different stages of the process. This means that the applicant can ensure the next application steps before paying the fees. This could for example mean that applicants can decide whether they are ready for “requesting substantive examination” after having received the European search report. There is also an opportunity to speed up the European patent process with additional fees. Currently, the search report is received from EPO within five months from the filing date. European patent application can be used as a first filing which means that the applicant is granted “a priority for a national, European, or international second filing made in the priority year”.<sup>80</sup>

The European patent process is divided in two parts. The first one is the formal examination which includes search report and written opinion of inventiveness. The second part is the substantive examination. The applications should be executed in EPO’s official languages English, French, or German and there might be some advantages for translating the application to all these options. Nonetheless, the final step still requires several different translations. The application process usually takes around two to four years from the filing date. The first stage is generally handled in EPO’s Receiving Section and the applicant does not need to be involved with this decision-making. However, if there

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<sup>79</sup> European Patent Office, 2022a.

<sup>80</sup> European Patent Office, 2022a.

is something to be fixed with the application, the EPO is in contact with the applicant. Cooperation is needed in the second stage and may require a representative.<sup>81</sup>

European patent system is seen to be relatively easy, inexpensive, and offering a strong protective basis for inventions globally. Moreover, the goal has been to develop the system economically sufficient.<sup>82</sup> European patent process costs are relatively low compared to separate patent filings in different countries. The costs are as high as approximately three to four separate applications.<sup>83</sup> However, the European Patent Office has developed a set of strict requirements for patentability which may affect the number of accepted patents<sup>84</sup>. There have also been several policy issues with the European patent. These are for example “backlog issue, the enhancement of patent awareness within the European Parliament, patent enforcement, the regional dimension of intellectual property in Europe, patents and standardization, the use of existing patents, and patents and competition”.<sup>85</sup>

Backlog is a legal uncertainty challenge which causes increasingly long patent application periods. SMEs are at a disadvantage regarding the patent enforcements because the European Union Patent Litigation System for Unitary Patent is still incomplete. Moreover, the regional policy of the EU is strongly concentrating on achieving the place as world leader in “Knowledge Based Economy”. The balance between patents and standardization is also unclear in Information and Communication Technology (ICT). There are also challenges in European patent itself as the accepted application provides multiple different national patents that are “governed by national laws”. Additionally, the use of a patent requires following the competition law.<sup>86</sup>

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<sup>81</sup> European Patent Office, 2022a.

<sup>82</sup> European Patent Office, 2022a.

<sup>83</sup> European Patent Office, 2022a.

<sup>84</sup> Euractiv, 2010.

<sup>85</sup> European Parliament, 2009.

<sup>86</sup> European Parliament, 2009.

### 3.3.2 Unitary Patent

European union has developed Unitary Patent for years, yet in 2012, there has been an agreement on a legislative patent package enhancing cooperation. This package includes “a regulation creating a European patent with unitary effect (“unitary patent”), establishing a language regime applicable to the unitary patent, an agreement between EU countries to set up a single and specialized patent jurisdiction (the “Unified Patent Court” (UPCA))”. At the moment, there are 25 EU member countries participating in the enhanced cooperation agreement. The exceptions are Spain and Croatia. Nevertheless, the implementation is still incomplete because Germany has not enforced the regulation to their national law. On the other hand, only 16 member countries have accepted the Unified Patent Court. The Unitary Patent System is presumed to begin its full operations on 1 June 2023. Nevertheless, the Unitary Patent Court is enabling some opt-out requests to be filed during the early sunrise period from 1 March 2023.<sup>87</sup>

There are several conditions to be met before filing the Unitary Patent. The claims in the application must be same in every member country even though the Unified patent court agreement was not accepted. The designation should be focused to all member countries. If the applicant has prevented designation from one of the 25 Unitary member states, the Unitary effect is not possible. The inventors should have a European patent and then, they can apply in written form for the unitary effect in the EPO. The Unitary Patent application should be executed within a month from the accepted patent application of European patent. If the EP is accepted and the unitary effect filing is proceeded within the month, but it has not been inspected by EPO, the applicant can ask for re-establishment. The application should “be duly signed” and a copy of the application is necessary. If all the requirements are met, the Unitary Patent is effective on “the date of the publication of the grant of the European patent”. If the timeline is within a month from the accepted EP, yet some requirements are missing, EPO provides the applicant a possibility to fix the missing parts. If the requirements are not met, the application is

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<sup>87</sup> European Commission, n.d. -c.

rejected. However, the rejection can only be done after an invitation to the applicant to comment on the application.<sup>88</sup>

If there are many inventors, they should decide on a representative. However, “a coproprietor of a European patent who owns that patent exclusively in respect of one or more EPC contracting states not territorially covered by the Unitary Patent scheme cannot request unitary effect or be designated as common representative”. There is some mandatory information that must be mentioned in the application. These are the inventors, the European patent number, and the possible representative. In addition, “a place of business on the date of filing the European patent application” is a voluntary indication. This means cases where the applicant is not a European union resident. Additionally, the application must include a translation which is either English or other official EU language.<sup>89</sup>

The next step is to file a “request for unitary effect”. It includes choosing the right language, which is automatic when applying online. In written and paper form, the “trilingual EPO Form 7000” is the right way to proceed because it checks the language requirements. However, the application should preferably be executed online because it is faster, more reliable, efficient, and it decreases administrative work. The filing is possible to do with Online Filing, Online Filing 2.0., and web-form filing. These services are free. In the EPO’s website, there are also other services available such as payment and inspection services. Even though EPO prefers the online application, it is possible to do it “in person, by postal services or by fax”. A receipt of executing the filing is provided in online form if the application is done online. On the other hand, the paper application receipt is sent to the applicant in paper form. If the application is accepted by EPO, other needed documents can be sent to EPO with duly signatures. Nevertheless, the application for unitary effect can also be withdrawn by the applicant if any decisions have not been made by EPO.<sup>90</sup>

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<sup>88</sup> European Patent Office, 2022b.

<sup>89</sup> European Patent Office, 2022b.

<sup>90</sup> European Patent Office, 2022b.



Unitary Patent should provide many advantages such as cost-saving and clearness. Costs have been decided to maintain as they are in national renewal fees of Germany, France, the United Kingdom, and the Netherlands. This means that the costs of patents would be around 5000 euros in ten years. European patents usually cost around 30 000 euros. The application system should be simple and without any “complex validation requirements”. Translation requirements should not be a challenge anymore.<sup>91</sup> When seeking the patent, it only requires one application which is free of charge. Moreover, the renewal fee is paid once in one currency. European Union presumes that it would increase “research, development, and investment in innovations” and in Europe as well.<sup>92</sup> It would also offer more security to the patent owners as currently; the prohibitive costs of “national validation and maintenance” reduce the number of national patents within the European patent application.<sup>93</sup> The Unitary Patent is also easier to use as the applicants can administrate their business from obtaining and sustaining to managing the patent in one place with one unitary patent. The unitary effect may decrease legal uncertainty and fragmentation as the litigation is held in Unified court.<sup>94</sup>

One of the most important goals of the Unitary Patent system is to support SMEs with the patent costs. European Commission is a responsible organization for it and additionally has a single market strategy which considers SMEs to have enough support in intellectual property rights. Commission is planning on providing “affordable European litigation fee insurance”, “specialized mediation and arbitration services”, structural funds, and restraining IP infringing projects. Commission is cooperating with “the European Patent Office, the Office for Harmonization in the Internal Market (OHIM), EU countries, and the European Parliament”.<sup>95</sup>

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<sup>91</sup> European Commission, n.d. -c.

<sup>92</sup> European Patent Office, 2022b.

<sup>93</sup> European Commission, n.d. -c.

<sup>94</sup> European Patent Office, 2022b.

<sup>95</sup> European Commission, n.d. -c.

Some disadvantages can also be seen. The complexity of patent systems remains in the EU and especially in national patent offices. The national patent offices are responsible of different patent application systems and the Unitary Patent would be an additional, third system to be handled nationally. This will affect the efficiency of application times. Additionally, it can be hard for inventors to decide on the suitable system for their inventions as the patent environment is more complicated. It has also been argued that the fees could be higher than expected. On the other hand, the litigation processes may occur as challenges. This Unified court has been developed to execute the Unitary Patent litigations. Yet, the inventors and entrepreneurs should be confident about the litigation process and the court itself. If the trust is not found, the Unitary patent system may not be as effective as believed.<sup>96</sup>

### **3.3.3 International Patent (PCT)**

International patent can be executed by the terms of Patent Cooperation Treaty. PCT itself is not a patent, but it provides the platform for patent application. The member countries of PCT have decided that every country has its own Receiving Office (RO) that is responsible for the application. However, the application process must go through International Searching Authority (ISA). After the international application process is over, the applicant can submit another patent agreement from “a national or regional patent office”. This means that the international patent is a group of national patents, not one unified patent.<sup>97</sup>

To apply the international patent, there are several steps to follow. The applicant sends an application to RO to be checked that the formal requirements are met. Then, the application is transferred to ISA. The International Searching Authority has “two-stage processing”. The first stage is called a novelty search which leads to International Search Report (ISR). Usually, this report is finished within three months of the application, yet it can be extended to nine months because of the priority date. This report has “a list of

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<sup>96</sup> Van Pottelsberghe, 2012.

<sup>97</sup> PRH, 2020b.

cited documents” and the opinion (WOISA) on novelty, inventiveness, and industrial feasibility of the inventive good. The other stage is performed by the International Preliminary Examining Authority (IPEA). This organization executes preliminary research of patentability of the invention and provides a report on International Preliminary Report on Patentability (IPRP). This stage is voluntary and can be done within three months of the ISR or within 22 months of the original application.<sup>98</sup>

This international process requires a national or regional application to become legally an international patent. In Finland, Finnish Patent and Registration Office is responsible for this phase as well and it is separate from the international processes. This means that the applicant must generally seek an approval of different PCT countries within 30 months of the original application. A representative or attorney is not legally binding in Finland, yet highly recommended. The international phases can be executed without legal help. Nevertheless, some of the national organizations may force to have a local representative.<sup>99</sup>

There are still multiple benefits from the international application. PRH is chosen as a RO and ISA which means that PRH executes all the different application processes. Finnish applicant can also seek for the patent from International Bureau of WIPO, European Patent Office, and the patent office of Sweden (PRV). The applicant is able to see different patent options in different countries during the one application, so the overview is quite wide. In addition, the application can be done in English, Swedish or Finnish in Finland. If there is some uncertainty of the scale the applicants want the patent to be on international level, the PCT system is able to provide 30 months for consideration as well. Moreover, the costs can be handled in a varying timeline. The applicant is offered with different reports and opinions on the patentability. There is a possibility for speeding the national application process with agreements on Patent Prosecution Highway (PPH). These

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<sup>98</sup> PRH, 2020b.

<sup>99</sup> PRH, 2020b.

benefits are also lowering the financial risks because the applicant can decide where to apply with the help of reports and opinions on patentability.<sup>100</sup>

Yet, there can be some disadvantages in PCT. For example, the PCT application is seen relatively expensive. Furthermore, the application period can be slow. Generally, direct national filing is faster. This is directly affecting the costs because the delayed proceedings increase the overall costs. Additionally, the PCT excludes some of the most important business areas and countries. Thus, the applicant must still execute a national filing for these territories.<sup>101</sup>

### **3.3.4 National Patent – Finland**

Finnish national patent must be done in written form and sent to the Patent Authority, Finnish Patent and Registration Office. The application must include several items, such as applicant name, invention title, and date. It should also provide a well-designed description, and possible drawing of the invention. The application fee should be paid upon the application. The application can be executed in Finnish, English, or Swedish. When the application is filed, the applicant can request the PRH to translate the application in different languages for an additional fee. If the application is missing something or does not meet the requirements, PRH may ask the applicant to provide the needed information. If not, the application can be dismissed. The applicant can also request an international patent research simultaneously with the national application provided that the applicant pays an extra prescribed fee. In one application, there should only be similar inventions, usually one. Thus, different and independent inventions should be filed in different applications.<sup>102</sup>

The maximum period for revealing the application documents for the public is eighteen months if the decision is still undone. However, the application is not usually revealed if

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<sup>100</sup> PRH, 2020b.

<sup>101</sup> Hindles, 2023.

<sup>102</sup> Finlex, 2020a: PRH, 2014.

it is not accepted by PRH, unless the applicant is asking a permission for reinstatement. Another exception is a business secret which may lead to unavailability of the application. The applicant has a right for appeal of the disliked decision. The appeal is done to Finnish Market Court.<sup>103</sup>

The national patent divides opinions on the advantages and disadvantages. In Finland, the national patent application is seen as a quite positive process. It is relatively fast and inexpensive. Moreover, the fact that the application is possible to execute in English, and the translations are only in Finnish and Swedish, was positive. On the other hand, the possibility to do the application in Finnish was not seen important. The industry of a company affected this outcome. However, the scope of security of national patent was not enough for many companies. Finnish companies are generally focusing the patents to the United States as well as some of the European countries, such as Germany, in addition to Finland.<sup>104</sup>

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<sup>103</sup> Finlex, 2020a: PRH, 2014.

