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# Artificial intelligence outsmarting the human perception of what is patentable?

- An EU examination of the patentability of  
artificial intelligence

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## Summary

Artificial intelligence challenges IPRs and patent is the legal field in focus for this thesis. The thesis examines if artificial intelligence can be the inventor of its own invention. Thereafter central questions to granting a patent by focusing on the second patent requirement in art. 56 EPC - the inventive step. The inventive step covers the technical character and non-obvious to a person skilled in the art.

As of May 2018, there are no cases from the BoA clarifying if artificial intelligence can be the inventor of its invention. Doctrine has covered this topic and concludes that there is a difference between inventorship and ownership. The right for the inventor to be mentioned is a formal requirement in the patent application. The requirement is interpreted from the VCLT and the BoA case law in the thesis. But they do not address the question since the inventor is not a substantial requirement for a patent leaving room for interpretation. Even though it is not possible right now for artificial intelligence to be acknowledged as the inventor there is an interesting discussion in doctrine why it should be considering the divide between inventorship and ownership. Artificial intelligence needs to be categorised under a physical or a legal person to be an inventor. The conclusion is to categorise it under legal person. However, the thesis elaborates the problems with this suggested solution as well. Artificial intelligence needs to be categorised since leaving it uncategorised means that it cannot be the inventor unless the legislation changes.

Further, what problem the patent requirement inventive step consisting of the technical character and the person skilled in the art impose on artificial intelligence is examined. The assessment of the technical character and the fact that it should be non-obvious to a person has shifted from the contribution approach to the problem-and-solution approach. Since the new approach requires a higher standard a mix between these two approaches is suggested for a more flexible application. The fictional person which has been defined in case law and the meaning of not obvious is complex and for this assessment of the inventive step the contribution approach is likely to be more suitable. By changing to the problem-and-solution approach it has allowed the EPO to have a higher standard for patent applications however, then a dynamic application should be applied since artificial intelligence is being examined under computer software. The fact that the artificial intelligence is non-tangible can make the examination more difficult but with a dynamic application of the inventive step artificial intelligence can be patented while upholding the high standard.

## Sammanfattning

Artificiell intelligens utmanar immaterialrätten och patent är det rättsliga området i fokus för uppsatsen. Uppsatsen belyser om artificiell intelligens kan vara uppfinnaren till sin egen uppfinning. Därefter behandlas grundläggande frågor för ett beviljande av ett patent genom att fokusera på det andra patentkravet i art. 56 EPC - uppfinningshöjd. Uppfinningshöjd omfattas av teknisk karaktär och fackmannens kunskap.

I maj 2018 finns det inga rättsfall från BoA som klargör om artificiell intelligens kan vara uppfinnaren till sin uppfinning. Doktrin har behandlat ämnet och kommit till slutsatsen att det finns en skillnad på uppfinnar- och ägarskap. Rätten för uppfinnaren att bli nämnd är ett formellt krav i patentansökan. I uppsatseten tolkas det tolkas utifrån Wien konventionen samt BoA fall. Men där nämns inte hur detta ska tolkas eftersom vem som är uppfinnaren inte är ett substantiellt patentkrav vilket lämnar rum för tolkning. Även om det i nuläget inte är möjligt att veta om artificiell intelligens kan erkännas uppfinningsrätten pågår den intressanta diskussionen i doktrin att det bör p.g.a. uppdelningen mellan uppfinnar- och ägarskap. För att artificiell intelligens ska kunna bli uppfinnaren behövs det kategoriseras under fysisk eller juridisk person. Slutsatsen är att det bör kategoriseras under juridisk person. Det finns dock problematiska aspekter med detta vilket behandlas i uppsatsen. Att inte kategorisera det skulle innebära att uppfinnarskap först är möjligt om lagen skrivs om.

Vidare tas problem kring patentkravet uppfinningshöjd upp som innefattar teknisk karaktär och fackmannens kunskap vid bedömningen av artificiell intelligens. Bedömningen utifrån de två delkriterierna kräver att lösningen på det tekniska problemet inte ska ha varit uppenbar för fackmannen och denna bedömningen har skiftats från en bidragande-metod till en problem-och-lösning metod. Eftersom den nya metoden kräver en högre standard har en mix av metoderna föreslagits för en mer flexibel tillämpning. Den fiktiva fackmannen har blivit definierad i rättsfall och betydelsen av inte uppenbart är komplex och för denna del av bedömningen föreslås den bidragande-metoden som ett led i bedömningen istället. Förändringen till problem-och-lösning metoden har möjliggjort det för EPO att bibehålla den höga standarden för patentansökningar men då behövs en mer dynamisk tillämpning för artificiell intelligens eftersom det tolkas in i dator mjukvara. Det faktum att artificiell intelligens är något abstrakt kan leda till en svårare prövning men med en dynamisk tillämpning av uppfinningshöjd för artificiell intelligens kan det patenteras samtidigt som den höga standarden upprätthålls.

## **Preface**

This year I crossed the finish line for my university years. I am extremely grateful for all the legal experiences I have gained in Sweden and abroad.

Through the years my dad has always supported me and kept on encouraging me. For this mentorship, I am forever grateful.

Jennifer Rönnerhed

Lund, May 22 2018

## **Abbreviations**

BoA	Board of Appeal
CJEU	Court of Justice of the European Union
EPC	European Patent Convention
EPO	European Patent Office
EU	European Union
IP	Intellectual Property
IPR(s)	Intellectual Property Right(s)
OJ	Official Journal
TFEU	Treaty on the Functioning of the European Union
TRIPs	Agreement on Trade-Related aspects of Intellectual Property Rights
VCLT	Vienna Convention on the Law of Treaties
WIPO	World Intellectual Property Office
WTO	World Trade Organization

# 1 Introduction

## 1.1 Background

'Forget artificial intelligence – in the brave new world of big data, it is artificial idiocy we should be looking out for.'<sup>1</sup> However provoking this quote is leading professionals, such as Stephen Hawking, are warning about the effects of artificial intelligence and encouraging the need for understanding it. In fact, artificial intelligence is pushing boundaries not only in people's personal lives but also in the legal field. Due to the rapid growth of this emerging technique leading organizations have named it the fourth industrial revolution.<sup>2</sup>

One legal field where artificial intelligence is creating legal uncertainty is IP. IPRs are defined as a company's intangible assets created by the mind.<sup>3</sup> IPRs can be put into two categories: industrial property and copyright. Industrial property consists of trademarks, design, geographical indication and patents. The category copyright covers books, music, movies and other artistic works.<sup>4</sup> IP allows a business to distinguish oneself from the competitors hence, a lot of money is used to protect IPRs.<sup>5</sup> IP is driving the global economy forwards by promoting innovation and information.<sup>6</sup> According to an EU study 50 % of EU's industries are IP-sensitive and IP amount to 39 % of EU's Gross Domestic Product.<sup>7</sup>

Artificial intelligence is raising new legal questions for several IPRs such as copyright, design and patents. Questions such as how artificial intelligence entity creations should be assessed challenge the application of the law in this technical area. These questions need to be addressed since artificial intelligence was estimated to 2.42 billion U.S. \$ in 2017 and is predicted to reach 59.7 billion U.S. \$ in 2025.<sup>8</sup> The world-wide web has transformed both humans and businesses and because of that development the legal application has expand into new areas.

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<sup>1</sup> Bernard Marr, '28 Best Quotes About Artificial Intelligence' *Forbes* (25 July 2017).

<sup>2</sup> EPO, 'New patent study confirms growth in Fourth Industrial Revolution technologies' (11 December 2017).

<sup>3</sup> WIPO, 'What is Intellectual Property?', p. 2.

<sup>4</sup> *Ibid* p. 2.

<sup>5</sup> 'Protecting Intellectual Property – The importance of protecting intellectual property' (Nibusinessinfo).

<sup>6</sup> Boel Flodgren, 'Civilrätten i ett framtidsperspektiv' (2016) *Svensk Juristtidning*, p. 35.

<sup>7</sup> EPO and EUIPO, 'Intellectual property rights intensive industries: contribution to economic performance and employment in the European Union' (September 2013), p. 6.

<sup>8</sup> Statista, 'Revenues from the artificial intelligence (AI) market worldwide, from 2016 to 2025 (in million U.S. dollars), (2018).



As with any rapid growth, the legal questions of this digitalized area are not being answered fast enough leaving legal application and interpretation gaps. Important questions for businesses such as infringement or invalidation procedures can and are arising in the relation to artificial intelligence and IPRs. But also more fundamental questions related to the IPRs and the scope of the protection. Due to the legal uncertainty regarding the meaning of legal concepts and the application of the legal framework this is a legal landscape worth examine. Because of the unanswered questions in this legal landscape this thesis will shed light on artificial intelligence from a patent perspective. Out of all the IPRs, patent is the one that has been least harmonised.<sup>9</sup>

Patent was chosen since this legal field raises interesting questions concerning the patentability of artificial intelligence. Artificial intelligence is not the first debated patent area covering patentability other areas such as biotechnology for e.g. genetic modified organism and pharmaceutical patents have also been subject to debate.<sup>10</sup> The patent filing of artificial intelligence has tripled in the last ten year.<sup>11</sup> This rapid growth will put new legal questions into the spotlight and the sudden increase has put artificial intelligence high on the agenda for politicians and leading legislative organisations such as the EU.