<sup>104</sup> Leskinen, Lönnqvist, Mikkola & Nurmisto, 2014, pp. 61–63.

## 4 Patent Application Decisions from Business and Legal Perspective

### 4.1 Patent Management

Patent management, or in broader terms innovational management, is essential for innovational business enterprises, such as many SMEs<sup>105</sup>. It provides tools for increasing company value by creating novelty in business models for goods<sup>106</sup>. Patent management also offers security for freedom-to-operate and includes analyses of different competitors or third parties' products and processes<sup>107</sup>. Patent management is a broader business aspect and should be a part of strategy, "innovation, technology, and R&D (Research and Development) management", but it also has a great impact on "marketing, finance, and human resources".<sup>108</sup> Patent management itself can also be divided between different departments, such as data science and legal<sup>109</sup>. From the innovation management perspective, the innovational environment has changed over the decades. Before, companies concentrated on product inventions whereas the focus is now on service innovations, such as "business process patenting" and platform innovation.<sup>110</sup> Additionally, patent management focuses more thoroughly on business model innovation<sup>111</sup>. Today, companies are also willing to research and develop their businesses further, for example with the help of cooperation agreements<sup>112</sup>.

There are also several different business approaches for patent management. For example, patent business has been modified from "legal perspective towards a managerial and organizational approach"<sup>113</sup>. Patents are known to be the most powerful IPR<sup>114</sup>

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<sup>105</sup> Moehrle, 2019.

<sup>106</sup> Bessant, Pavitt & Tidd, 2005.

<sup>107</sup> WIPO, 2005.

<sup>108</sup> Moehrle, 2019.

<sup>109</sup> Moehrle, 2019.

<sup>110</sup> Moehrle, 2019.

<sup>111</sup> Clauss, 2017.

<sup>112</sup> Moehrle, 2019.

<sup>113</sup> E.g. Al Ali, 2003, p. 312.

<sup>114</sup> E.g. Lai & Che, 2009.

because they can maintain the highest positive “effect on commercial success and market value”<sup>115</sup>. Furthermore, the management style of patents creates the largest value for the enterprises<sup>116</sup>. However, the awareness of patents is relatively low in companies and especially in smaller ones<sup>117</sup>. There are also limitations in the portfolios and optimization of patent management<sup>118</sup>. On the other hand, patent management can be done in a more content-oriented way as all the patent documents are processed. This can be executed with a workbench of intelligent patent documenting. It examines and summarizes the patent information. Other options can be “computer-supported patent management, patent search engines, and machine translation programs”. Search engines enable broad patent information. In addition, the translation programs may permit an access to the patent markets. They may also open new and uncharted markets.<sup>119</sup>

There are at least three important perspectives for examining patent management. First, technology management views patent management from a resource-based point of view. This means that the competitive advantage is created by uniqueness of strategic technological resources.<sup>120</sup> Companies should focus on developing these resources because they provide dynamic capabilities that help the companies to face the changing market needs. Therefore, the technology management from patent management perspective should concentrate on innovation management technologies and other strategic ones. Second, patent management is close with the research and development management<sup>121</sup>. R&D aims to organize different management activities in companies<sup>122</sup>. R&D can also develop their own patent management and file patents that are required in R&D<sup>123</sup>. Third, the companies can cooperate with the patents for example by forming

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<sup>115</sup> E.g. Rivera & Kline, 2000.

<sup>116</sup> Conley, Ernst & Omland, 2016.

<sup>117</sup> Agostini, Nosella & Teshome, 2019 cited Pitkethly, 2018, pp. 163–179.

<sup>118</sup> Bader, Gassmann, Ruether & Ziegler, 2012; Moehrle, Walter & Wustmans, 2017, pp. 27–33.

<sup>119</sup> Bouayad-Agha, Burga, Brüggmann, Carrascosa, Ciaramella, Ciaramella, Codina-Filba, Escorsa, Judea, Mille, Müller, Saggion, Ziering, Schütze & Wanner, 2015, pp. 33–42.

<sup>120</sup> Peteraf, 1993.

<sup>121</sup> Moehrle, 2019.

<sup>122</sup> Moehrle, 2019 cited Schnittker & Walter, 2016.

<sup>123</sup> Moehrle, 2019.

patent pools<sup>124</sup>. All these aspects are affecting patent management, and companies must be ready to develop and follow the environmental changes in business markets. The analyses and models are essential for this and must be used on a regular basis. This constant research should be focused on online services as most of the patent information is formatted in online form.<sup>125</sup>

## 4.2 Patent Strategy

Patent strategies can focus on different business and legal areas. The right of veto of the patent is the traditional perspective on patent security and strategy. It means that the companies want to secure inventions from copying and misuse.<sup>126</sup> On the other hand, a patent can enable a monopoly position in the markets<sup>127</sup>. Nevertheless, the ideology has changed towards a more business-oriented set of mind, and SMEs have also taken a part of this development. The patent is now seen as an important part of supporting business. Additionally, “the value of the company is based more on intangible rights”. The patentable market value is constantly growing especially in companies that work with different inventions. In Finland, this is shown as an increasing number of technology-oriented start-ups which generally have a “strong patent strategy”.<sup>128</sup>

The patent strategy decisions obtain geographical, sociological, and psychological perspectives. Especially geographical coverage is essential. General rule is that wider coverage is safer, yet this is not the case in every patent system. Geographical coverage and its importance depend on businesses and technologies in the European area. There are few important business areas in Europe that all the companies should consider. For example, when the company has a patent in Germany, France, or the United Kingdom, the competitors cannot usually intervene the patentable coverage in Europe. This is due to

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<sup>124</sup> Moehrle, 2019 cited Eppinger, 2015 and Enkel & Bader, 2016, pp. 207–226.

<sup>125</sup> Moehrle, 2019.

<sup>126</sup> Leskinen et al., 2014, pp. 33–42.

<sup>127</sup> Schmidt, 2013, pp. 242–251.

<sup>128</sup> Leskinen et al., 2014, pp. 33–42.



the majority proportion of market area of the most essential business areas or countries. Thus, the competitors have agreed that it is not rational or profitable to use the invention in the other business areas.<sup>129</sup> In addition to the geographical overview, “the sociological and psychological aspects of industrial organizations” must be considered<sup>130</sup>.

Another important patent strategy aspect is commercialization of patents which means that the patentable technical invention can be used in business processes of a certain company. It can also be a part of the company’s products. The product- and process-oriented markets are differing from each other from the legal patent strategy point of view. Therefore, it is generally harder to evaluate current and real patent than product processes.<sup>131</sup> Commercialization can also be done by selling or licensing a patent. Moreover, there are at least three benefits from commercialization. First, the number of patents can provide important information about the innovational business processes in different companies. Second, this can offer a basis for predicting the companies’ economic success. Third, these facts increase the market value and enable better financial services and value in acquisitions.<sup>132</sup>

One of the solutions for the companies, especially SMEs, is cooperation or cooperative competition where can be found “inter-organizational collaboration between competitors”. Cooperation could provide different companies key enabling technologies (KETs), cost-savings when all the costs can be divided between the companies, and better results in sustainability, market growth and expansion. Risks in patent application are also lower when done together. It can also lead to some challenges, such as opportunism, and knowledge leakage.<sup>133</sup> For the larger SMEs, internal patent information could be a great solution. With the help of a patent team, the patent process could be visible to the entire company, and they would be providing internal marketing solutions for the existing and

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<sup>129</sup> Leskinen et al., 2014, pp. 33–42.

<sup>130</sup> Schmidt, 2013, pp. 242–251.

<sup>131</sup> Schmidt, 2013, pp. 242–251.

<sup>132</sup> Leskinen et al., 2014, pp. 33–42.

<sup>133</sup> De Matos, Hidalgo, Molling, Monticelli & Santini, 2023.

new clients. This could also provide a competitive and strategy advantage for the company.<sup>134</sup>

Patent management is also an important part of patent strategy, and they should be utilized together. From the patent strategy point of view, many companies are generally focusing on investing in different companies or concentrating their investments on a specific part of their own business by leaving some units without investments<sup>135</sup>. This presents itself when the company decides on acquisitions and mergers<sup>136</sup>. Patent management can be used to support these strategic steps by analyzing different patent portfolios internationally and finding the companies that are interested in purchasing business units.<sup>137</sup>

### **4.3 Patent Licensing and Prior Art Searches**

Patent licensing and Prior Art Searches are a part of patent management and strategy. Yet, these alignments are themselves so important from the financial perspective that they should be presented separately.<sup>138</sup> Patent licensing means a permit of the patent owner to utilize the patent. Prior Art Searches in patent industry are examinations on the previous patentable inventions. It is a part of patent application process and should be executed both by the applicant and the patent licensee.<sup>139</sup>

Before commercialization or licensing, companies should analyze and evaluate the financial value of the patent as the patent process may be expensive. It can be done by following four different steps. First, the company should gather information of the patentability and context. Second, it could be wise to collect an evaluation team for the patent

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<sup>134</sup> Rainey, 2014, pp. 16–21.

<sup>135</sup> Moehrle, 2019.

<sup>136</sup> Kaul & Wu, 2016, pp. 1220–1239.

<sup>137</sup> Moehrle, 2019.

<sup>138</sup> Jeong & Yoon, 2015, pp. 37–52.

<sup>139</sup> Langinier & Marcoul, 2016, pp. 399–427.

application process. Third, the company should decide on whether to utilize legal help. Fourth, the patent should be evaluated for example in regard to its scope, validity, synergy between other patents, the global effect, the monopoly impact, and the life cycle. Thus, the company should consider all the possible advantages and threats, such as litigation. If the invention is not valuable enough, the evaluation team should provide some information about the possible other options. Next, a demand curve, maximization, and income-approach valuation should be executed. All this information is written in the final patent valuation report.<sup>140</sup>

The patent filing and granting procedure is a standard and the applicant must provide information about the previous inventions and patents. All this information gathered by the applicant can be called prior art.<sup>141</sup> False information will lead to the rejection of the patent application<sup>142</sup>. Prior Art Searches should be done by the patent applicant first. After that, the applicant should provide the information to the examiner that decides on the patent application approval.<sup>143</sup> Prior Art Searches can highlight the possible challenges and forecast future possibilities. “Prior Art” and “search” terms suggests evaluating literature. There are two main Prior Art Search methods which are clearance and novelty searches. The clearance search aims to find the possible infringements of a patentable invention and minimize the risk with the help of this information. It concentrates on the claims that are executed in a country that the patent could be filed. The novelty search is a wider tool for finding information about “all prior art”. It tries to find out if the invention is disclosed or new enough.<sup>144</sup>

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<sup>140</sup> De Vocht, Jacobs & Sas, 2014.

<sup>141</sup> Jeong & Yoon, 2015, pp. 37–52.

<sup>142</sup> Kesan, 2002, pp. 145–179.

<sup>143</sup> Langinier & Marcoul, 2016, pp. 399–427.

<sup>144</sup> Rimai, 2018, pp. 133–144.

#### 4.4 Frameworks, models, and analyses

There are many patent management and strategy frameworks, models, and analyses that can be utilized to provide important information of the patents and their systems<sup>145</sup>. Additionally, other patent tools have been developed that focus for example on financial situation or evaluating patent data<sup>146</sup>. All these tools can be seen essential for companies that focus on applying for a patent, yet the extent should be decided for example within the company's innovation budget and technological possibilities.

Patent management can be evaluated with a methodological approach where the company should focus on analyzing its domain of construct, item generation, scale purification, internal consistency assessment, scale validation, and replication (Figure 2). In this approach, the first step, domain of construct, considers the business activities and organizational aspects.<sup>147</sup> The second, item generation, focuses on providing information about the development and production of the patentable item. Next, the scale purification is "the process of eliminating items from multi-item scales"<sup>148</sup>. Instead, the internal consistency assessment provides information about the different examination targets and if there are any similarities between them. Then, the scale validity provides information about the different parts of the examination, such as content<sup>149</sup>. As the name already highlights, the replication means that the study can be repeated. This methodological approach is based on Churchill's study<sup>150</sup>.

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<sup>145</sup> E.g. Agostini, Nosella & Teshome, 2019; Schmidt, 2013, pp. 242–251.

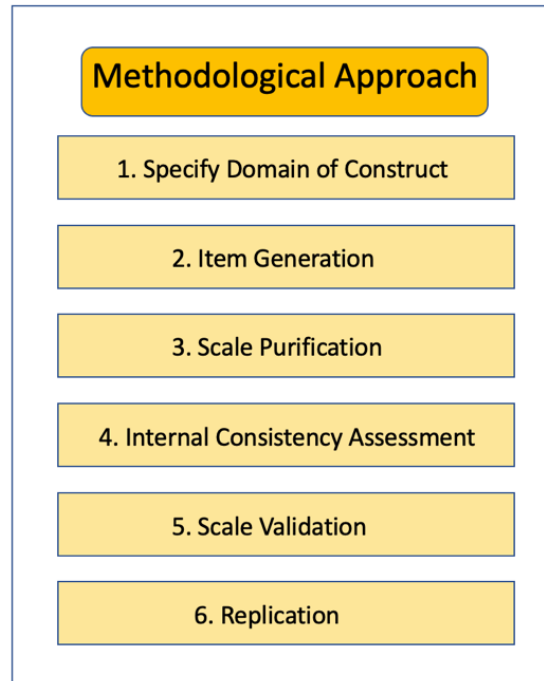
<sup>146</sup> E.g. De Vocht, Jacobs & Sas, 2014; Langinier & Marcoul, 2016, pp. 399–427; Jeong & Yoon, 2015, pp. 37–52.

<sup>147</sup> Agostini, Nosella & Teshome, 2019.

<sup>148</sup> Durach, Horst, Kembro & Wieland, 2017.

<sup>149</sup> Agostini, Nosella & Teshome, 2019.

<sup>150</sup> 1979.



**Figure 2.** Methodological Approach<sup>151</sup>.

From the basis of this methodological approach, Agostini, Nosella & Teshome<sup>152</sup> have created a macro-specific measurement scales and processes for patent management. These are “patent generation, patent portfolio, patent intelligence, patent enforcement, patent exploitation, and defensive measures”. These measurements can be supported with organizational and cultural dimensions. Agostini, Nosella & Teshome<sup>153</sup> have validated this outcome on the basis of the multi-dimensional character of patent management.

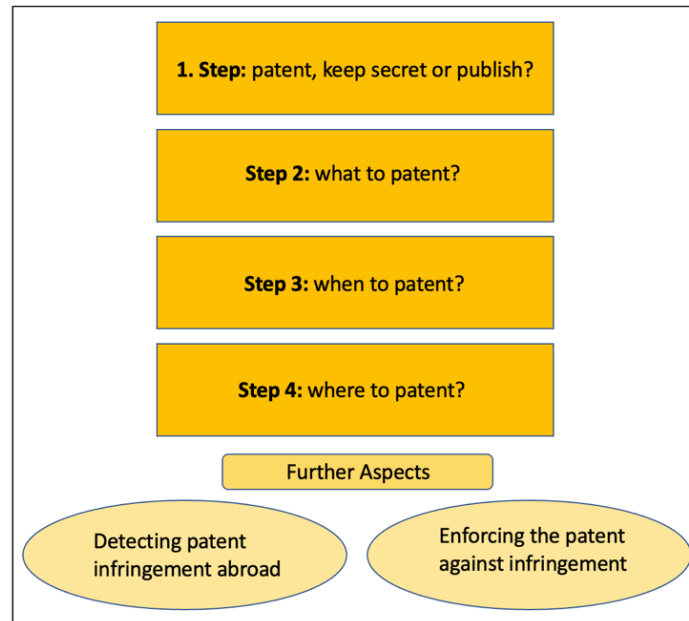
From the Patent Strategy perspective, there are several different tools that can be used when considering the patent application. One approach is to focus on developing patent strategy by answering the questions in Figure 3.<sup>154</sup>

<sup>151</sup> Adapted from Agostini, Nosella & Teshome, 2019.

<sup>152</sup> 2019.

<sup>153</sup> 2019.

<sup>154</sup> Schmidt, 2013, pp. 242–251.



**Figure 3.** Patent Strategy Decisions - Model<sup>155</sup>.

First, it is important for the company to decide whether it is going to apply for a patent for the invention or to preserve the patentable innovation without public presenting. If the company considers secrecy, it should then focus on finding a solution to the next questions about the sufficiency of current patent coverage, time-period for secrecy, and a future need for patent. The third option is to present the invention to public without patent. If so, the invention cannot be patented anymore as such.<sup>156</sup>

Patent landscape and IP competitive intelligence are patent strategy tools that involve both quantitative and qualitative approaches. Furthermore, the patent landscape and IP competitive intelligence together form an anticipatory prescriptive analysis. The quantitative metrics are IT-centered and offer a broad basis for patent examination. On the other hand, the qualitative aspect focuses on people and results in integrated datasets and more specific patent information.<sup>157</sup> This system of evaluation is shown in Figure 6.

<sup>155</sup> Adapted from Schmidt, 2013, pp. 242–251.

<sup>156</sup> Schmidt, 2013, pp. 242–251.

<sup>157</sup> Pargaonkar, 2016, pp. 10–20.

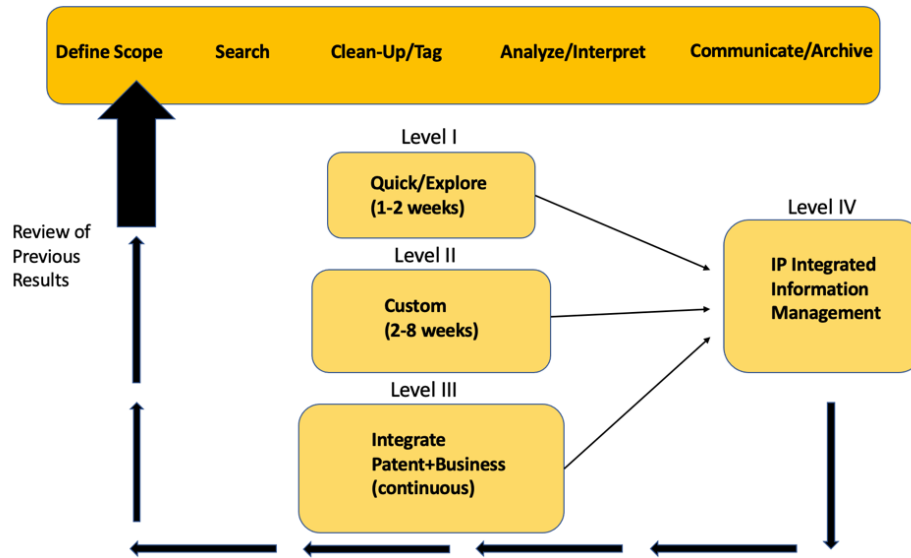


Figure 4. Patent landscape and IP competitive intelligence<sup>158</sup>.

The IP intelligence is based on Michael Porter's<sup>159</sup> five strategy shaping forces, "competitors, new entrants, substitute products or services, buyers, and suppliers". These are the risk factors that the IP intelligence acknowledges, as well. This analysis enables the IP management, information-driven strategy, and technological planning resolutions. For the IP intelligence and landscaping, the requirements "new", "non-obvious", and "useful" should be picked as the basis of the analyses. They provide the needed information about patentability. After the requirements are in order, the overall framework of the patent landscape and IP competitive intelligence based on the examination should be done. It contains three components which are process, technology, and people. The process component focuses on the constantly developing dynamic process whereas the technology covers different instruments for search, examination, and repository. Moreover, the people component provides information about the managers, and technical intelligence.<sup>160</sup>

In the framework, the process component includes defining the scope, searching, data clean-up, analyzing, and communicating. This phase concentrates on the business

<sup>158</sup> Adapted from Pargaonkar, 2016, pp. 10–20.

<sup>159</sup> 1979, p. 137.

<sup>160</sup> Pargaonkar, 2016, pp. 10–20.

requirements, the utilization, and users of the product. The developing process should also focus on all the activities along the steps and provide a reporting template of the result. In this process phase, many different tools are available, yet the analytics tools are generally the most efficient for providing an analysis. These tools aim to facilitate accustomed functions. In addition, searching tools are another option for finding relevant data and patent content. However, the data the tools provide, should be value-adding and standardized as well as lead to the coverage of the technology component. Therefore, the integrated data repository is essential for the company. In contrast, the people component is also very important and focuses on developing innovational processes. The “people” is referring to skilled staff, such as patent analysts or IP competitive intelligence managers.<sup>161</sup>

After the basis of the patent analysis is done, the next phase is the IP competitive intelligence analysis which contains four levels. These levels and the analysis project should be set in proportion to “time, money, and resources”. The first level is for an overview or breadth of the situation. There the researcher could use for example different landscape maps, such as a tree map. The second analysis level provides more specific and in-depth information. However, it still has a large overview in the basis. This level requires “data clean-up and custom tagging”. This can be done with a hybrid approach which includes automated and manual clustering. The third level of analysis is the level where patent intelligence is unified with the “business intelligence and market-place data”. This level needs analysis of the trends, business needs, and competition and should also be communicated with the personnel. The last, fourth, level of the analysis is a basis for generating patent information and technical data. There, a key performance indicator (KPI) could be used to make “metrics for business and patent intelligence”.<sup>162</sup>

Another important part of the patent application process is financial valuation which can be done with industrial standards or discounted cash flow (DCF) methods. Industrial

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<sup>161</sup> Pargaonkar, 2016, pp. 10–20.

<sup>162</sup> Pargaonkar, 2016, pp. 10–20.



standards can for example be found in “general terms and conditions for a specific industry”, literature of business development, licensing and business development societies, different databases, consultants, and court cases. This information should be compared to the current data with set criteria, such as territory, lifetime, pros and cons, costs, and development. After this, the company should recognize “a scale for the selected criteria”. As all the criteria are not equally essential, the company should choose a proper weight to the selected ones and score the results with the help of scaling. Lastly, this information is adapted to the previous market and business data.<sup>163</sup>

An alternative financial calculation is the “25 percent rule” for cases when there are no industrial standards to be found. This rule is explained by Goldscheider et al.<sup>164</sup> and Lu<sup>165</sup> as “dividing the expected profits for the product or technology that incorporates the IP at issue in such a way that 25% is retained by the licensor (the seller) and that 75% goes to the licensee (the buyer)”. This rule can especially be used to patent valuation. The financial position can be calculated from the sold goods’ costs, turnover, sales, revenues, costs of marketing and sales, R&D, and general and administrative (G&A) expenses. Another calculation can be executed by EBITHA or “earnings or operational profit before interest, taxes, depreciation (of tangible fixed assets), and amortization (depreciation of non-tangible assets such as goodwill).”<sup>166</sup>

DCFs on the other hand, are mathematical discounting calculations for finding the current actual value when compared to the past and future. There is a need for value and cash (c), time period (t), and discount rate of a value that is affected by inflation and risk (d). The calculation requires “an equation for converting future cash payments into their present equivalent, considering the time for executed payments, the risk, and inflation.” This provides the formula in Picture 1.<sup>167</sup>

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<sup>163</sup> De Vocht, Jacobs & Sas, 2014.

<sup>164</sup> 2002 cited by De Vocht, Jacobs & Sas, 2014

<sup>165</sup> 2011 cited by De Vocht, Jacobs & Sas, 2014

<sup>166</sup> De Vocht, Jacobs & Sas, 2014.

<sup>167</sup> De Vocht, Jacobs & Sas, 2014.

$$\text{NPV} = \sum_{t=0}^n \frac{C_n}{(1+d)^n}$$

**Picture 1.** Mathematical Formula of NPV<sup>168</sup>.

NPV stands for the present value in a specific year. Therefore, the investment could be profitable, if the calculated value is positive whereas the value zero means that the costs and revenues are equal. On the other hand, a negative value reflects larger investments than profits. Additionally, this calculation requires estimated numbers of cash flow which include for example “the total market, market growth, market share, price setting, total costs of R&D, sales and marketing”. Furthermore, the company should utilize this information to the current markets for the goods, “growth expectations, and annual sales of related existing products to estimate annual revenues”.<sup>169</sup>

Besides other patent tools, Prior Art Searches are essential for the patent applicants and there are many ways to execute them<sup>170</sup>. Example searches are patent mining, document processing, citation metrics, road-mapping, mind-mapping, and digital tools<sup>171</sup>. Additionally, patent application process can be examined more thoroughly with the help of “emerging technologies and technology dynamics (trend analyses), technology forecasting, road-mapping and foresight” as well as R&D management. There are also other options such as “engineering industries, science and technology (S&T) indicators, evolutionary economics, technology assessment and impact analysis”. Moreover, policy studies focused on innovations, science, and technology are an important part of prior art. These different aspects can be useful for the general picture of patent application, yet the focus is now on the actual patent tools.

<sup>168</sup> De Vocht, Jacobs & Sas, 2014.

<sup>169</sup> De Vocht, Jacobs & Sas, 2014.