## 1.2 Purpose and research questions

The purpose of this thesis is heading into unknown territory since it is a field where little has been written from a patent law perspective. The purpose of this thesis is to examine what is legally accepted when a patent contains an artificial intelligence element by examining the EPC and applying it to BoA-cases. This will be done by problematizing patent aspects that artificial intelligence entity raises. To examine the purpose of the thesis two guiding research questions will be examined throughout the thesis:

- i. Can the artificial intelligence entity creating an invention be acknowledged as the inventor?
- ii. How should the concept of technical character in the inventive step and the concept of non-obvious to a person skilled in the art in art. 56 EPC be addressed from an artificial intelligence aspect?

These questions are fundamental for the patentability of an invention and therefore important to investigate from an artificial intelligence view.

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<sup>9</sup> Flodgren (n 6), p. 49.

<sup>10</sup> Ulf Bernitz and others, *Immaterialrätt och otillbörlig konkurrens* (14th Edition, 2017), p. 3.

<sup>11</sup> European Parliament, 'Report 27 January 2017 with recommendation to the Commission on Civil Law Rules on Robotics' (2017), point D.

### 1.3 Delimitation

The delimitations that have been made provide an IP oriented regional examination of the EPC.<sup>12</sup> Artificial intelligence entrance into patent will be covered in this thesis. Consequently, technical details into artificial intelligence will not be covered. However, what artificial intelligence is will be explained in order to understand the patent issues. The focus will be on generally explaining artificial intelligence and various usage of artificial intelligence. The meaning of the concept artificial intelligence, for this thesis, will be further elaborated in the terminology subchapter 1.5.

The IP orientation focuses on the patent law. Nevertheless, copyright is the only other IPRs that will be covered briefly from an artificial intelligence perspective by analogies in the discussion. The international perspective of patent is covered by TRIPs<sup>13</sup> and the regional by the EPC. Other international or regional agreement, conventions or legislation will not be further discussed such as the Paris Convention, the Patent Co-Operation Treaty etc. since these are designed from TRIPs. Nor will specific directives covering patents such as the biotech directive be covered instead a general overview to the patent requirements will be in focus.

Due to the scope of the thesis no national perspective will be covered. Instead the focus is on the application within the EU. This approach was chosen because IPRs are international and the EPO examine both international and regional applications. The BoA-cases serving as a comparison can therefore, for the purpose of the thesis, be BoA to assess the EU-approach to how artificial intelligence and patents should be understood. A BoA case examines the patentability, which has been appeal from the examination division, at the EPO and decides if a patent should be granted or not. The importance of the BoA cases is very high since no other regional court in Europe examines the patentability. The national application of the BoA can vary in the member states. However, since the patent requirements are well established by the international treaties the research questions can be sufficiently answered by examining BoA cases addressing the patentability.

Patent is not the only interesting issue surrounding artificial intelligence. Other issues about liability can occur when a human or property is being hurt. Although these issues are interesting they are not within the civil area of

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<sup>12</sup> The Convention on the Grant of European Patents, The European Patent Convention (16<sup>th</sup> Edition, June 2016). [Hereinafter EPC].

<sup>13</sup> Trade-Related Aspects of Intellectual Property Rights (TRIPs). [Hereinafter TRIPs].

intellectual property. Hence, it will not be covered since criminal law falls outside the scope of this thesis.

## 1.4 Methodology

The research questions will be answered by using a legal dogmatic method. A legal dogmatic method uses accepted legal sources and tries to find an answer by looking at the law, case law, various litterateur such as monographies and papers. This method has been critiqued since it could put more emphasis on the argumentation for a certain solution instead of providing a solution.<sup>14</sup> This is important to note since it is key to be critical to the chosen method. Despite the criticism against the legal method there is no method better suited covering this substance according to the author of the thesis. The purpose of applying this method is to provide an answer to the problem questions based on the legal research.

The legal dogmatic method will be applied in three steps. Firstly, this method is being used to describe the two big components of the thesis – artificial intelligence and patents. Secondly, the method will be used to analyse the legal framework. Finally, the method will be used by examining the legal research questions.

Further, the legal dogmatic method provides guidance when interpreting the law. Legal interpretations methods such as e contrario, theological, literal etc. can be used.<sup>15</sup> However, since the BoA-cases will be used to answer the research questions they are interpreted based on the VCTL art. 31 and 32.<sup>16</sup> Therefore, none of the usual legal interpretations method will be applied. The VCLT articles regulate the interpretation of treaties and state that a treaty should be interpreted in good faith in light with the objects and purpose.

In addition to the legal dogmatic method inventive aspects are being presented. The thesis therefore presents inventive suggestions within the area.

## 1.5 Terminology

As stated under the purpose and research questions the concept of invention and artificial intelligence will be covered. These concepts need to be well-

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<sup>14</sup> Jan Kleineman, 'Rättsdogmatisk metod', in Fredric Korling and Mauro Zamboni (eds), *Juridisk metodlära* (Studentlitteratur 2013), p. 21.

<sup>15</sup> Ibid, p. 21.

<sup>16</sup> Vienna Convention on Law of Treaties concluded at Vienna on 23 May 1969. [Hereinafter VCLT].

defined for the sake of clarity. It is important to state that the usage of the terminology invention is the author's own for examining the research questions.

Artificial intelligence is used in the general meaning and no specific use of it will be examined since all create plausible patentable inventions. With help of a general artificial intelligence outline the basic legal questions arising in this area can be addressed and applied unanimously to all types. The European Commission has defined it as 'systems that show intelligent behaviour: by analysing their environment they can perform various tasks with some degree of autonomy to achieve specific goals'.<sup>17</sup>

Invention refers to something that is created by an artificial intelligence entity. The definition of an invention is not necessarily static but it can be a dynamic concept. An artificial intelligence invention is created by the algorithms and generates a new technical thinking that is perceived by humans with the help of a computer. The invention is not always tangible but the artificial intelligence can be incorporated into tangible objects to enhance their function.

## **1.6 Material**

Since a legal dogmatic method is being used the material is a blend of doctrine and jurisprudence in combination with legislation. Artificial intelligence is a new legal area therefore, several doctrine sources are online and with the help from e-books, online journals, organisations websites along with IP-blogs the research questions will be answered. The area overall does not contain many sources nor cases leaving room for interpretation and hypothetical scenarios.

As always when using online material, a critical approach is necessary and the search has therefore been limited to online books found at legal sites and online legal journals to provide a more academic view. The newspapers that have been used were chosen to illustrate the use of artificial intelligence. Due to the lack of material covering this topic emphasis will, when necessary, be put on the author's legal interpretation and how this area can continue to be developed. This area of law has no pure CJEU case covering the patentability instead these cases are determined by the EPO's BoA. The BoA cases that will be covered are cases selected, by the author of this thesis, to provide a comprehensive discussion for answering the research questions. The BoA-cases have also been accessed online along with regional legislation from

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<sup>17</sup> European Commission, 'Digital Single Market – Artificial intelligence for Europe' (2018), p. 1.

EPO's own website. The EPO's website for finding the cases is not alone enough and to complement the search results Google Patents, Google Prior Art, WIPO's Patentscope and EPO's Espacenet have also been used.

## 1.7 Previous research

Software is *per se* not patentable. However, if the software fulfils some technical requirements it can be patentable.<sup>18</sup> The EPO has found that patents for computer program can be patented 'if it entails a technical aspect, solves a technical problem or can make a computer work outside its given function'.<sup>19</sup> The international approach differs and there are countries who find all type of software patentable. Software patents have been excluded from protection in several countries since it is found 'that innovation in this field typically involves cumulative, sequential development and re-use of other's work, and that the need to preserve interoperability between programs'.<sup>20</sup> It has also been found that a software program is not patentable if it analyses data or allows for graphic presentation of data.<sup>21</sup>

Intellectual property and software have been covered both legislative and in the academia since the end of the last millennium. As a result, artificial intelligence has been categorised under copyright.<sup>22</sup> However, copyright is not found to be a satisfying protection for computer software in the long run.<sup>23</sup>

## 1.8 Outline

This thesis consists of six chapters. Chapter two is a descriptive chapter about artificial intelligence focusing on the definition and EU's legislation of it.

Chapter three introduces patent and the patent requirements along with an overview of the concept inventor and invention. This along with the legal framework internationally and regionally, which also is covered in chapter three will problematize the patent requirements and to provide the reader with a better understanding of the legal issues surrounding artificial intelligence.

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<sup>18</sup> EPC art. 52 (3).

<sup>19</sup> Marianne Levin, *Lärobok i immaterialrätt: upphovsrätt, patenträtt, mönsterrätt, känneteckensrätt i Sverige, EU och internationellt* (11th Edition, Wolters Kluwer 2017), p. 260.

<sup>20</sup> WIPO, 'Computer programs and business models'.

<sup>21</sup> Carlos M Correa, 'Chapter 8: Patent Rights', in Abdulqawi A. Yusef and Carlos M. Correa (eds), *Intellectual Property and International Trade, The TRIPS Agreement* (3<sup>rd</sup> edition, Kluwer Law International 2016), p. 279.

<sup>22</sup> Levin (n 19) p. 260.

<sup>23</sup> 'Is copyright an appropriate protection for computer programs?' (Law and Right, 7 September 2016).

Chapter four gives a background to ground-breaking cases for patenting artificial intelligence covers BoA-cases related to the research questions.