<sup>170</sup> Langinier & Marcoul, 2016, pp. 399–427; Jeong & Yoon, 2015, pp. 37–52.

<sup>171</sup> Bouayad-Agha et al., 2015, pp. 33–42; Chimuka, 2019; Dirnberger, 2016, pp. 12–20; Jeong & Yoon, 2015, pp. 37–52; Madani & Weber, 2016 pp. 32–48.

First prior art search group is patent mining tools. In patent mining, the company should focus on several specific keywords and unfit keywords should be changed. Patent mining can be divided into “bibliometrics, data mining, network analysis and cluster analysis”. Bibliometric analysis provides patent mining information about “top authors, journals, universities, and countries”. It utilizes “eigenvector centrality” which helps to find “connections to a highly connected node”. Bibliometric analysis is generally used to evaluate metadata and present some patterns and scarcities in technologies. Another keyword-focused analysis is network analysis which organizes the most used keywords to a chronological order. On the other hand, cluster analysis focuses on finding clusters in keywords. These two analyses provide more detailed information about the keywords and patents.<sup>172</sup> For example, cluster analysis can group patents into corresponding classes whereas network analysis discovers the patent networking forms<sup>173</sup>.

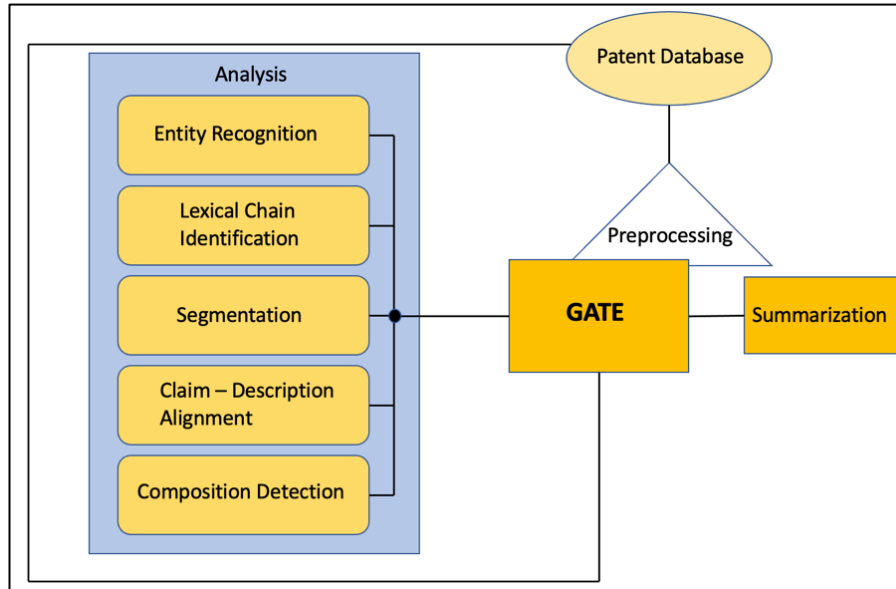
Content-oriented patent document processing is a part of prior art searches. It aims to analyze and summarize patent material. Content-oriented patent document processing includes “preprocessing tools, five patent analysis modules and a module for patent summarization”. All the steps of the workbench are covered in Figure 5. The first step is using preprocessing tools which contains of an “open-source software GATE”. It provides algorithm integration.<sup>174</sup>

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<sup>172</sup> Madani & Weber, 2016 pp. 32–48.

<sup>173</sup> Choi et al., 2016, pp. 426–437; Madani & Weber, 2016 pp. 32–48.

<sup>174</sup> Aswani, Bontcheva, Cunningham, Damljanovic, Funk, Gorrell, Greenwood, Heitz, Li, Maynard, Peters, Petrak, Roberts, Roberts, Saggion & Tablan, 2011; Bouayad-Agha et al., 2015, pp. 33–42.



**Figure 5.** Content-oriented patent document processing<sup>175</sup>.

After preprocessing the patent data, next step is a patent analysis which is divided in five modules. The first one is entity recognition which is a part of term recognition for capturing meanings that express entities in innovations. These term types should be pre-defined. Thus, this phase utilizes a TOPAS workbench which is an interactive analysis. TOPAS uses “patent citations, physical measurements, technical quality entities, substances, and processes”. These terms are filtered, and the best suited candidates are chosen. These candidates are then divided into non-technical and technical groups. The second module is lexical chain identification. This deepens the “coreference and content relation” by defining terms from semantic relation’s point of view. This phase “is based on the Stanford Deterministic Coreference Resolution System (StCR)” which has the candidate detection, coreference resolution, and post-processing steps. Candidate selection provides information about the “nominal, pronominal, and named entities”. Coreference resolution uses independent models to cluster the chosen candidates to different groups. The post-processing step is used to eliminate unnecessary candidates.<sup>176</sup>

<sup>175</sup> Adapted from Bouayad-Agha et al., 2015, pp. 33–42.

<sup>176</sup> Bouayad-Agha et al., 2015, pp. 33–42.

The third module, segmentation is done after the lexical chain identification. Nevertheless, before the segmentation phase is possible, different functional parts of the invention must be found. These parts are called components, and they are segmented, classified, and identified into similar groups. After this, the segmentation begins and is done in three levels. On the first segmentation level, there are five obligatory ones, “technical field, background art, summary of the invention, description of drawings, and preferred embodiments”, and two optional, industrial applicability and examples, segments. The second segmentation level handles the “headline and topic transition segment recognition”. The third segmentation level consists of finding the patent chunks. These chunks include important information about the patent, such as the advantages and objectives of the innovation.<sup>177</sup>

The last two modules, claim and summarization, are important for the result. Claim module includes the description aligning. The alignment is done by connecting claim segments to sentential and sub-sentential description segments because they can provide more information together. This aligning is executed with the interactive patent analysis that offers information about the claims and “features for abstractive summarization”. The last module, summarization, provides an extractive and abstractive summarization. Extractive summarization focuses on a surface-oriented approach that is “based on distribution heuristics to select relevant linguistic constructions” whereas the abstractive summarization concentrates on summary-relevant content elements. The latter utilizes “linguistic aggregation or natural language text generation techniques” which lead to the need of semantic analysis. From the summarization information, the metrics of numerical scores are done. There are three options where component mentions features, segment relevance features, and classical extractive summarization features. This metric is changed into summaries which can be evaluated closer.<sup>178</sup>

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<sup>177</sup> Bouayad-Agha et al., 2015, pp. 33–42.

<sup>178</sup> Bouayad-Agha et al., 2015, pp. 33–42.

Another citation metric and a prior art search tool is called a claim and search report approach which aims to discover the patent quality. The claim and search report approach tries to find patent documents that damage novelty, inventiveness, or are causing a legal risk towards the patent application. This approach uses citations which contain patent information, such as “geographic flows of information”. The other option is backward citation metrics, which concentrates on discovering the right prior art to the different claims and is not based on the number of citations.<sup>179</sup>

Next patent tool in prior art search category is patent road-mapping. It is a blueprint tool that provides “a future plan or strategy”. There are two layers, technology, and patent layers. Road-mapping helps to decide on patenting in the short term. The target, for example the country or company, must be decided beforehand. Patent road-mapping includes forecasting, patent analysis and text mining methods<sup>180</sup>. Patent forecasting is divided into normative and exploratory forecasting.<sup>181</sup> Normative forecasting aims to connect future needs to technological performance<sup>182</sup>. The technology roadmap and relevance tree are examples of this method<sup>183</sup>. However, patent decision tree analysis has been said not to provide enough information and exclude “uncertainty and flexibility” perspectives which are essential in project valuation and decision-making processes.<sup>184</sup> In contrast, the exploratory forecasting combines the previous data and present circumstances<sup>185</sup>. It can utilize “growth curves, trend extrapolation, and Delphi techniques”<sup>186</sup>.

Patent roadmap also requires quantitative tools, patent analysis and text mining. These provide numerical patent statistics and trends.<sup>187</sup> The patent roadmap also needs qualitative tools that offer information about the patent contents. First the ontology of the

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<sup>179</sup> Thompson, 2016, pp. 47–54.

<sup>180</sup> Jeong & Yoon, 2015, pp. 37–52: E.g. Curran & Leker, 2011, pp. 256–273.

<sup>181</sup> Jeong & Yoon, 2015, pp. 37–52.

<sup>182</sup> Jeong & Yoon, 2015, pp. 37–52 cited Martino, 1993.

<sup>183</sup> Jeong & Yoon, 2015, pp. 37–52.

<sup>184</sup> Güemes-Castorena, Hernández-García & Ponce-Jaramillo, 2018, pp. 24–38.

<sup>185</sup> Jeong & Yoon, 2015, pp. 37–52.

<sup>186</sup> Cheng, Chen & Chen, 2008, pp. 131–141.

<sup>187</sup> E.g. Curran & Leker, 2011, pp. 256–273.

patentable invention is covered. Next, the applicant should focus on gathering patent information from a patent database by using keyword vectors. Then the clustering and TEMPEST framework should be utilized because they help to group and classify the patents. Next, the patterns of the patent development are evaluated by using structural and temporal patterns. Lastly, the planning and road-mapping of a patent can be executed properly. The ontology of technology enables the applicant to find “the concept and structure of technology”. It also helps to decide on the right components. The next step, keyword technique should be executed by using the ontology information as a basis. The clustering phase is also done with the keywords, yet it provides a hierarchical order to the patent information.<sup>188</sup>

In patent road-mapping, TEMPEST framework is additionally used with the clustering. TEMPEST can evaluate technological information of patents from different points of view.<sup>189</sup> All the letters represent an analytical perspective. T (time) includes either “fabricating or controlling method” and manufacturing process of the patent. E (Energy) contains the technological information about the patent which can be the power source of the invention or the method of application. M (material) can be ingredients or matters that the technology or product is produced from. On the other hand, patentable inventions aim to create a function which can be added to generating “attributes of technology”, and these steps are evaluated in the P (personality). S (space) provides information about the patentable innovation from the structural point of view. It also handles the “concepts of arrangement, structure, constituent, or components of the implemented technology/product”.<sup>190</sup>

The pattern phase of patent road-mapping utilizes the categorization of the TEMPEST framework. The structural pattern aims to discover the order of patent development. On the other hand, the temporal pattern evaluates the suitable time for the patent

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<sup>188</sup> Jeong & Yoon, 2015, pp. 37–52.

<sup>189</sup> Jeong & Yoon, 2015, pp. 37–52 cited Coh, 2002.

<sup>190</sup> Jeong & Yoon, 2015, pp. 37–52.

application.<sup>191</sup> The grouped and analyzed patterns can be examined with SCAMPER which helps to find concrete aspects of patterns<sup>192</sup>. S (Substitute) stands for a person or some other good acting or serving “in the place of another”. C (Combine) means all the products and technologies that can be united. A (Adapt) is used “to adjust for the purpose of suiting a condition or purpose”. M (Modify, Minify, Magnify) means to alter “the form or quality”, and it can be increased or decreased. P (Put to other use) stands for the invented new purposes for a specific item. E (Eliminate) means that some items can be eliminated and still produce something similar. R (Rearrange, Reverse) could lead to means that change the original plan or layout. This information is used to plan the patents that would be possible to file and are not already protected.<sup>193</sup>

There are also many other patent mapping solutions, and one of them is TRIZ-Led Patent Mapping technique that enables patent conflict discovering. It is also a part of data mining processes as well as prior art searches. TRIZ examines differences “between patent claims” and utilizes multi-dimensional scaling. Discovered information can be evaluated with legal judgments. TRIZ compares the claims to the chosen criteria and provides a means to compare “judgment standards between different legal authorities in mechanical engineering terms”. It can be called “Theory of Inventive Problem Solving” which is combined with patent mapping technique. The conflict of patents can occur in two conditions, infringements and invalid. Infringements are current claims on a specific patentable invention whereas invalid means patent claims that seem suspicious.<sup>194</sup>

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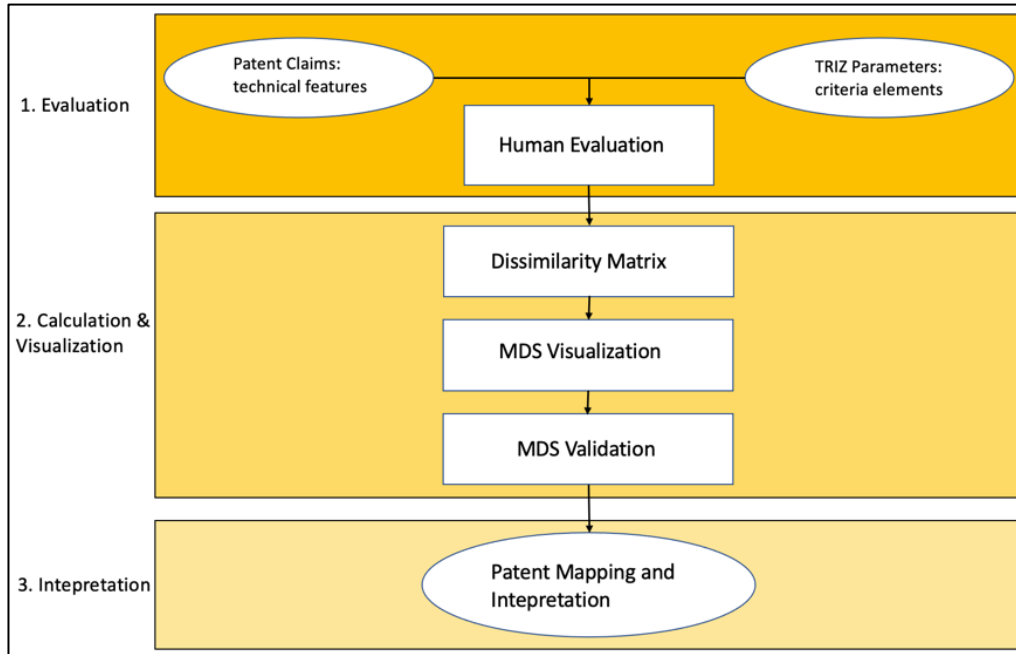
<sup>191</sup> Jeong & Yoon, 2015, pp. 37–52.