Chapter five is the core of the thesis and problematize the legal framework of the patentability requirements from an artificial intelligence perspective by covering BoA-cases.

Chapter six round off by concluding remarks based on the substance covered in the previous two chapters.

## 2 Artificial intelligence

### 2.1 A general overview to artificial intelligence

Artificial intelligence is a rising star in the digital economy and has thus generated curiosity in the digital world. The current curiosity around artificial intelligence, from humans and businesses, is one reason why it is chosen for the scope of the thesis. This subchapter has been divided into four sections to guide the reader through the scope of artificial intelligence. Firstly, an introduction to how artificial intelligence can be defined and understood will be covered. Secondly, a brief history of the raise of these new intelligent algorithms. Thirdly, various types of uses having artificial intelligence incorporated will be presented. Finally, advantages of it will shed light and help understand the growing interest for it.

To understand what artificial intelligence is one first needs to understand the definition of an algorithm and software. An algorithm is 'a process or set of rules to be followed in calculation or other problem-solving operations, especially by a computer'.<sup>24</sup> Software is a programme where several algorithms give instructions to perform a certain task.<sup>25</sup> The definition of artificial intelligence can be explained as 'the simulation of human intelligence processes by machines, especially computer systems'.<sup>26</sup> To rephrase it artificial intelligence is 'the development of computers that are able to do things requiring human intelligence without human intervention'.<sup>27</sup> However, there is no recognised definition of artificial intelligence despite various attempts to define it.<sup>28</sup> The understanding of the concept is not clear and one reason is because there are several synonyms to artificial intelligence such as deep learning, self-learning, neural network and machine learning. Therefore, a unanimous definition is made more complex since it falls under other concepts as well.

Artificial intelligence emerged out of the ashes of World War II. The name artificial intelligence has been used since 1956.<sup>29</sup> In the 1980's it became an industry who started adopting scientific methods and later in the beginning of

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<sup>24</sup> Oxford English Dictionary definition of algorithm, e-Resource, Oxford University Press.

<sup>25</sup> Oxford English Dictionary definition of software, e-Resource, Oxford University Press.

<sup>26</sup> Margaret Rouse, 'Definition AI (artificial intelligence)' (*TechTarget*, December 2016).

<sup>27</sup> Natalia Muska, 'A look at the Role of Intellectual Property in the Growing AI Space' (*ClearViewIP*, 14 February 2017).

<sup>28</sup> Lea Gary, 'The Struggle to Define What Artificial Intelligence Actually Means' *Popular Science* (3 September 2015).

<sup>29</sup> Peter Norvig and Stuart Russell, *Artificial Intelligence – A Modern Approach* (3<sup>rd</sup> edition, Pearson 2010), p. 1.

the 2000's it started collecting big data.<sup>30</sup> One reason for the worry about artificial intelligence is that it is the only technology seeking to build machines that will work autonomously and in an ever-changing complex environment.<sup>31</sup> Although machine building is only one aspect of it that has not prevented it from being a hot topic now due to the human being's never ending search for the understanding of the mind and our own intelligence. As of right now artificial intelligence is winning that race since it not only tries to understand, but because it can also 'build intelligent entities'.<sup>32</sup>

Artificial intelligence algorithms have created new types of technologies, which have an artificial element in them, such as 3-D printing, virtual reality, robotics, autonomous vehicles, blockchain and internet of things.<sup>33</sup>

3D-printing is a phenomenon that has been known to the public a period of time especially, because of the headlines it created when guns could be created using 3-D printing.<sup>34</sup> It allows an object to be produced with the help of a computer consisting of several layers making the finished product in 3D. Despite the headlines, it is used in other industries such as pharmaceutical and engineering.<sup>35</sup>

Virtual reality is well-known in gaming but tech companies producing cell phones are increasing its use of it too.<sup>36</sup> The common perception of virtual reality is when the environment is created with software and the simulation is so high that the user perceives it as the actual environment.<sup>37</sup> This is one reason why virtual reality is being used in the military to train the soldiers how to react in the most desired way.<sup>38</sup>

Robotics entails the use of robots or the design of them. It can serve as body parts or aiding workers with their daily tasks.<sup>39</sup> But it is also being used for assembling cars, lifting heavy objects and working in storage buildings.

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<sup>30</sup> Ibid pp. 24-28.

<sup>31</sup> Ibid p. 18.

<sup>32</sup> Ibid p. 1.

<sup>33</sup> Muska, (n 27).

<sup>34</sup> Rebecca Morelle, 'Working gun made with 3D printer' *BBC* (Texas, 6 May 2013).

<sup>35</sup> Oxford English Dictionary definition of 3D-printing, e-Resource, Oxford University Press.

<sup>36</sup> Simon Solotko, 'Virtual Reality is the Next Training Ground for Artificial Intelligence' *Forbes* (11 October 2017).

<sup>37</sup> Oxford English Dictionary definition of virtual reality, e-Resource, Oxford University Press.

<sup>38</sup> Virtual Reality Society, 'Virtual Reality in the Military'.

<sup>39</sup> Andrus Ansip, 'Making the most of robotics and artificial intelligence in Europe' (17 November 2017).



Autonomous vehicles are being heavily marketed by Google who seeks to be leading in this field.<sup>40</sup> Artificial intelligence is not only being used for driverless cars but also for camera based vision when parking and for instant stops if something unexpected gets in front of the car. The human can be passive when driving and the artificial intelligence is active.

Blockchain is frequently used in cryptocurrency such as Bitcoin and uses a chain of codes making one action untraceable to a specific individual. No middle hand, such as banks, should be involved in these money transactions.<sup>41</sup>

Internet of things is impacting billions of people every day. The meaning of internet of things is that devices can be connected to the internet by a switch or devices can be connected to each other by for example using Bluetooth.<sup>42</sup> Due to the rapid accessibility of the internet several devices are now constantly connected. Research shows that 20.4 billion devices will be connected by the year 2020 compared to 8.4 billion connected devices in 2017.<sup>43</sup> The number is anticipated to grow by the introduction of 5G in 2020.<sup>44</sup> Internet of things is what suggests top picks on Netflix, filter spam mail to the junk folder, every time a credit card is used the transaction is approved by artificial intelligence. It is also used for online translation sites and speech recognition, unlocking your phone by using the finger print feature and much more. Artificial intelligence allows for enormous amounts of data to be analysed enabling us to get personal suggestions and narrow search results on Google. Please see Supplement A for a graphic illustration of artificial intelligence usage on a daily basis on p. 57.

The benefit of artificial intelligence is the amount of data that can be rapidly analysed. It can learn from the data its analysing and identify complex connections. Its ability to detect complicated connections has also been pointed out as a risk.<sup>45</sup> In 2013, a staggering 90 % of all the data in the world had been collected in the two years before.<sup>46</sup> In the constantly changing field of technology, along with this rapid peak of global data collection, it may come as no surprise that artificial intelligence is mainly being used by global

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<sup>40</sup> Samuel Gibbs, 'Google sibling Waymo launches fully autonomous ride-hailing service' *The Guardian* (7 November 2017).

<sup>41</sup> Oxford English Dictionary definition of blockchain, e-Resource, Oxford University Press.

<sup>42</sup> Jacob Morgan, 'A Simple Explanation of 'The Internet of Things' *Forbes* (13 May 2014).

<sup>43</sup> Egham, 'Gartner Says 8.4 Billion Connected "Things" Will Be in Use in 2017, Up 31 Percent From 2016' (Press Release Gartner Newsroom, 7 February 2017).

<sup>44</sup> Nicholas Shields, 'Here's how 5G will revolutionize the Internet of Things' *Business Insider* (15 June 2017).

<sup>45</sup> Regeringen, 'Artificiell intelligens – en nyckel för att stärka svensk konkurrens' (21 December 2017).

<sup>46</sup> European Commission, 'Business Innovation Observatory – Big Data Artificial Intelligence Case Study 9' (September 2013), p. 3.

companies with a technical specialisation such as Facebook, Apple, Amazon and Google.<sup>47</sup>

## 2.2 Artificial intelligence in the EU law

The booming industry of artificial intelligence has not escaped the EU. Hence, this subchapter aims to show how the EU has integrated artificial intelligence into the legislation to deal with the upcoming challenges. To demonstrate this documents from the EU will be used. After reading this subchapter the reader will understand that the EU is working to regulate artificial intelligence but the union is not targeting the patentability.

The EU's awareness of the increase of artificial intelligence has resulted in attempting to regulate robotics. EU believes it to be necessary to regulate artificial intelligence for the digitalized information society to continue to prosper. Therefore, a resolution was adopted by the European Parliament governing the liability of robotics.<sup>48</sup> This is a necessary step for artificial intelligence to be a part of the internal market. Although the EU acknowledges artificial intelligence, by robotics, the European Parliament stated in a report that there is a need for a flexible definition of artificial intelligence to keep the innovation high.<sup>49</sup> However, the report did not seize the opportunity of defining artificial intelligence. One possible reason for this is that the Parliament considers the Commission to be more suitable for defining the concept. The difficulty of understanding the concept is problematic when it comes to agreeing on a definition.<sup>50</sup> Notwithstanding, another reason why there is no definition to artificial intelligence may be that humans still do not know the limits of it and as a result reserve themselves from giving it a too strict definition. However, the uncertainty in the definition provides a dynamic application, enabling a wider application scope.

Despite the European Parliament's missed opportunity to define artificial intelligence the European Parliament Committee has suggested a 'horizontal and technologically neutral approach to intellectual property'.<sup>51</sup> This along with a more detailed description to artificial intelligence will offer a more balanced approach to IPRs when it is being applied to software. In that way

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<sup>47</sup> Louis Columbus, 'The best AI Companies to Work For in 2018 Based on Glassdoor' *Forbes* (26 November 2017).

<sup>48</sup> European Parliament, 'Resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics' (2017).

<sup>49</sup> European Parliament Report (n 11), point C.

<sup>50</sup> Thomas Kirchberger, 'European Union Policy-Making on Robotics and Artificial Intelligence: Selected Issues' (2017) Volume 13, *Croatian Yearbook of European Law and Policy*, p. 196.

<sup>51</sup> European Parliament Resolution (n 48).

innovation would remain high. The European Parliament has already suggested a solution how the legal interpretation and definition issues could be addressed by proposing ‘common Union definitions’.<sup>52</sup> A common EU definition is problematic for different reasons. To begin with there needs to be consensus of a definition along with a clear predictability for authorities to know what falls under the definition and as stated in previous paragraphs this is complex.

The complexity and unambiguously of the definition artificial intelligence is evident. Nevertheless, the European Commission has attempted to define it. The Commission’s definition for artificial intelligence is that it is ‘systems that show intelligent behaviour: by analysing their environment they can perform various tasks with some degree of autonomy to achieve specific goals’.<sup>53</sup>

By the European Commission providing a definition of artificial intelligence, that enables the EU to continue to work with it and addressing the challenges it imposes. The EU aims for leadership in artificial intelligence, but the focus is not on patentability. Instead the EU wants to prepare its members states and its citizens for a labour market shared with robots, integrate more working force by using technology to boost the economies etc. However, the EU’s narrow approach does not justify neglecting other artificial intelligence aspects such as IPRs. This strategy from the EU is perhaps not the coincidence it appears especially, when taking into consideration that robotics is a concern for the EU citizens, which has been lifted. The citizens are less bothered with internet of things, blockchain etc. because many do not realize how much they use it and more importantly it is not likely to threaten their job. Even if other types of artificial intelligence could threaten some jobs the wider public do not perceive it that way. One possible reason for the EU not addressing the patentability is because of structure of IP law in Europe where the EPO cover patents and the European Intellectual Property Office cover trademarks, design and copyright.

In summary, the legal structure of IP between the EPO and the European Intellectual Property Office shapes the legal development without any traditional involvement from other EU-organs. Despite this, the EU will still be able to present an effective legislation focusing on artificial intelligence in the way it sees benefiting both member states and citizens.

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<sup>52</sup> European Parliament Resolution (n 48).

<sup>53</sup> European Commission, Fact Sheet ‘Artificial Intelligence For Europe’ (25 April 2018).

## 3 Patents and the legal framework

### 3.1 What is a patent?

A patent is the result of an intellectual solution to a technical problem.<sup>54</sup> It protects technical creations such as products, methods or various type of uses that solve a technical problem.<sup>55</sup> Therefore, there are various types of patents such as product patents, usage patents and procedure, also known as method, patents.<sup>56</sup> Additionally, a patent gives the owner exclusive right lasting 20 years.<sup>57</sup> A granting of a world patent does not exist, instead each patent application must go through each state to get an exclusive right to the invention. Beside from applying an application in each state one single application can be submitted to the EPO to avoid the administrative processes in each country. By submitting a EPO patent application the patent can be valid in the 38 EPO member states.<sup>58</sup>

### 3.2 The inventor

Each patent application needs to have a named inventor since by naming the inventor an acknowledgement is given, which is an important non-economic factor.<sup>59</sup> The definition of invention is complex since it is rarely interpreted however, there are some key stones in order to understand who the inventor is. The inventor has the right to the patent and in the EPC it is argued that the inventor has been limited to physical persons.<sup>60</sup> However, a legal person can also be included under inventor by acquiring the right e.g. if employees invent under an employment contract.<sup>61</sup>

Adding to the complexity of defining the invention, an EU-directive has touched upon the subject of who the inventor is in software. The legal protection of computer programs states that authorship of computer programs

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<sup>54</sup> Bengt Domeij, *Patenträtt: svensk och internationell patenträtt, avtal om patent samt skyddet för växtsorter och företagshemligheter* (Iustus 2007), p. 23.

<sup>55</sup> Proposition 2003/04:55. *Gränser för genpatent m.m. – genomförande av EG-direktivet om rättsligt skydd för biotekniska uppfinningar*. [Electronic] Stockholm: Justitiedepartementet, p. 26.

<sup>56</sup> Ibid p. 55. See also Statens Offentliga Utredningar 2006:70. *Oinskränkt produktskydd för patent på genteknikområdet*. [Electronic] Stockholm: Justitiedepartementet, p. 76.

<sup>57</sup> TRIPs art. 33.

<sup>58</sup> EPO, 'Member States of the European Patent Organisation'.

<sup>59</sup> Domeij (n 54), p. 15.

<sup>60</sup> EPC art. 60.

<sup>61</sup> Catarina Holtz and Bengt G. Nilsson, *Patentlagen: en kommentar och en jämförelse med EPC och PCT* (Jure 2012), p. 28.

is a natural person or the group of physical persons that created the program.<sup>62</sup> However, the directive did not address the complexity of identifying the inventor when artificial intelligence creates inventions. The thesis will continue to cover this aspect in the two following chapters and further elaborations on this will be done based on WIPO's position that IP is creation of the mind however, not clarifying if it de facto is a human mind.<sup>63</sup> Nevertheless, WIPO and the EU-directive leaves room for identifying the inventor when an artificial intelligence entity is capable of being the inventor of patents.

The issue of identifying the inventor can have significant impacts on a patent application. In Sweden a patent application without an inventor is an invalidity ground, but a wrongful information about the inventor's name is not an invalidity ground.<sup>64</sup> In the U.S. a wrongful information about the inventor's name is in fact an invalidity ground.<sup>65</sup> The reason for the different approaches have to do with various legal traditions and mainly to stronger regulate the liability responsibility.

### 3.3 The invention

There is no definition of an invention in the EPC, instead art. 52 (2) EPC has a negative definition of what is not an invention.<sup>66</sup> The EPC does not consider discoveries, scientific theories and mathematical methods or aesthetic creations or schemes, rules and methods for performing mental acts, playing games or doing business and programs for computers as inventions.<sup>67</sup> This list of non-patentable inventions is not exhaustive.<sup>68</sup> The exceptions have a chance of being patentable if the 'patent application [...] relates to such subject-matter or activities *as such*'.<sup>69</sup> The meaning behind the complex definition of invention is constantly under debate because of the technical development. Despite the lack of a definition in the EPC, art. 52 (1) EPC provides that 'any inventions, in all fields of technology, provided that they are new, involves an inventive step and are susceptible of industrial application' should be patentable. As a result, a 'computer-implemented-

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<sup>62</sup> Council Directive 2009/24/EC of 23 April 2009 laying down specific provisions on the legal protection of computer programs [2009] OJ/L 111/16, art. 2.

<sup>63</sup> Ronald Vu, 'Should an artificial intelligence be allowed to get a patent?' (Tech and Law center 10 March 2017).

<sup>64</sup> Svensk Författningssamling (1967:837) Patentlagen 52 §.

<sup>65</sup> Domeij (n 54), p. 22.

<sup>66</sup> EPO, Guidelines for Examination November 2017, Part G Patentability, Chapter II – Inventions, General remarks.

<sup>67</sup> EPC art. 52(2).

<sup>68</sup> Holtz and Nilsson (n 61), p. 33.

<sup>69</sup> EPC art. 52(3) [emphasis added].

method’ is subject for patent.<sup>70</sup> Because of the complex definition software patents are more likely to face litigation than other types of patents. Due to the litigations, it is hard to understand how companies and litigators define invention. If less patent cases would be settled by a litigator a better understanding of the concepts could be developed by e.g. the BoA or another court.

Since the patent law does not give a clear answer to what an invention is the concept has been defined in praxis and doctrine.<sup>71</sup> Cases in Germany from the Federal Court of Justice, the Bundesgerichtshof, have developed a definition for invention, which the EPO has used as guidance for their rulings.<sup>72</sup> The invention concept has been further defined by Mario Franzosi because in addition to WIPO’s believe that it is a creation of the mind he adds that ‘an invention is a combination of existing things’.<sup>73</sup> This can imply that the mind creating needs to be aware of existing and limit the concept to the human mind. But Franzosi does not define things to be merely tangible or intangible hence, the room for interpretation still stands.

The special standing for computer software was possible due to the fact that ‘the TRIPs Agreement does not require the application of a particular concept of invention, the protection of computer programs as such may be excluded, in order to avoid monopolization of algorithms [...] that [...] should remain in the public domain’.<sup>74</sup> This special standing has allowed artificial intelligence to be categorised into one of two categories. Either

‘(a) computer programs that only produce a technical effect within the computer or other hardware components; and (b) computer programs that produce technical effects different from those described in (a), entailing changes in the state of physical matter, such as effects on equipment applied to a specific industrial task’<sup>75</sup>

The BoA does not give a clear definition of which type of artificial intelligence it is. Regardless, the two categories provide a better

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<sup>70</sup> G-0003/08 Anonymous/*Programs for computer* [12.05.2010] unpublished.