<sup>192</sup> Jeong & Yoon, 2015, pp. 37–52 cited Eberle, 2008.

<sup>193</sup> Jeong & Yoon, 2015, pp. 37–52.

<sup>194</sup> Atherton, Harrison & Zheng, 2014, pp. 11–23.





**Figure 6.** TRIZ-Led Patent Mapping<sup>195</sup>.

Figure 5 shows that TRIZ-Lead Patent-Mapping is a three-phase examination. The overall evaluation is done first, then the calculations and visualizations and finally, the interpretation of the results. It uses a matrix to discover the technical features in patents. There are technical features, TRIZ parameters, and a marker in a square that has a relevant claim in the matrix. After this, the calculation is done by triangular matrix which provides information about the differences. The last phase is a part of patent mapping which is executed by visualized features.<sup>196</sup>

In contrast, a digital mind-mapping software is a prior art search tool for patent search and management. There are many digital mind-map instruments that the patent applicant can use that help in categorizing a broad data flow. A digital mind-map could be in a tree-form. Additionally, the information about the patents could be divided into three groups which are “integration of various information types”, “information structuring options”, and “access options to information”. Some documents and hyperlinks can be added, and different project management software tools utilized. Moreover, fonts,

<sup>195</sup> Adapted from Atherton, Harrison & Zheng, 2014.

<sup>196</sup> Atherton, Harrison & Zheng, 2014, pp. 11–23.

colors, and different layout options help to categorize the mind-map. For the patent information, the mind-map should show the task and data groups which are “search workflow organization” and “search information mapping”. The workflow may include for example administrative tasks, meetings, and deadlines. On the other hand, the search information mapping could contain folders and patent databases. There could be “a country-specific patent information mapping”, as well.<sup>197</sup>

Another digital prior art search tool is a Multi-Level Model which utilizes Artificial Intelligence (AI) as a basis. This framework focuses on “patentability and inventorship” and can create patentable softwares.<sup>198</sup> AI has many characteristics, but the main concept has been formed to “advanced, automated and autonomous AI systems”<sup>199</sup>. This framework is based on the AI revolution which can be classified to different overlapping constituent parts<sup>200</sup>. The multi-level approach is then important because the patent offices do not recognize these different AI levels<sup>201</sup>. The Multi-Level Model divides the framework into three main levels: semi-autonomous, fully autonomous, and neuro-autonomous. In the semi-autonomous level, there are both “automation and autonomy” which vary by the size of the effect. Instead, fully autonomous consists of soft and hard AI. The last, neuro-autonomous level is used to classify the connection “between the biological (the brain) and AI driven algorithms and machines”. These three main levels are parts of the core product or the AI system itself. As connectivity grows, importance of the software component and then again data component or algorithm expands. This enables AI to generate plenty of data “in real time”. Thus, the AI is capable of consuming data and software intensity, which relates to the hard and soft AI parts.<sup>202</sup> The Multi-Level Model is shown in Figure 7.

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<sup>197</sup> Dirnberger, 2016, pp. 12–20.

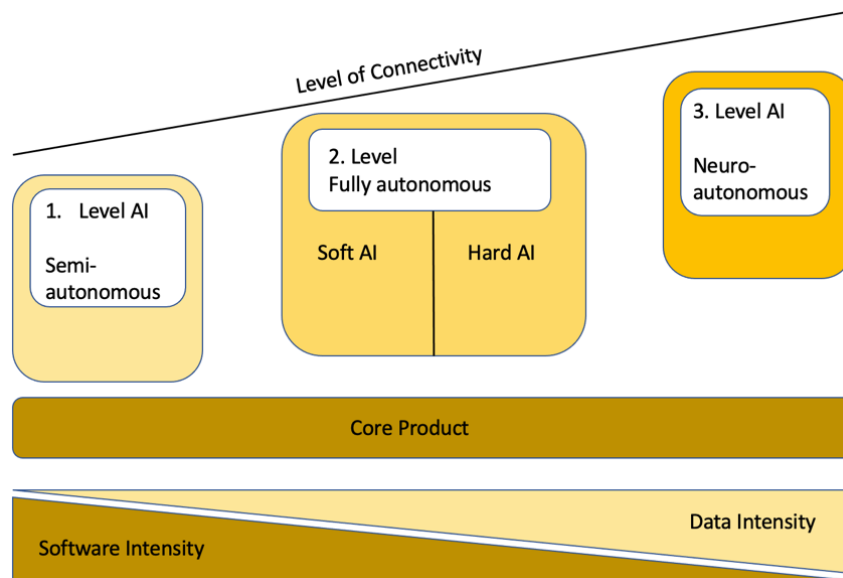
<sup>198</sup> Chimuka, 2019.

<sup>199</sup> Shlomit & Xiaoqiong, 2017, pp. 2215–2263.

<sup>200</sup> Chimuka, 2019.

<sup>201</sup> Chimuka, 2019.

<sup>202</sup> Chimuka, 2019.



**Figure 7.** Multi-Level Model<sup>203</sup>.

In patent processes, semi-autonomous level algorithms should be used in a similar way as the software analysis. These algorithms are quite similar to those in software but require a human aspect as well. The intensity of software is also larger. This level suits for examining the global patent environment. This is related to the interoperability of world legal systems including standards, policies, and legal practices. In contrast, the second level, fully autonomous, has a larger and advanced connection to the data intensity.<sup>204</sup> Nevertheless, the software intensity is still higher than the data intensity in soft AI, and the need of predictability and clarity is significant<sup>205</sup>. On the other hand, hard AI systems obtain consciousness, thinking, and feeling of human understanding. Moreover, the focus is moving on to the data intensity and should be used in an anonymized way by following the General Data Protection Regulations (GDPR) where the governmentally and privately owned data is a common good and autonomous. Instead, the third neuro-autonomous level can be seen as a future picture of AI being “smarter than human beings”. The third level must consider ethics and privacy questions which leads to the impact of legal policies.<sup>206</sup>

<sup>203</sup> Adpated from Chimuka, 2019.

<sup>204</sup> Chimuka, 2019.

<sup>205</sup> Chimuka, 2019 cites European Patent Office, 2017.

<sup>206</sup> Chimuka, 2019.

Currently, a need for patent search experts that gather a broad patent data from analyses, “such as patentability, freedom-to-operate, patent invalidation, patent statistics”, is growing extensively. Thus, the amount of internal and external data is increasing, and employees are forced to adapt to this environment. There are three main thematic classifications for this information base.<sup>207</sup> These are:

(1) Science, technology, and associated business represented by the company, (2) patenting/patent search process relevant information including compliance with internal and external regulations, (3) know-how on the underlying information technology, software and database systems required to quickly and comprehensively access the information relating to the two aforementioned topic groups<sup>208</sup>.

The first one contains for example literature and disclosures of inventions and patents. The second classification includes internal and external regulations, such as patent law and enterprise policies. The third group utilizes for example manuals and other sources for information retrieval.<sup>209</sup>

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<sup>207</sup> Dirnberger, 2016, pp. 12–20.

<sup>208</sup> Dirnberger, 2016, pp. 12–20.

<sup>209</sup> Dirnberger, 2016, pp. 12–20.

## 5 The Comparison of Patent Systems for SMEs

### 5.1 Impact of Patent Tools on Small and Medium-Sized Enterprises

SME innovation environment, different patent systems, and tools can be seen as important perspectives for SMEs. However, these perspectives should be compared with each other as they provide more information about the patent systems together. SMEs differ relatively much from each other by the size and financial status<sup>210</sup>. Therefore, the comparison of patent systems is divided into two main groups, small and medium-sized enterprises, in this study. This decision is made because small enterprises are quite similar together whereas the medium-sized companies also formulate a separate group of companies regarding the financial and size aspects<sup>211</sup>.

It is important to do business and financial planning for all SMEs. This includes the recognition of business possibilities in goods and technologies. Value addition is also essential from the customer perspective as well as for discovering competition environment. It can be done with investment calculations that provide predicted success calculations. Business planning also needs financing, development, and research which are easier to manage with the right calculations and analyses. However, financial limitations may occur, and the research must be done within the budget.<sup>212</sup> Additionally, companies should focus on product development by utilizing smart manufacturing, such as IoT or automation, and logistical strategies to unify IT and goods to business processes. This would also provide broad data possibilities to the company.<sup>213</sup>

After the business planning is operated properly, SMEs must consider many different aspects of patentability before filing a patent application. Thus, companies should focus on patent management, strategy, financial background, and prior art searches by

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<sup>210</sup> European Commission, n.d. -d.

<sup>211</sup> European Commission, n.d. -d.

<sup>212</sup> Koski, 2017, pp. 11–17.

<sup>213</sup> Brown et al., 2020. pp. 39–66.

utilizing different legal and business tools.<sup>214</sup> These tools should also help to compare different patent systems. In the background of Finnish SMEs innovation procedures, there is a great impact of other extrinsic factors, such as digitalization, environment, and innovation development<sup>215</sup>. Additionally, SMEs should decide on whether there is need for some external financing, such as public funding<sup>216</sup>. Finnish legislation also impacts the innovation decisions and Finnish SMEs should execute a broad preliminary work of “products, consumer, environment, IPR, tax, labor, social, data protection, health, and traffic laws”<sup>217</sup>.

## 5.2 Small Enterprises

### 5.2.1 Patent Management and Strategy Tools

Both patent management and strategy tools can be seen as a basis for small companies’ innovation processes. Furthermore, they should be clearly defined before entering a patent application procedure.<sup>218</sup> These tools provide similar results for all small enterprises, and thus Finnish ones can take advantage of the following results. Although patent management is important to all SMEs, there can be seen a special need of management for small enterprises as it provides suitable tools for novelty creation<sup>219</sup>. It also requires analyzing the competition environment<sup>220</sup>. This is important for small companies when they search patent information about patents and inventions. There is a broad methodological framework for patent management which concentrates on “domain of construct, item generation, scale purification, internal consistency assessment, scale validation, and replication”<sup>221</sup>. This helps the small enterprise to have an overall view of the

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<sup>214</sup> E.g. Agostini, Nosella & Teshome, 2019; De Vocht, Jacobs & Sas, 2014; Langinier & Marcoul, 2016, pp. 399–427; Jeong & Yoon, 2015, pp. 37–52; Schmidt, 2013, pp. 242–251.

<sup>215</sup> Energiapolitiikka.fi, 2021: Tilastokeskus, n.d. -g.

<sup>216</sup> Tilastokeskus, n.d. -c.

<sup>217</sup> Tilastokeskus, n.d. -d.

<sup>218</sup> Moehrle, 2019.

<sup>219</sup> Bessant, Pavitt & Tidd, 2005; Moehrle, 2019.

<sup>220</sup> WIPO, 2005.

<sup>221</sup> Agostini, Nosella & Teshome, 2019.

patent management processes in the company. Small enterprises can simultaneously add different patent systems to this framework and discover whether there are possibilities in every patent system. This is an important and vast step that should be included in a small enterprise's patent processes.

In addition to the methodological approach, there are other patent management tools, such as patent portfolio and intelligence. These tools can be looked from the organizational and cultural aspects which provide a multi-dimensional standpoint for patent management.<sup>222</sup> These tools can be very important for more specific examination in small companies. Thus, the small company should consider if there is a need for examination because a small company itself does not necessarily have a multi-dimensional organization environment. Another option is to focus more on the other tools because they might provide more profitable information about the patent systems. There is also a possibility to create a patent team who oversees internal patent marketing<sup>223</sup>. However, this may not be the most suitable option for small enterprises on account of a small number of employees. Thus, these companies should concentrate on doing teamwork within the entire company so that everyone is familiar with the patent processes.