<sup>71</sup> Bernitz and others (n 10), p. 173.

<sup>72</sup> Rainer Schulte and others, *Patentgesetz mit Europäischem Patentübereinkommen: /b Kommentar auf der Grundlage der deutschen und europäischen Rechtsprechung* (10th Edition, Carl Heymann 2017), p. 137.

<sup>73</sup> Mario Franzosi, ‘Patentable Invention: A Definition’, in Antonina Bakardjieva Engelbrekt and others (eds), *Festschrift till Marianne Levin* (Norstedts Juridik 2008), p. 282.

<sup>74</sup> Correa (n 21), p. 279 – 280.

<sup>75</sup> Ibid p. 277.

understanding of artificial intelligence in patent cases since the computer software principles applies.

### **3.4 The legal framework**

As mentioned in the introduction patent is a harmonised area of law. In this subchapter, the legal framework along with concepts of patents will be covered starting with the international legislation with TRIPs and thereafter the regional EPC. Thereafter, the EU framework will be covered by primary law, secondary law and general EU principles.

#### **3.4.1 International legislation - TRIPs**

TRIPs is a multilateral agreement covering IPRs and was entered into force in 1995.<sup>76</sup> The agreement is stemming from the WTO and applies in 150 countries.<sup>77</sup> Its goal was to reach a global minimum protection for IPRs and since TRIPs is a part of the WTO all its 164 members are also bound by TRIPs.<sup>78</sup>

Three exclusions to patentability are mentioned in TRIPs: inventions contrary ordre public or morality, diagnostic/therapeutic and surgical methods and finally, plants and animals other than micro-organisms.<sup>79</sup> The member states have a crucial obligation to ensure that the patent application in TRIPs serves its purpose and need to show what provisions or law they implement that is connected to TRIPs.<sup>80</sup>

TRIPs has laid the foundation for guiding core principles to ensure a fair treatment. These principles are the national treatment, territoriality principle, minimum protection and the convention principle. The national treatment principle means that no discrimination is allowed. The meaning of national treatment is not unique for IPRs and can be found in other legal areas such as international trade law. Beside from the principle of national treatment the international agreement also requires the most favourable nation treatment.<sup>81</sup> A member state making a patent public should do so without discriminating.<sup>82</sup> The principle of minimum protection sets the lowest legal protection a member state can have. To ensure a harmonization this principle has been

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<sup>76</sup> WTO, 'Overview: the TRIPS Agreement'.

<sup>77</sup> Bernitz and others (n 10), p. 15.

<sup>78</sup> Holtz and Nilsson (n 61), p. 21.

<sup>79</sup> TRIPs art. 27(2) - 27(3b).

<sup>80</sup> Holtz and Nilsson (n 61), p. 22.

<sup>81</sup> Bernitz and others (n 10), p. 16.

<sup>82</sup> TRIPs art. 27(1).

very important.<sup>83</sup> The principle of territoriality means that the protection has a geographical limitation. However, a worldwide protection is possible due to international treaties.<sup>84</sup> The convention priority applies when a patent application is applied in several countries the convention priority can help solve the novelty issues arising.<sup>85</sup>

### **3.4.2 The EPC**

EPC is the prominent multinational convention for assessing patents in the EU. It has been in force since 1977 and the enforcement created the EPO. As a convention, it is not directly linked to the EU and therefore the convention consists of EU member states and non-EU members states.<sup>86</sup> A total of 38 member states are a part of the convention, as mentioned in subchapter 3.1, where 28 are EU member states and 10 non-EU member states. The EPC is interpreted by applying the VCLT since the BoA has ruled that the interpretation of art. 31 and 32 in VCLT applies to the EPC.<sup>87</sup>

The EPC contains the patent requirements that will be covered in subchapter 3.5. Because the requirements are a substantial part of the thesis for answering the research questions they will be examined at the end of chapter three so the reader can have them in mind when the BoA-case law is discussed in chapter four.

#### **3.4.2.1 The Unified Patent Court**

The EU has attempted to establish the unified patent court which would have exclusive competence of European patent proceedings. In order for the court to be established an agreement has been drafted. Only EU member states can by accession enter into the agreement however, Spain and Poland have chosen not to.<sup>88</sup>

Some member states ratification matters more for the existence of the unified patent court than others. Currently a decision from the Federal Constitutional Court of Germany, which will be ruled upon later in 2018 is said to have the

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<sup>83</sup> Bernitz, and others (n 10), p. 16.

<sup>84</sup> Ulrich Löwenheim, 'The Principle of National Treatment in the International Conventions Protecting Intellectual Property, Josef Drexl and others (eds), *Patents and Technological Progress in a Globalized World* (Springer 2008), p. 593.

<sup>85</sup> Levin (n 19), p. 296.

<sup>86</sup> Bernitz and others (n 10), p. 23.

<sup>87</sup> BoA G-0005/83 EISAI/*Second medical indication* [05.12.1984] OJ EPO 1985, 064 Reasoning 4.

<sup>88</sup> Unified Patent Court, 'About the UPC'.



potential of killing the united patent court agreement.<sup>89</sup> This is a big problem since the agreement will not be entered into force until the three largest member states with the most European patents sign the unified patent court agreement. These three states are the United Kingdom, France and Germany.<sup>90</sup> The Federal Constitutional Court of Germany will address the ratification of the agreement if they choose to bring up the complaint. Since an admission of this complaint would mean that Germany still has not ratified the agreement the unified patent court's implementation would be seriously delayed or potentially killed.<sup>91</sup>

### 3.4.3 Intellectual property in the EU

IP is an important player in the European legal system. One of EU's obligation according to art. 118 TFEU is to 'in the context of the establishment and functioning of the internal market [...] establish measures for the creation of European intellectual property rights to provide uniform protection of intellectual property rights throughout the Union [...]'.<sup>92</sup> To understand the legal issues arising one needs to have an overview of the legal framework in the EU. Therefore, the primary and secondary EU law will now be discussed together with general principles of EU law.

### 3.4.4 Overview of primary and secondary EU law

IP is the most private field of law within the EU.<sup>93</sup> After the Lisbon treaty<sup>94</sup>, the Charter of fundamental rights<sup>95</sup> is equally primary law as the TEU and TFEU treaties. The art. 17 (2) of the Charter is of special importance for IP since it states that 'intellectual property shall be protected'. Further, fundamental freedoms resulting from the constitutional traditions common to member states constitutes general principles of EU law.<sup>96</sup> Since IP is a fundamental freedom the EU-law principles now apply.

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<sup>89</sup> 'There is scepticism whether the Unified Patent Court will ever be set up' (Kluwer Patent Blog, 2 March 2018).

<sup>90</sup> Hogan Lovells, 'UPC and Germany: Status update – Constitutional complaint, ratification timeline and more' (17 October 2017).

<sup>91</sup> 'German complaint against Unified Patent Court Agreement on FCC decision list for 2018' (Kluwer Patent Blog, 21 February 2018).

<sup>92</sup> Consolidated version of the Treaty on the Functioning of the European Union (TFEU), OJ C 326, 26/10/2012, art. 118. [Hereinafter TFEU].

<sup>93</sup> Ansgar Ohly and Justine Pila, *The Europeanization of Intellectual Property Law* (Oxford University Press 2013), p. 3.

<sup>94</sup> European Union, Treaty of Lisbon Amending the Treaty on European Union and the Treaty Establishing the European Community (13 December 2007) 2007/C 306/01.

<sup>95</sup> Charter of Fundamental Rights of the European Union, OJ C 326, 26/10/2012. [Hereinafter the Charter].

<sup>96</sup> Consolidated Version of the Treaty on European Union, OJ C 326, 26/10/2012 art. 6 (3). [Hereinafter TEU].

The fundamental principles granted to IP can impact the cooperation between member states and the union. Each member state has obligations to the international and regional agreements it has entered into. IPRs are to a large extent still national rights of exclusivity; although, vast internationalisation IPRs are territorially limited. Because of the harmonization of IPRs being more in line with the internal market and the free movements the territorial limitation is slowly being erased.<sup>97</sup> Although the difference gets smaller on the EU-level, they can still be spotted on a national level. Germany has a strong tradition of patent law along with the United Kingdom.<sup>98</sup> The member states domestic legal differences are diminished by the EU's and WTO conventions and agreements. Despite some clashes between the member states they are not as big as in other legal areas since the patent framework is very similar due to the strong international framework reflected in regional and domestic law.

It is not only international law that affect regional law. Regional law can also change the application of international law from an EU perspective, which can be illustrated by examining TFEU art. 207 (1). EU has the power according to art. 207 (1) to enter into an agreement on behalf of the member states where the member states put EU's interest before their own domestic. However, EU as a member to an agreement is not accepted in a larger extent, in fact the only agreement of substance that recognises the EU as a member is the WTO agreement.<sup>99</sup> Going back to the art. 207 (1), a recent judgment named the Daiichi judgement,<sup>100</sup> ruled that TRIPs provisions fall under the common commercial policy in art 207 (1). Consequently, the commercial policy entails trade policy where the EU has the responsibility to legislate commercial IP aspects.<sup>101</sup> Moreover, the CJEU ruled that since it falls under the common commercial policy the member states lack the competence to interpret the provisions.

### 3.5 Patent requirements

For a patent to be patentable the law set up three requirements; novelty, inventive step and industrial application according to the EPC. The requirements will be covered as they are positioned in the EPC. A person

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<sup>97</sup> Bernitz and others (n 10), p. 11-12.

<sup>98</sup> Larry A. DiMatteo and Robert E. Thomas, 'Unifying the international law of business method and software patents' in Robert C. Bird and Subhash C. Jain (eds), *The Global Challenge of Intellectual Property Rights* (Edward Elgar Publishing 2008) p. 21.

<sup>99</sup> European Commission, 'EU and WTO', (2018).

<sup>100</sup> Case 414/11 *Daiichi Sankyo and Sanofi-Aventis Deutschland v DEMO Anonimos Viomikhaniki kai Emporiki Etairia Farmakon* [2013].

<sup>101</sup> European Commission, 'What is trade policy?' (2018).

skilled in the art is covered in the inventive step requirement but for the second research question it will be explained further under that requirement.

### 3.5.1 Novelty

Art. 54 EPC contains the novelty requirement and is often referred to as the state of the art. EPO's definition is that 'the state of the art comprises everything made available to the public anywhere in the world by means of a written or oral description, by use, or in any other way, before the date of filing or priority'.<sup>102</sup> The novelty requirement requires a world-wide novelty.<sup>103</sup> If there is no novelty that also means that there is no inventiveness either.<sup>104</sup>

The novelty requirement has faced some critique stating that it is not necessary because novelty is connected to the inventive step requirement. This criticism points to the fact that an invention is not patentable if it lacks an inventive step and claims that either novelty or inventive step would suffice to assess the patentability of an invention.

### 3.5.2 Inventive step

'An invention shall be considered as involving an inventive step if, having regard to the state of the art, it is not obvious to a person skilled in the art'.<sup>105</sup> Two aspects of the inventive step will be covered: technical character and a person skilled in the art. This subchapter cover the technical character. The inventive step has proven to be the hardest obstacle to overcome according to case law since it entails that a technical problem should be solved by applying technical features.<sup>106</sup> An invention is assessed based on the technical character and the technical features because a granted patent application needs to solve a technical problem, which is one of the fundamental reasons for the protection of patents. The standard of the inventive step should ensure a fair degree of certainty and 'should not be below what may be considered an average amongst the standards presently applied by the Contracting States'.<sup>107</sup> By keeping the inventive step to a fair degree the incentive to innovate will not be reduced.

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<sup>102</sup> EPO, Guide for applicants (2017): How to get a European Patent, B. Patentability, II. Novelty Basic principle.

<sup>103</sup> C-428/08 *Monsanto Technology LLS v Cefetra BV and Others* [2010], para. 45.

<sup>104</sup> Gerald Paterson, *The European Patent System – The Law and Practice of the European Patent Convention* (2<sup>nd</sup> Edition, Sweet and Maxwell 2001), p. 482.

<sup>105</sup> EPC art. 56.

<sup>106</sup> Stefan Steinbrener, 'The European Patent Convention' in Gregory A. Stobbs (ed), *Software Patents Worldwide* (e-Book Kluwer Law International 2008), p. 58.

<sup>107</sup> T-0001/81 *AECI/Thermoplastic sockets* [04.05.1981] OJ EPO 1981, 439, Reasoning 11.

The state of the art, also known as the prior art, of the technical problem that needs to be solved can consist of a combination of prior art disclosed documents. This is often referred to as the mosaic approach. When a patent is granted to documents belonging to the invention get disclosed and it is therefore possible to be used in other patent applications to examine the inventive step. The mosaic approach in this situation determines the technical features.<sup>108</sup> Since the technical features and the technical problem are assessed by the person skilled in the art but guidance is needed for distinguishing the features a mosaic combination can be a helpful tool. Perhaps when more documents are combined to assess the prior art the question of non-obvious needs to be addressed differently. This will be covered in chapter five.

The standard of the technical character can shift depending on the invention. In technical areas especially, it may seem reasonable and justifiable to have higher standards of the inventive step, since the contrary could potentially risk eroding the patent development by granting patents more easily and thereby possibly preventing the research and development progress.<sup>109</sup> Higher demands for the inventive step can be used to keep the incentive for research and development. When assessing the complexity of the technical character more guidance will be provided in the two upcoming chapters four and five.

### **3.5.2.1 A person skilled in the art**

The EPC does not give a definition nor an explanation of a person skilled in the art. This definition has instead been interpreted through case law and various guidelines. The technical problem has to be non-obvious for the person skilled in the art in order to be granted a patent. To demonstrate the understanding of what is non-obvious BoA-cases will be used. Such cases do not involve an actual physical person but fictional, an archetype for the legislation to solve the question of inventive step.

If the person skilled in the art finds that the solution is obvious then the invention does not include an inventive step, if the solution is not obvious then it is an inventive step. The invention is to be examined based on the knowledge the person has at the time of the application. Any knowledge gained after the application cannot be used in the assessment.<sup>110</sup> The person assessing the invention can be limited by the its own knowledge even though it is a fictional person. The knowledge can be limited due to the person's

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<sup>108</sup> EPO, 'Guidelines for Examination', Part G – Patentability, Chapter VII – Inventive step – 6. Combining pieces of prior art.

<sup>109</sup> Levin (n 19), p. 300.

<sup>110</sup> Levin (n 19), p. 298.

technical field of specialisation.<sup>111</sup> It can also be required that to assess the invention other technical fields should be examined to search for similarities.<sup>112</sup>

Not only the BoA has defined the concept but other courts in Europe have found a person skilled in the art to be an engineer who works in the relevant field along with a wide common general knowledge.<sup>113</sup> Moreover, the German patent court has attempted to develop an even more narrowed definition of a person skilled in the art: a degree engineer with a focus on a certain technology that has years of experience.<sup>114</sup> In addition to the German patent court, the highest court in Germany finds that the knowledge and the work method of the person skilled in the art need to be explained for the court to understand how the concept is to be understood in each case.<sup>115</sup>

The knowledge is of importance in order to assess the technical problem. The technical problem should be formulated in a general way in order to assess it.<sup>116</sup> A person skilled in the art can be viewed as a brake pad in the application. Anything that the person skilled in the art knows or could have developed based on his knowledge is not inventive.<sup>117</sup> The knowledge is based on the special technical field, common general knowledge, neighbouring field, routine work and experimentation.<sup>118</sup> The appropriate skilled person in the art depends on the area the invention falls within. Technical areas where the science is still in the early phases should be examined by specialist.<sup>119</sup> If a technical problem is acknowledged by this person by which the invention can be objectively overcome, without being obvious to a person skilled in the art a patent application is granted.

### 3.5.3 Industrial application

The invention must be industrial applicable.<sup>120</sup> An invention needs to have a technical nature, which is an especially complicated and debated element concerning software. EPO's interpretation of industrial is wide to cover any

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<sup>111</sup> T-0426/88 Lucas/ *Closed loop of internal combustion engine idling speed* [09.11.1990] OJ EPO 1992, 427.

<sup>112</sup> T-0026/98 Alza Corporation/*Iontophoretic delivery device* [30.04.2002] unpublished.

<sup>113</sup> Dai Rees, 'Inventive Step: Stories We Tell' (2017) SSRN independent, p. 5.

<sup>114</sup> Bundespatentgericht [13.04.2005] Az. 4 Ni 39/04.

<sup>115</sup> Bundesgerichtshof [25.11.2003] X ZR 162/00.

<sup>116</sup> Schulte and others (n 72), p. 338.

<sup>117</sup> Ibid p. 339.

<sup>118</sup> Ibid p. 341.

<sup>119</sup> Ibid p. 342.

<sup>120</sup> EPC art. 57.

physical activities with a technical character.<sup>121</sup> The industrial application is targeted towards industries such as trade, agriculture, forestation, fishing etc.<sup>122</sup> It is sufficient that the invention can be used in one industry.<sup>123</sup> Exceptions have been found to when industrial application is lacking. The BoA has decided that one exception is when the invention is ‘contrary the law of physics’.<sup>124</sup> However, the logic behind the requirement is to prevent inventions that lack practical importance and usage from being granted.

The requirement of industrial application has been considered weak due to the rise of inventions generated by a computer. This has been done by claiming that industrial application requires that the invention has a technical character which reproduce.<sup>125</sup> But the BoA ruled that no guidance can be found in the EPC supporting this.<sup>126</sup>

### 3.6 Concluding remarks

To conclude the technical problem being solved with help of the EPC patent requirements require different interpretations. Novelty and inventive step has a similar purpose and are dependent on each other. Once novelty has been established the technical character the person skilled in the art needs to find that the technical problem is being solved in a non-obvious way. However, there is still room for interpretation regarding some aspects of the inventive step which the United Patent Court may address. The industrial application rarely cause any debate in comparison to the inventive step. In the upcoming chapter the patent requirement inventive step will be discussed further together with who the inventor is in artificial intelligence by assessing the doctrine.

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<sup>121</sup> EPO, Guidelines for Examination Part G – Patentability, Chapter III – Industrial Application – 1. General remarks.

<sup>122</sup> Holtz and Nilsson (n 61), p. 34.

<sup>123</sup> T-0144/83 Du Pont/*Appetite suppressant* [27.03.1986] OJ EPO 1986, 301.