Patent strategy is also essential alongside patent management. The most important tool is patent strategy questions which provide a broad overview of the company's patent processes. Small companies should especially focus on the last question on "where to patent"<sup>224</sup> and consider patents from different angles. Moreover, the basis for finding the suitable patent system for small enterprises needs to be ready before any actions. Moreover, a preparatory comparison of patent systems could be one solution for small firms that are able to conduct larger investigation. This is possible with other patent strategy tools, patent landscape and IP competitive intelligence. They help the company to examine patent information as well as focus on the competence of employees.<sup>225</sup> As

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<sup>222</sup> Agostini, Nosella & Teshome, 2019.

<sup>223</sup> Rainey, 2014, pp. 16–21.

<sup>224</sup> Schmidt, 2013, pp. 242–251.

<sup>225</sup> Pargaonkar, 2016, pp. 10–20.

a small enterprise may have a tight budget and timeline, these two tools enable different utilization schedules that fit the company's needs.

Another patent strategy option for small enterprises would be a coopetition between other companies. The innovation budget can be limited in small firms and cooperation with other companies would be a cost-saving, sustainable, technologically advantaged, financially, and geographically suitable solution. It would also decrease the patentable risks. However, challenges in opportunism and knowledge leakage should also be considered by small firms.<sup>226</sup> Nevertheless, this could be a great solution for many Finnish small companies to work together in national and international business environment.

### **5.2.2 European Patent System**

After patent management and strategy decisions are made, a closer investigation of the financial situation is required. This can be executed with industrial standards, 25 percent rule, and discounted cash flows. Industrial standards of patents are important because they include all the needed patent information from the licensing to court litigation. This requires extensive data acquisition, comparison, and scaling from the small enterprises.<sup>227</sup> Fortunately, the European patent system provides information about other patentable inventions, but the information may not be easily discovered<sup>228</sup>. This phase is essential, yet small companies may have some budget limits. There is also another financial tool, 25 % rule, for situations where there are no industrial standards. Another important financial tool is discounting cash flows that present the predictions of a patent's future value and offer a tangible calculation of profits and costs.<sup>229</sup> From the European patent system perspective, this calculation would consider for example the patent system filing time and estimated costs. All these financial calculations are highly important for small enterprises as their budget may be limited.

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<sup>226</sup> De Matos, Hidalgo, Molling, Monticelli & Santini, 2023.

<sup>227</sup> De Vocht, Jacobs & Sas, 2014.

<sup>228</sup> European Parliament, 2009.

<sup>229</sup> De Vocht, Jacobs & Sas, 2014; Goldscheider et al, 2002; Lu, 2011.



The European patent system reveals financial aspects that should be considered alongside the financial calculations. For example, European patent litigation costs are usually quite high and multiple simultaneous litigation processes in different European countries may outreach the financial status of small companies and thus favor an opposing side<sup>230</sup>. On the other hand, European patent is regarded to be a relatively inexpensive and economically sufficient choice compared to individual filings in every country<sup>231</sup>. Yet the costs may increase significantly as the application process is long due to backlog<sup>232</sup> and have been estimated to be approximately 30 000 euros in ten years<sup>233</sup>. Fortunately, the European patent process can be speeded up with additional fees<sup>234</sup>. Costs of patenting are already high for small enterprises so they must closely consider overall costs that may also occur afterwards. Furthermore, patent filing is a legal procedure and may require legal help. Even though the patent law is the main legal source, the companies must also follow the competition law requirements<sup>235</sup>. This also means that the small companies should have a vast legal knowledge or a need for legal help which then again is relatively expensive.

Prior art searches are providing patent information for small companies by examining current patent data.<sup>236</sup> These tools can be seen useful for small enterprises as they reveal broad European patent information background for example of the patentable invention, patent system, and patent quality. In addition, European patent is seen easy and globally protective<sup>237</sup>. Nonetheless, small companies may not have the possibility to execute the European patent data because of the gaps in European patent information<sup>238</sup>. European patent terms of protection are also related to the country where the patent is

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<sup>230</sup> Chimuka, 2019.

<sup>231</sup> European Patent Office, 2022a.

<sup>232</sup> European Parliament, 2009.

<sup>233</sup> European Commission, n.d. -c.

<sup>234</sup> European Patent Office, 2022a.

<sup>235</sup> European Parliament, 2009.

<sup>236</sup> Bouayad-Agha et al., 2015, pp. 33–42; Chimuka, 2019; Langinier & Marcoul, 2016, pp. 399–427; Jeong & Yoon, 2015, pp. 37–52; Thompson, 2016, pp. 47–54.

<sup>237</sup> European Patent Office, 2022a.

<sup>238</sup> European Parliament, 2009.

in force. Furthermore, infringements are processed in national courts.<sup>239</sup> This can be seen as a benefit because the decision-making is being made locally, yet there is no finished unified court<sup>240</sup> that manages all the litigations. However, protection means separate contracts in every country where the patent is accepted<sup>241</sup>. This can be difficult for a small company as they must manage all the different contracts, conditions, and legal environments. It has also been argued that European patent protection is hard to obtain because of the severe requirements<sup>242</sup>, and small companies should consider this before applying<sup>243</sup>. Moreover, ambiguity of standardization in ICT patent applications provides uncertainty<sup>244</sup> which may hinder the possibilities of small companies.

### 5.2.3 Unitary Patent System

Before any decision is made based on patent management and strategy, financial calculations should be executed by examining results from industrial standards, 25 percent rule, or discounted cash flows. These can predict the costs for current and future situation.<sup>245</sup> Small firms should compare these financial points to Unitary patent. It is predicted to be inexpensive, less than the European patent<sup>246</sup>. Unitary Patent is predicted to cost approximately 5000 euros in ten years<sup>247</sup>. This is important to small enterprises that generally have smaller financial possibilities to success. Even though costs are predicted to be quite small, it is argued that possible long application processes are inevitably affecting the costs<sup>248</sup>, and this would be a challenge for small enterprises. Furthermore, Finnish small companies benefit from the euro currency used in the Unitary patent system as they are already using euro as a business currency<sup>249</sup>. In addition, translation requirements are easier to fulfil without a vast language knowledge or additional fees

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<sup>239</sup> European Patent Office, 2022a.

<sup>240</sup> European Parliament, 2009.

<sup>241</sup> European Parliament, 2009.

<sup>242</sup> Euractiv, 2010.

<sup>243</sup> European Parliament, 2009.

<sup>244</sup> European Parliament, 2009.

<sup>245</sup> De Vocht, Jacobs & Sas, 2014.

<sup>246</sup> European Patent Office, 2022b.

<sup>247</sup> European Commission, n.d. -c.

<sup>248</sup> Van Pottelsberghe, 2012.

<sup>249</sup> European Patent Office, 2022b.

for translation. Moreover, there are programs for supporting the SMEs with the costs of patents, for example with the help of litigation fee insurance<sup>250</sup>. Without these services, the litigation might impede the possibilities for small enterprises because they are financially at disadvantage compared to the larger enterprises.

Prior art searches are tools for data acquisition and evaluation which small companies can benefit from<sup>251</sup>. However, as there are so many options, small companies should consider the broadness due to possible limited budget. Nonetheless, these tools would reveal an extensive amount of European patent data. As mentioned before, the Unitary Patent is a European Patent with unitary effect and unified court. Thus, it requires an EP application together with unitary effect. Companies can apply the effect even for current European patent.<sup>252</sup> Unitary patent is regarded as stable and the application process clear and easy without complex validation requirements<sup>253</sup>. This is good for small companies because this might decrease the need for extensively broad data obtaining.

Prior art searches also reveal other advantages and disadvantages regarding the Unitary patent administration, technology, and litigations. First, application does not require that much work as the translations are easier<sup>254</sup>. Patent administration can also be handled in one place<sup>255</sup>, which eases the technical perspective. Small companies benefit from this because management can be done by a small group or even by one person. If administrative tasks were in different places, more know-how on technologies and systems would be needed. Nonetheless, legal uncertainty may increase because the Unified court is new, and all the litigations must be processed there<sup>256</sup>. Applicants should have a complete confidence over legal procedures which might not be the case with the new

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<sup>250</sup> European Commission, n.d. -c.

<sup>251</sup> Bouayad-Agha et al., 2015, pp. 33–42; Chimuka, 2019; Langinier & Marcoul, 2016, pp. 399–427; Jeong & Yoon, 2015, pp. 37–52; Thompson, 2016, pp. 47–54.

<sup>252</sup> European Commission, n.d. -c.

<sup>253</sup> European Patent Office, 2022b.

<sup>254</sup> European Patent Office, 2022b.

<sup>255</sup> European Patent Office, 2022b.

<sup>256</sup> European Patent Office, 2022b.

court system, especially in the beginning<sup>257</sup>. This is a large challenge for small enterprises as litigation is already a financial issue. It might also lead to a lower number of applications from small firms.

Unitary patent can be considered from the process and geographical perspective as well. On one hand, it is positive that all services are available in national Finnish PRH, but it also hinders possibilities for finding the right system<sup>258</sup>. Especially, small enterprises may not have a chance to examine patent materials enough. The Unitary patent would also add another patent protection option for applicants<sup>259</sup> which is not making the decision easier for smaller companies. As the national patent office oversees many different application processes, it will also affect the application process times negatively<sup>260</sup>. Generally, the wider the geographical distance in patent security, the wider the benefits for the company. However, Unitary Patent does not necessarily provide these benefits for the applicant.<sup>261</sup> Unitary effect is useful for export companies, yet it can negatively affect national markets. Therefore, the number of patents is directly impacting the increasing threat of patent infringement. Thus, increasing restrictions of business environment by patents decreases business opportunities.<sup>262</sup> Small companies should focus on their business areas. Hence, if a small company exports goods, they are benefitting more on this patent than other companies that focus on other industries.

#### **5.2.4 International Patent System**

For small companies, understanding the current and future financial situation is highly important as patent filing may only be possible if a company can afford it. Yet, the patent management and strategy basis should be established beforehand. These calculations can be done with the help of industrial standards, 25 percent rule, or discounted cash

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<sup>257</sup> Van Pottelsberghe, 2012.

<sup>258</sup> Van Pottelsberghe, 2012.

<sup>259</sup> Van Pottelsberghe, 2012.

<sup>260</sup> Van Pottelsberghe, 2012.

<sup>261</sup> Leskinen et al., 2014, pp. 33–42.

<sup>262</sup> Leskinen et al., 2014, pp. 33–42.

flows.<sup>263</sup> International patent system has several financial perspectives to be considered by the small companies. For example, the system costs can be remedied one at the time.<sup>264</sup> This is important for a small enterprise as their financial situation may be tight. Moreover, a chance to speed up the process is also a great benefit<sup>265</sup> which may help save money and decrease financial risks for small companies. This is essential because the application process itself is quite expensive and long as usually a direct patent application to a specific country is a faster solution<sup>266</sup>. Length of the process means more costs for small enterprises. On the other hand, accelerated process enables faster protection, yet it is not free of charge<sup>267</sup>. Calculations should be done by the small company to find out which alternative is more attractive. Additionally, PCT does not cover all the global business areas. This leads to a need for filing more applications to different countries.<sup>268</sup> If the small company would want to secure their invention properly in global markets, the filing costs of many different applications would be on an excessively high level and possibly out of the small company's reach.

Prior art searches enable many aspects of international patent data from mining to metrics<sup>269</sup>. From the international patent application point of view, a possibility of applying PCT in Finnish Patent and Registration Office is seen positive in Finnish companies<sup>270</sup>. This is easier for small enterprises as well because they can decide on a suitable patent system with the help of available information in one place and in Finnish. International Bureau of WIPO, European Patent Office, and the patent office of Sweden are other options for filing the application. PCT also enables the applicant to preview all patent alternatives of different countries before filing.<sup>271</sup> This provides a small enterprise a great advantage for data acquisition.

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<sup>263</sup> De Vocht, Jacobs & Sas, 2014.

<sup>264</sup> PRH, 2020b.

<sup>265</sup> PRH, 2020b.

<sup>266</sup> Hindles, 2023: PRH, 2020b.

<sup>267</sup> Hindles, 2023: PRH, 2020b.

<sup>268</sup> Hindles, 2023.

<sup>269</sup> Bouayad-Agha et al., 2015, pp. 33–42: Chimuka, 2019: Langinier & Marcoul, 2016, pp. 399–427: Jeong & Yoon, 2015, pp. 37–52: Thompson, 2016, pp. 47–54.