<sup>124</sup> T-0541/96 Zachariah, Chacko P./*Element and energy production device* [07.03.2001] OJ EPO 1998, 511.

<sup>125</sup> Måns Jacobsson, Erik Tersmeden and Lennarth Törneroth, *Patentlagstifningen: en kommentar* (Norstedt 1980), p. 43.

<sup>126</sup> T-0931/95 Pension Benefit System Partnership/*Controlling pension benefits system* [08.09.2000] OJ EPO 2001, 441.

## 4 The BoA law comparison

### 4.1 General

Firstly, doctrine will cover the question of who the inventor is when an artificial intelligence entity generates an invention. Secondly, cases will cover the second research question. As mentioned in chapter one the BoA cases that will be covered are cases selected, by the author of this thesis, to provide a comprehensive discussion for answering the second research question. Each case will be briefly covered, starting with the background before moving to the substance issue of artificial intelligence in the patent application. The second question has been divided into two parts. The first part covers the three cases of Comvik, Hitachi and Nokia concerning inventive step and target the technical character. While the second part contains cases covering a person skilled in the art and the concept of non-obvious. However, before examining the doctrine and cases addressing the research questions important principles from cases covering computer software will be examined. The rulings of the BoA are essential since the clarification benefit the member states and the EPC members follow the BoA-judgments in national decisions.<sup>127</sup> Since patent law is the least harmonised IPR, the growing cases ruled by the BoA will have a crucial importance for the development of patents in Europe.<sup>128</sup>

Vicom<sup>129</sup> was a revolutionary early case stating that computer related inventions are patentable as long as it does not process abstract information but provides a concrete physical result.<sup>130</sup> Vicom elaborated on the ‘as such’ criteria, which was clarified in another case, stating ‘it is not necessary to give a relative weighting to its technical and non-technical features’.<sup>131</sup> If the invention uses technical means patentability is possibly provided it meets the requirements set up in art. 52 to 57 EPC.<sup>132</sup> Computer programs can be patentable under the EPC if it has a technical result.<sup>133</sup> What the quote confirms is that an invention is not to be purely assessed based on the technical or non-technical features instead the technical result can be enough

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<sup>127</sup> Bundesgerichtshof [14.04.2010] Xa ZB 10/09.

<sup>128</sup> Bernitz and others (n 10), p. 156.

<sup>129</sup> T-0208/84 *Vicom/Method and apparatus for improved digital image processing* [15.07.1986] OJ EPO 1987, 014.

<sup>130</sup> Bernitz and others (n 10), p. 176.

<sup>131</sup> T-0026/86 *Koch and Sterzel/X-ray apparatus* [21.05.1987] OJ EPO 1988, 019, Headnote 2.

<sup>132</sup> *Ibid* Reasoning 3.4

<sup>133</sup> T-1173/97 *International Business Machines Corporation/Asynchronous resynchronization of a commit procedure* [01.07.1998] OJ EPO 1999, 609.

to demonstrate patentability. The technical character will be further elaborated under subchapter 5.2.

## 4.2 Examining who is the inventor

There are no BoA-cases solely addressing the understanding of the inventor. The incentive to invent may be reduced if the reward is uncertain. Thereby, from a legislator's point of view they may hesitate to revise a complicated law.<sup>134</sup> It is important for the legal certainty to know who the inventor is. The BoA assess the patentability requirements of a patent and the inventor is not one of them. The inventor is named by the applicant before submitting the patent application. Up until 2018 the BoA has not examined the inventor concept to cover anything else than a physical person or a traditional legal person. Overall the BoA is quiet when it comes to understanding if an artificial intelligence entity can be the inventor of its own creation, in fact arguments for physical persons remaining the inventor is being argued. This is because the applicant is the one arguing for the applicability of the patent requirements to the application.

The doctrine is arguing that the machine creating the patentable invention, or the artificial intelligence, is the inventor and should be acknowledged as the inventor. The machine itself does not create the invention but the concept is used in a routine fashion. The artificial intelligence which is a software of the computer is creating the invention. Nevertheless, all the cases covered in the thesis have either a physical or a legal person as the inventor. Artificial intelligence is active in several areas of IP. However, no patent case address if and when a machine or an artificial intelligence entity can be the inventor of an invention created by its own intelligence.

An inventor is considered to be a person by patent regulations, cases and various guidelines by IP organisations. As will be demonstrated and argued for in the next chapter, possible analogies could be made from other areas of IP law for an extension of the concept inventor. Since no BoA-decisions are at hand this will be analysed from a problematizing perspective, based on doctrine, in line with VCLT in the following chapter give.

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<sup>134</sup> Rosa Maria Ballardini, 'Legal Certainty and Software Patents: A European Perspective' in Rosa Maria Ballardini, Marcus Norrgård and Niklas Brunn (eds), *Transitions in European Patent Law: Influences of the Unitary Patent Package* (Wolters Kluwer 2015), p. 61.



### 4.3 BoA-cases examining the inventive step

The cases addressed by the BoA have all been appealed from the examination division. Out of the small percentage appealed to the BoA some of these cases address the inventive step. Therefore, the inventive step will be highlighted from cases, which attempt to demonstrate the difficulty in assessing the inventive step. The complex technical character is a part of the inventive step assessment, which decides the patentability. The BoA has found the technical character to be an implicit requisite for an inventive step.<sup>135</sup>

The technical character can be explained as a technical teaching, which can be ‘instructions addressed to a skilled person as how to solve a particular technical problem using particular technical means’.<sup>136</sup> The discussion surrounding technical and non-technical features is complex but an X-ray case illustrates how a mix between technical and non-technical features can be used to contribute to the technical solution.<sup>137</sup> This will be covered before going into the other cases. An X-ray machine can have some technical pieces and in the X-ray case software was implemented onto these parts, which resulted in a longer life span for the machine. The mix between non-technical and technical features therefore generated a good outcome. Although the machine itself contains non-technical features, the computer software can change the non-technical machine.<sup>138</sup> In the X-ray case the BoA stated that not all mixes of technical and non-technical features are patentable instead the technical features need to result into something that bring the legal field further and thereby keeping a high standard.<sup>139</sup> The BoA has summarized the mix of technical and non-technical features where the non-technical is not examined.<sup>140</sup> Any non-technical problem or solution is not assessed since it is not relevant.<sup>141</sup> Instead, the similarity of the technical features with the closest prior art in other technical fields are examined.<sup>142</sup>

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<sup>135</sup> EPO, Case Law of the Boards of Appeal, (8<sup>th</sup> Edition July 2016), I. Patentability, D. Inventive Step, 9. Assessment of inventive step, 9.1.1 Technical character of the invention.

<sup>136</sup> T-0154/04 Duns Licensing Associates, L.P./*Methods of estimating product distribution* [15.11.2006] OJ EPO 2004, 046.

<sup>137</sup> T-0026/86 (n 131).

<sup>138</sup> Toby Gosnall, ‘What is “technical” at the European Patent Office? Understanding flaws in some common arguments helps understand what is required.’ (Barker Brettell Intellectual Property, 1 December 2014).

<sup>139</sup> T-0026/86 (n 131) Reasoning 12.

<sup>140</sup> T-1546/06 Siemens Corporation/*Energy absorbing element* [10.02.2009] unpublished, Reasoning 2.

<sup>141</sup> T-1145/10 Microsoft Technology Licensing, LCC/*Method and apparatus for protecting regions of an electronic document* [26.02.2016] unpublished.

<sup>142</sup> T-1379/11 Sap Se/*Systems and methods for providing an interaction between a status management service and an audit trail service* [25.10.2016] unpublished.

There are two fundamental cases which in hindsight have been found to reshape the requirement of the inventive step. The first case is the Comvik case<sup>143</sup>, a Swedish mobile communication operator was seeking a patent for SIM-cards with two identities that could be activated by the user. The BoA concluded that when an invention contains both technical and non-technical features, along with having a technical character, all the features which give the invention the technical character are to be examined.<sup>144</sup> A test has been developed to examine the invention against art. 56 EPC, the so called problem-and-solution approach.<sup>145</sup> By applying the method the technical problem that the invention solves can be comprehended. Thereby it follows if ‘a feature do not contribute to the solution to any technical problem by providing technical effect has no significance for the purpose of assessing the inventive step’.<sup>146</sup> There was no inventive step in the Comvik case because the technical character was obvious.<sup>147</sup>

The second case changing the understanding of the inventive step is the Hitachi case.<sup>148</sup> This case concerns ‘an automatic auction method executed in a server computer’.<sup>149</sup> A definition to invention is given in the Hitachi case by stating that ‘it should be constructed as subject-matter having a technical character’.<sup>150</sup> Thereby the BoA firmly state that there must be a technical character. A previous case already ruled that an invention can consist of a mix of technical and non-technical features in art. 52(1) EPC.<sup>151</sup> However, the separation of these features is hard, since features that are technical may be hidden in non-technical.<sup>152</sup> Only the features that could contribute to the technical character were considered when assessing the inventive step, as mentioned in Comvik. The most profound change to the inventive step by the Hitachi case was that the BoA ruled that ‘a method involving technical means is an invention within the meaning of Article 52(1)’.<sup>153</sup> Further the Comvik and Hitachi cases mention that a business scheme who circumvents the technical problem instead of solving it does not contribute to the technical character.<sup>154</sup> Shortly after the Hitachi case a video game case followed the

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<sup>143</sup> T-0641/00 Comvik Gsm AB/*Two Identities* [26.09.2002] OJ EPO 2003, 352.