<sup>270</sup> PRH, 2020b.

<sup>271</sup> PRH, 2020b.

International patent can also be applied in English, Swedish or Finnish<sup>272</sup>. This is important because Finnish and Swedish are national languages in Finland and most Finnish people use Finnish. Yet, there are many Swedish talking people in Finland as well. On the other hand, English is used in most business markets which makes it essential. In addition, Finnish companies are in favor of using English in patent applications<sup>273</sup>. Decision on the scale of protection does not necessarily have to be done immediately because PCT process allows a consideration period<sup>274</sup>. Additionally, plenty of information is provided to the applicant in the middle of the PCT process<sup>275</sup>. This can also be seen as a benefit for small companies' data acquisition. However, it does not exclude former examination of patent data with the help of analyses which is crucial for small firms.

### 5.2.5 National Patent System

As mentioned, patent management and strategy tools should be utilized before moving to examining the financial side. Financial comprehension is a necessity for small companies before filing a patent, and it can be done with financial tools<sup>276</sup>. From the financial perspective, Finnish national patent is seen quite inexpensive<sup>277</sup> which benefits the small companies.

For small companies, prior art searches should also be used for discovering information about the patents<sup>278</sup> and national patent system. All Finnish companies including small ones, argue that national patent application is relatively efficient. Furthermore, Finnish companies are satisfied with the proceedings which can also be executed in English. However, most enterprises are of the opinion that national patent does not provide

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<sup>272</sup> PRH, 2020b.

<sup>273</sup> PRH, 2020b.

<sup>274</sup> PRH, 2020b.

<sup>275</sup> PRH, 2020b.

<sup>276</sup> De Vocht, Jacobs & Sas, 2014.

<sup>277</sup> Leskinen et al., 2014, pp. 61–63.

<sup>278</sup> Bouayad-Agha et al., 2015, pp. 33–42; Chimuka, 2019; Langinier & Marcoul, 2016, pp. 399–427; Jeong & Yoon, 2015, pp. 37–52; Thompson, 2016, pp. 47–54.

enough protection globally.<sup>279</sup> This is a crucial challenge especially for small enterprises as they must consider costs as well as protection scale very carefully. If a small firm decides to focus only on national markets, it may lead to increasing competition, a new patent of the same invention in a different country, and challenges if another firm is able to join the same markets with lower prices. Thus, many Finnish companies usually apply for a patent in the United States and in large European economic areas, like Germany. Nevertheless, they are also filing patent applications in Finland.<sup>280</sup>

## 5.3 Medium-Sized Enterprises

### 5.3.1 Patent Management and Strategy Tools

Patent management and strategy tools are also vital for medium-sized companies when clearly defined because they provide a foundation for innovation procedures and possible patent applications<sup>281</sup>. The outcomes of the tool implementation highlight the similarities of patent systems and medium-sized enterprises. From the patent management point of view, a methodological approach<sup>282</sup> is needed in medium-sized enterprises for discovering overall patent management processes. If a budget for data acquisition is sufficient, there is a possibility for patent portfolio and intelligence tools that provide a wider perspective of patent management considering also the cultural and organizational aspects<sup>283</sup>. In patent management, patent team would be a solution<sup>284</sup>. Medium-sized enterprises might benefit from it as there are 50 to 250 employees working in these companies<sup>285</sup>. If medium-sized companies decided on filing a patent, there would be many possibilities and challenges which can be recognized even better with other patent tools.

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<sup>279</sup> Leskinen et al., 2014, pp. 61–63.

<sup>280</sup> Leskinen et al., 2014, pp. 61–63.

<sup>281</sup> Moehrle, 2019.

<sup>282</sup> Agostini, Nosella & Teshome, 2019.

<sup>283</sup> Agostini, Nosella & Teshome, 2019.

<sup>284</sup> Rainey, 2014, pp. 16–21.

<sup>285</sup> Rainey, 2014, pp. 16–21.

Medium-sized enterprises should also consider patent strategy. Patent strategy can be built with the help of strategy questions<sup>286</sup>. The strategy can be seen as a foundation for more thorough patent data acquisition and thus is important for medium-sized companies. To increase understanding of the patent strategies, patent landscape and IP competitive intelligence tools can be used to discover more data and employees' competence<sup>287</sup>. These tools are important for medium-sized enterprises, yet the broadness and time spent can vary because of the budget. These strategy tools can be used to find information about all patent systems. Another alternative would be cooperation with other companies. This would enable reducing costs, lowering risks, growing technical, sustainable, market, and enlargement opportunities. Nonetheless, risks of opportunism and knowledge loss are possible and should be taken into account in medium-sized firms. Even though the innovation budget and possibilities of medium-sized companies are generally better than in small ones, cooperation is still a well-designed option for medium-sized enterprises for larger market expansion.<sup>288</sup>

### 5.3.2 European Patent System

After the patent management and strategy are defined, medium-sized companies can move on to financial calculations. Calculation tools, industrial standards, or 25 percent rule<sup>289</sup>, provide information about the European patent system as information is provided to an applicant<sup>290</sup>. Yet, the information can be difficult to find.<sup>291</sup> Nevertheless, there might also be a need for discounted cash flows if other tools do not offer enough calculations about the future<sup>292</sup>. European patent itself reveals important financial data that can be used in calculations. For example, European patent costs are estimated to

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<sup>286</sup> Schmidt, 2013, pp. 242–251.

<sup>287</sup> Pargaonkar, 2016, pp. 10–20.

<sup>288</sup> De Matos et al., 2023.

<sup>289</sup> De Vocht, Jacobs & Sas, 2014.

<sup>290</sup> Leskinen et al., 2014, pp. 61–63.

<sup>291</sup> European Parliament, 2009.

<sup>292</sup> De Vocht, Jacobs & Sas, 2014.



come to 30 000 euros in ten years<sup>293</sup>. Nevertheless, costs of separate patent applications in separate countries are much higher than European patent process costs. There is also an opportunity to speed up the European patent process with additional fees.<sup>294</sup> Medium-sized companies should use it if it is profitable because usually a longer application period means larger costs<sup>295</sup>.

Financial data acquisition also reveals that there are different patents for different countries depending on where it is applied. Thus, national litigation for patent infringements is beneficial for medium-sized enterprises because specific national patent contract conditions are dealt nationally and with the help of national laws.<sup>296</sup> Nevertheless, the knowledge of different legal environments is needed, and the litigation process can be expensive. Even though medium-sized enterprises are financially wealthier than small ones, possible litigation costs can be excessively high for them. Additionally, medium-sized enterprises have a relatively good position in managing the patent costs of European patent application.

Prior art searches help to discover and study patent information. Medium-sized companies have many options for that such as patent mining, network analysis, and patent road-mapping.<sup>297</sup> There is also a lot of European patent information that can be found and used in prior art searches. For example, the European patent system contains many strict requirements<sup>298</sup> that must be met by the medium-sized enterprises as well. Nonetheless, they can be in advantage with their better financial situation for being able to do a more thorough patent data acquisition beforehand than small companies. Thus, the requirements may be predicted better in medium-sized companies. A lack of patent information<sup>299</sup> may concurrently be a challenge for medium-sized enterprises. However,

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<sup>293</sup> European Commission, n.d. -c.

<sup>294</sup> European Patent Office, 2022a.

<sup>295</sup> European Parliament, 2009.

<sup>296</sup> European Patent Office, 2022a.

<sup>297</sup> Bouayad-Agha et al., 2015, pp. 33–42; Chimuka, 2019; Langinier & Marcoul, 2016, pp. 399–427; Jeong & Yoon, 2015, pp. 37–52; Thompson, 2016, pp. 47–54.

<sup>298</sup> Euractiv, 2010.

<sup>299</sup> European Parliament, 2009.

possibly better examination facilities may help them to find missing information from somewhere else than the European Parliament. Additionally, Finnish Patent and Registration Office provides broad information about patents and patent application systems<sup>300</sup>.

Prior art searches highlight other facts about European patent, as well. For example, patent enforcement<sup>301</sup> is still causing challenges to medium-sized enterprises as the unified litigation is still incomplete. Indistinctness of standardization in ICT technologies<sup>302</sup> is also a problem for medium-sized enterprises. Know-how of different legal systems and patent law is essential, yet there is also a need for competition law competence as patentability may lead to following competition law<sup>303</sup>. As medium-sized companies have more staff than small ones, the possibility for internal and external legal help is larger.

### 5.3.3 Unitary Patent System

Medium-sized enterprises can focus on financial calculations after the patent management and strategy are cleared up. Financial calculations are important for medium-sized enterprises because they provide the possible costs and profits by utilizing industrial standards, using 25 percent rule, or calculating discounted cash flows.<sup>304</sup> There is already a financial perspective for Unitary patent, as well. The cost-savings and stability of Unitary patent<sup>305</sup> is providing a good basis for inventions of Finnish medium-sized firms. Unitary Patent is predicted to settle to 5000 euros in ten-year-period<sup>306</sup>. Additionally, the translations and payments in euro currency are executed in an easier way<sup>307</sup>. In Finland, euro is the national currency, so this is easier for the medium-sized enterprises to follow. There would not be that much work in checking the different currency changes either.

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<sup>300</sup> E.g. PRH, 2022.

<sup>301</sup> European Parliament, 2009.

<sup>302</sup> European Parliament, 2009.

<sup>303</sup> European Parliament, 2009.

<sup>304</sup> De Vocht, Jacobs & Sas, 2014.

<sup>305</sup> European Patent Office, 2022b.

<sup>306</sup> European Commission, n.d. -c.

<sup>307</sup> European Patent Office, 2022b.

On the other hand, the litigation process is a financial burden that the medium-sized firms should consider. The European union is supporting SMEs in patent application, and it is focusing on support with the Unitary patent<sup>308</sup>. This is a huge benefit for medium-sized companies as they can save in patent costs and be in a better financial position. As Finnish Patent and Registration Office takes care of the different patent application processes and is responsible for the Unitary patent, the application periods will be longer<sup>309</sup>. This is a negative fact for medium-sized firms because the longer proceedings will increase the costs.

For data examination, there are many alternatives in the form of prior art searches. These are for example different mining techniques, analyses, metrics, models, road-mapping, and approaches.<sup>310</sup> These tools can also offer much information about the Unitary patent. The Unitary Patent effect is available for current or new European patents. This also enables the use of Unified court.<sup>311</sup> The application procedures and requirements are predicted to be clear and easy compared to the current systems<sup>312</sup>. This is essential for medium-sized companies as the data acquisition process might be shorter and may not require so much funding. The translation can be done in Finland as the knowledge of English is already so good. Moreover, there are translation services provided if needed<sup>313</sup>.

In addition to the previous, patent administration is completed in one system<sup>314</sup>. This is very good as the medium-sized companies should not have to use the time for understanding different systems and they could use the time for managing the patent environment better. However, the clearness of the application is still not sure as there are other options for it and all the applications are done in the same place for Finnish

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<sup>308</sup> European Commission, n.d. -c.

<sup>309</sup> Van Pottelsberghe, 2012.

<sup>310</sup> Bouayad-Agha et al., 2015, pp. 33–42; Chimuka, 2019; Langinier & Marcoul, 2016, pp. 399–427; Jeong & Yoon, 2015, pp. 37–52; Thompson, 2016, pp. 47–54.

<sup>311</sup> European Commission, n.d. -c.

<sup>312</sup> European Patent Office, 2022b.

<sup>313</sup> European Commission, n.d. -c.

<sup>314</sup> European Patent Office, 2022b.

companies<sup>315</sup>. The fact that the applicants must apply for the European patent with Unitary effect<sup>316</sup> may mislead the applicants.

Furthermore, medium-sized companies should precisely consider the Unitary patent because it is still unfinished, and the process is not clear<sup>317</sup>. The medium-sized enterprise might also face legal uncertainty over the new Unified court, as there is no trust-base for it yet<sup>318</sup>. These firms should also consider the geographical area that the Unitary patent provides. Usually broader area provides more protection, but the Unitary patent may not deliver this. Medium-sized enterprises that are exporting goods are in a better position with wider Unitary effect than others in national markets. This means that other medium-sized companies should consider the width of the geographical distance.<sup>319</sup>

#### **5.3.4 International Patent System**

Even though it should be important to medium-sized companies to define patent management and strategy, the comprehension of company's financial status is also essential. This can be done with different financial patent tools<sup>320</sup>. There is important data about the financial status of the international patent. There are no translation costs<sup>321</sup> and medium-sized firms can save in overall costs. Moreover, costs can be managed more when there is a possibility to do financial calculations also in the middle of the process. In addition to the translation costs, medium-sized firms are usually financially in better position than small ones, yet their financial situation might still be restrictive. The opportunity for speeding the patent process<sup>322</sup> is beneficial for medium-sized companies as it enables the patent to be available sooner as well as can save money and lower the financial risk. As the medium-sized firms' financial position may be limited, the already

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<sup>315</sup> Van Pottelsberghe, 2012.

<sup>316</sup> European Commission, n.d. -c.

<sup>317</sup> Van Pottelsberghe, 2012.

<sup>318</sup> European Patent Office, 2022b.

<sup>319</sup> Leskinen et al., 2014, pp. 33–42.

<sup>320</sup> De Vocht, Jacobs & Sas, 2014.

<sup>321</sup> PRH, 2020b.

<sup>322</sup> Hindles, 2023: PRH, 2020b.

relatively expensive PCT application<sup>323</sup> may not be the suitable solution. It might lead to direct application in different countries which is usually faster and thus saves money<sup>324</sup>. The fact that PCT is not able to cover all the international business areas<sup>325</sup>, is a challenge for medium-sized firms because it can lead to increasing costs of applying more protection.

For deeper data acquisition, prior art searches<sup>326</sup> are in favor of medium-sized companies, and there is already plenty of data about international patent that medium-sized companies can utilize. The opportunity of filing PCT application in PRH, International Bureau of WIPO, EPO, and PRV<sup>327</sup> is important to the medium-sized firms. In the patent data acquisition point of view, the possibility to see all international patent information when filing PCT is crucial for the medium-sized companies<sup>328</sup>. The broad information load in the middle of the PCT<sup>329</sup> is also helpful because even though it is important to do the evaluation of patent data before the application, the additional information may help to focus on the advantages and disadvantages. Moreover, application languages are important to all Finnish firms. On the other hand, the consideration period of PCT<sup>330</sup> enables medium-sized companies to consider suitable protection countries.

### 5.3.5 National Patent System

Clarification of patent management and strategy is important but medium-sized companies still need financial research and therefore, medium-sized companies can predict patent costs and profits with financial patent tools<sup>331</sup>. There are also financial aspects of Finnish national patent. Finnish medium-sized companies see the Finnish patent

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<sup>323</sup> Hindles, 2023: PRH, 2020b.

<sup>324</sup> Hindles, 2023.

<sup>325</sup> Hindles, 2023.

<sup>326</sup> Bouayad-Agha et al., 2015, pp. 33–42: Chimuka, 2019: Langinier & Marcoul, 2016, pp. 399–427: Jeong & Yoon, 2015, pp. 37–52: Thompson, 2016, pp. 47–54.

<sup>327</sup> PRH, 2020b.

<sup>328</sup> PRH, 2020b.

<sup>329</sup> PRH, 2020b.

<sup>330</sup> PRH, 2020b.

<sup>331</sup> De Vocht, Jacobs & Sas, 2014.

application cheap. A challenge is the size of protection, national patent provides. Generally, the US and Germany are providing enough protection, but this means more costs and applications.<sup>332</sup>

Additionally, prior art searches<sup>333</sup> should be used by medium-sized companies as these tools provide patent data information. The Finnish patent application is evaluated to be efficacy. Finnish companies are also satisfied with the possibility to do the application in English.<sup>334</sup> Additionally, national patent should be an important option for medium-sized companies if they are focusing on Finnish markets. Yet, they should consider protecting national markets from competition with other patents, as well<sup>335</sup>.

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<sup>332</sup> Leskinen et al., 2014, pp. 61–63.

<sup>333</sup> Bouayad-Agha et al., 2015, pp. 33–42; Chimuka, 2019; Langinier & Marcoul, 2016, pp. 399–427; Jeong & Yoon, 2015, pp. 37–52; Thompson, 2016, pp. 47–54.

<sup>334</sup> Leskinen et al., 2014, pp. 61–63.

<sup>335</sup> Leskinen et al., 2014, pp. 61–63.

## 6 Discussion and Conclusions

There are many advantages and disadvantages in different patent systems that should be evaluated with alternative patent tools. Additionally, more thorough patent data should be examined with their help. These tools are very beneficial for both small and medium-sized companies, but these enterprises should decide on the broadness of utilization. For example, a clear patent management and strategy procedure is a requirement and works as a foundation for all innovation processes in Finnish SMEs. They can enable innovation that the company can afford.<sup>336</sup> Management and strategy tools also present many similarities. For example, possibilities for cooperation and internal patent team are essential<sup>337</sup>. Cooperation would be a great opportunity to all SMEs, but patent team is more rational for medium-sized enterprises than small ones. Nevertheless, business and financial planning should be executed beforehand to permit broader business development and innovations<sup>338</sup>. Simultaneously, the impacts of external environment must be considered from the technological, legal, financial, and environmental perspective<sup>339</sup>.

When using other patent tools, Finnish SMEs should concentrate on several aspects of patent systems. Financial and application time examination can be seen essential for all Finnish SMEs. From the financial perspective, Unitary patent seems to be the most cost-saving option<sup>340</sup>. Additionally, Unitary patent conditions and European financial support would be in favor for SMEs. Unitary patent is the only patent that enables financial support in this scale.<sup>341</sup> This system also uses euro as a currency which eases the patent system usage for Finnish SMEs<sup>342</sup>. On the other hand, international patent application periods are usually quite long, yet it also enables programs for faster application times

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<sup>336</sup> De Vocht, Jacobs & Sas, 2014.

<sup>337</sup> De Matos et al., 2023; Rainey, 2014, pp. 16–21.

<sup>338</sup> Koski, 2017, pp. 11–17.

<sup>339</sup> Energiapolitiikka.fi, 2021: Tilastokeskus, n.d. -d.

<sup>340</sup> European Patent Office, 2022b.

<sup>341</sup> European Commission, n.d. -c: European Patent Office, 2022b.

<sup>342</sup> European Patent Office, 2022b.

which affects the costs in a decreasing way<sup>343</sup>. Instead, European patent costs are rather expensive compared to Unitary patent<sup>344</sup>. In addition, European patent application periods are generally quite long as there are many demanding requirements to fulfill<sup>345</sup>. Instead, Unitary patent has been designed to be easy without challenging requirements<sup>346</sup>. The application period and costs in national patent are relatively short and low<sup>347</sup> so from the financial aspect, it creates potential for SMEs. Regarding the previous information, it seems to limit examination and possibilities because the financial position is highly important for SMEs. Moreover, they generally have a limited innovation budget which might restrict small companies even further.

Even though financial status is important for SMEs, they should also consider other patent system aspects. For example, the trust towards the patent system is essential. The European, international, and national patents are trusted by the companies. Unitary patent is the only system where implementation and functionality are still unfinished and may bring financial and legal challenges. The fact that the Unified court is not yet working and does not have the trust base, increases uncertainty.<sup>348</sup> Nevertheless, the litigation system can be seen as one of the most important trust and financial factors. In European patent system, a possible litigation is executed separately in every patent contract country<sup>349</sup>. Finnish national patent litigations are done automatically in Finland. On the other hand, Unitary patent litigation is aimed to be settled in Unified court<sup>350</sup>. One common court is a cost-saving and easy solution for SMEs because they are only required to understand the European patent and competition law conditions instead of all the conditions in different countries. SMEs could also be spared from additional and expensive legal help.

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<sup>343</sup> Hindles, 2023: PRH, 2020b.

<sup>344</sup> European Commission, n.d. -c: European Patent Office, 2022b.

<sup>345</sup> Euractiv, 2010.

<sup>346</sup> European Commission, n.d. -c: European Patent Office, 2022b.

<sup>347</sup> Leskinen et al., 2014, pp. 61–63.

<sup>348</sup> Van Pottelsberghe, 2012.

<sup>349</sup> European Patent Office, 2022a.

<sup>350</sup> European Commission, n.d. -c.



Geographical distance for patent protection is also an important factor for SMEs. Finnish national patent has negative outcome of not providing enough protection. It has been concluded that filing a patent in Germany, France, or the United Kingdom, are ensuring a sufficient amount of protection in Europe as they cover most of the European market areas.<sup>351</sup> However, the patent filing route in these countries can be seen versatile because it can be fulfilled by filing a national patent for each country or using other patent systems. Unitary patent only covers most member countries of the European Union<sup>352</sup>. However, it would concern all the largest European market areas and thus provide enough security in Europe. If the company wanted more protection globally, a patent in the United States would be a potential solution<sup>353</sup>.

Instead, international patent can provide a broad protection globally, yet it also leaves some of the most important international market areas out. In addition to the PCT, it would require a separate patent filing from these areas.<sup>354</sup> Nonetheless, there can be more possible patent protection countries than in national and Unitary patent. When considering the Unitary patent and geographical distance, a broader protection is not necessarily better. For exporting SMEs, a broad Unitary protection is a good solution, but for SMEs staying in local markets, the broad protection is decreasing the national market potential.<sup>355</sup> Instead, European patent offers protection in Europe and internationally<sup>356</sup>. Therefore, it competes with the PCT for the broadness of protection. Yet, it does not cover all the important markets worldwide either<sup>357</sup>. For SMEs it is important to decide the protection broadness based on the willingness to internationalize or stay local.

The access of patent system, the system platform, and patent requirements may also have a great importance in the final decision-making of Finnish SMEs. The Unitary patent system has been built upon one system where all the transactions and maintenance can

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<sup>351</sup> Leskinen et al., 2014, pp. 33–42.

<sup>352</sup> European Commission, n.d. -c.

<sup>353</sup> Leskinen et al., 2014, pp. 61–63.

<sup>354</sup> Hindles, 2023.

<sup>355</sup> Leskinen et al., 2014, pp. 33–42.

<sup>356</sup> European Patent Office, 2022a.

<sup>357</sup> European Patent Office, 2022a.

be followed. This increases the user-friendly basis and access compared to the other patent systems. On the other hand, all the patent systems and filing processes can be executed at least in Finnish Patent Registration Office (PRH). This is a good factor for data acquisition and comparison, yet it may lead to the challenges of choosing the right system. Furthermore, as the PRH is responsible of all the filings, the overall application period may be longer.<sup>358</sup> Thus, it is good that there are other possible application platforms, such as European patent Office<sup>359</sup> for Finnish SMEs to choose from. Information about other patents is presented most sensibly in the middle of international patent application process<sup>360</sup>. Instead, there is an unfortunate information gap for European patent from the European parliament<sup>361</sup>. The Finnish Patent and Registration Office still provides plenty of patent information for all the applicants<sup>362</sup>.

Moreover, the estimations have shown that the overall patent application requirements should not be as demanding in Unitary patent as in European, international, and national patents<sup>363</sup>. For example, translation is easier in Unitary patent than in European patent which requires multiple different translations<sup>364</sup>. Unitary patent also enables an opportunity for translation services<sup>365</sup>. This is a challenge for SMEs with limited innovation budget as the process may need a representative<sup>366</sup>. On the other hand, the possibility for doing a Finnish national patent application in English is a great advantage for SMEs<sup>367</sup>. In addition, the international patent application does not require extensive translations<sup>368</sup>.

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<sup>358</sup> Van Pottelsberghe, 2012.

<sup>359</sup> E.g. PRH, 2020b.

<sup>360</sup> PRH, 2020b.

<sup>361</sup> European Parliament, 2009.

<sup>362</sup> E.g. PRH, 2022.

<sup>363</sup> Euractiv, 2010: European Commission, n.d. -c: European Patent Office, 2022b.

<sup>364</sup> Euractiv, 2010: European Commission, n.d. -c: European Patent Office, 2022a.

<sup>365</sup> European Commission, n.d. -c.

<sup>366</sup> European Patent Office, 2022a.

<sup>367</sup> Leskinen, Lönnqvist, Mikkola & Nurmisto, 2014, pp. 61–63.

<sup>368</sup> PRH, 2020b.

All this information and comparison data are prior art searches and thus parts of the data acquisition provided by different patent tools. However, this information only presents the basis for more thorough investigation. Innovation and business planning should be clear before any other steps are taken in the company. SMEs should also utilize patent management and strategy tools for finding the right balance between invention and protection. Other tools help to implement concrete data to support decision-making. This study has compared the different patent systems and applications with the help of patent tools, but the Finnish SMEs also need information about their industry, other patents, and financial calculations.

Nonetheless, the patent tools presented in this study are highly useful and will help the company to find more patent data directed to their use. All the patent tools might still not be suitable for all SMEs, and they should decide on which ones to utilize. Additionally, finding the suitable patent system for all Finnish SMEs is challenging as there are differences for example in size, finances, industry, and innovation processes. That is why this study concentrates on the tools and basis for finding the right system if there is any. This might help Finnish micro-companies as well; however, the focus is merely on small and medium-sized enterprises. The future studies could aim to provide example solutions for suitable patent systems for Finnish SMEs or larger enterprises. They could also focus on different countries or fewer patent systems.

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