<sup>144</sup> Ibid Headnote 1.

<sup>145</sup> Ibid Reasoning 5.

<sup>146</sup> T-0641/00 (n 143) Reasoning 6.

<sup>147</sup> Ibid Reasoning 15.

<sup>148</sup> T-0258/03 Hitachi, Ltd/*Automatic auction method* [21.04.2004] OJ EPO 2004, 575.

<sup>149</sup> Ibid Reasoning 2.

<sup>150</sup> Ibid Reasoning 3.1.

<sup>151</sup> T-0038/86 I.B.M./*Automatic text grade level analyser for a text processing system* [14.02.1989] OJ EPO 1990, 384 Headnote 3.

<sup>152</sup> T-0258/03 (n 148), Reasoning 5.8.

<sup>153</sup> Ibid Headnote 1.

<sup>154</sup> Ibid Headnote 2.

same reasoning as the two previous cases, thus becoming an accepted interpretation.<sup>155</sup>

The Nokia case enabled users to enter goods they wanted to purchase in their phones, providing a shopping itinerary displaying an order depending on the user's profile.<sup>156</sup> The BoA presented a new view in assessing the technical character. No inventive step was found in the Nokia case but the BoA identified three fallacies that can be used when an invention is a mix between technical and non-technical features. There was no inventive step since the BoA concluded that the overall effect of the features wasn't technical. The fallacies are based upon arguments claimed by the appellant for the invention to be inventive. The BoA identified the following fallacies; technical leakage fallacy, broken technical chain fallacy and non-technical prejudice fallacy.<sup>157</sup> The mix of non-technical and technical is more complex to assess than in the X-ray case since the interaction between the non-technical and technical has developed into a grey area.<sup>158</sup> The leakage fallacies can serve an important task in detecting the interaction between the features.

The fallacies will not be further elaborated due to the scope of the thesis since it is not necessary to answer the research question from the legal perspective.

#### **4.4 BoA-cases examining a person skilled in the art**

As mentioned in chapter three, a person skilled in the art is a sub-criterion to the inventive step.<sup>159</sup> This person makes the assessment regarding if the invention is inventive and thereby fulfils the patent requirement to be granted a patent. It is assumed to be a human along with the fact that an average human's knowledge is decisive if to grant a patent or not. However, since the person skilled in the art does not exist but is instead a hypothetical person it needs to be identified with caution.<sup>160</sup> Although it is called a person skilled in the art the assessment can be made from more than one person.<sup>161</sup> But an inventor cannot be a person skilled in the art.<sup>162</sup> As previous cases in chapter three have mentioned, the invention is inventive when it is not obvious to a person skilled in the art.<sup>163</sup>

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<sup>155</sup> T-0928/03 Konami Co., LTD/*Video game system and storage medium for storing program for use in the video game system* [02.06.2006] unpublished.

<sup>156</sup> T-1670/07 Nokia Siemens Networks Oy/*Method and system of shopping with a mobile device to purchase goods and/or services* [11.07.2013] unpublished.

<sup>157</sup> Ibid Reasoning 9, 11 and 16.

<sup>158</sup> Gosnall (n 138).

<sup>159</sup> See 3.5 Patent requirements.

<sup>160</sup> T-0641/00 (n 143) Reasoning 8.

<sup>161</sup> Schulte and others (n 72), p. 340.

<sup>162</sup> T-0039/93 Allied Colloids/*Polymer powders* [14.02.1996] OJ EPO 1997, 134.

<sup>163</sup> T-0641/00 (n 143) Reasoning 2.

The EPO guidelines for determining the actual knowledge of a person skilled in the art corresponds to other leading patent offices around the world. This person has been defined differently depending on the invention. In one case concerning genetic engineering the person was a scientist engaging in research or teaching who was working with genetics.<sup>164</sup> The person assessing the invention may shift and adjust to the invention at hand. A dynamic interpretation of a person skilled in the art is vital to comprehend the obviousness of an invention.

As was written in chapter three the skilled person has a set of knowledge. In the Nokia case the BoA found that the common general knowledge would be enough to assess obviousness.<sup>165</sup> The BoA attempts to assess what the person would consider and what the person does not need to consider to make a conclusion of non-obviousness. In Comvik the person was identified as ‘an expert in a technical field’.<sup>166</sup> Furthermore, the BoA gives examples of what additional skills the persons should have such as data processing, accounting etc. The additional skills depend on the nature of the invention.

Patent law becomes relevant, for an artificial intelligence entity, when the software has technical functions worth protecting.<sup>167</sup> The IP protection for ‘inventions created and developed by AI systems has not been covered for any discussion’.<sup>168</sup> Therefore, the following chapter five will now discuss the patent protection for inventions created by artificial intelligence entities by covering who the inventor is and the two assessments of the inventive step – technical character and non-obvious to the person skilled in the art.

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<sup>164</sup> T-60/89 *Harvard/Method of making a selected protein* [31.08.1990] OJ EPO 1992, 268.

<sup>165</sup> T-1607/07 (n 156) Summary 2.

<sup>166</sup> T-0641/00 (n 143) Reasoning 8.

<sup>167</sup> WIPO, ‘Patent Expert Issues: Computer Programs and Business Methods’.

<sup>168</sup> Dr. Ravid Yanisky Shlomit and Jackie Liu Xiaoqiong, ‘When Artificial Intelligence Systems Produce Inventions: The 3A Era and an Alternative Model For Patent Law’ (13 March 2017), SSRN Cardozo Law Review, p. 7.

## **5 A problematization of the patentability of artificial intelligence in the EU**

### **5.1 Who is the inventor?**

To examine the first research question, if an artificial intelligence entity can be the inventor of its own invention, this discussion has two key pillars. The first is centred around who the inventor is and an analogy to copyright will be made to provide a discussion of the concept. The second is how an artificial intelligence entity could fall under the concept of inventor from a legal perspective by applying the VCLT and by examining physical and legal person.

Ryan Abbott, a professor of law, believes that it will not be long until computers are behind most innovations. Thereby, replacing the human mind.<sup>169</sup> Artificial intelligence was not taken into consideration when writing the patent law or when reflecting upon the meaning of the inventor. Since artificial intelligence was not taken into consideration when drafting the law arguments have been made that unforeseen technologies require a wider scope of application in the patent law.<sup>170</sup> If it would be sufficient to grant an artificial intelligence entity to be named as the inventor is however not decided.

Although Abbott believes that computers will be behind most of the inventions he is hesitant to whether a machine or the artificial intelligence creating the invention actually can be the inventor.<sup>171</sup> Abbott interprets a computer and a machine to include the artificial intelligence entity as well but he does not make a clear distinction between them. However, when he has been asked about the publications, addressing artificial intelligence as the inventor, it has been clear that he includes artificial intelligence entities when referring to computers as well.<sup>172</sup> One reason for the word computer being used instead of artificial intelligence could be because of our ability to perceive a computer since it is tangible. Artificial intelligence is not perceivable and since it works inside of a computer that word is being used

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<sup>169</sup> Ryan Abbott, 'Hal the Inventor: Big Data and Its Use by Artificial Intelligence' (19 February 2015) SSRN MIT Press, p. 1.

<sup>170</sup> David Vaver, 'Invention in Patent Law: A Review and a Modest Proposal' (2003) Vol. 11, No. 3, *International Journal of Law and Information Technology*, p. 306.

<sup>171</sup> Erica Fraser, 'Computers as inventors – Legal policy implications of Artificial Intelligence on Patent Law' (2016) Vol. 13, Issue 3, p. 329.

<sup>172</sup> Dom Galeon, 'If AI invents something, who should be credited?' (World Economic Forum, 10 November 2016).

instead. Due to Abbott's hesitation whether artificial intelligence can be the inventor he suggests a compromise. The compromise is that the artificial intelligence would be granted the inventorship and the holder of the computer patent the ownership. Abbott separates the inventorship and ownership because of the differences between them. Inventorship refers to the creative mind behind the invention. Ownership is the recognition of the right to a proprietary right. However, the owner of the right does not necessarily match the inventor.<sup>173</sup> Doctrine indicates that Abbott has identified a weak spot of the patent law.

The suggested compromise of having artificial intelligence alone as the inventor has not yet received endorsements from other legal professionals. Therefore, if artificial intelligence cannot be the single inventor then one solution could be joint inventorship between the artificial intelligence and a physical or legal person. Inventorship is possible for more than one person provided they work towards the same goal however, this is problematic since artificial intelligence and human intelligence are different. Although a digital coded communication is done from the artificial intelligence instead of a verbal communication, as typically done between two persons, the percentage of the participation from each side may be questioned. By taking the artificial intelligence into account the human's participation could be small since the artificial intelligence algorithms work constantly. Questions such as how the algorithms are programmed and when the human can detect that they have gone beyond what is known by the human intelligence are hard to answer. By applying the EPC in combination with the VCLT it does not appear impossible for a joint inventorship for artificial intelligence. The VCLT allows for a good faith interpretation, but the formal requirements for a patent in the EPC is an obstacle, which will be discussed later in this subchapter. However, the joint inventorship solution is not the most optimal. Especially, since naming the artificial intelligence entity alone as the inventor would cause a split of the non-economic acknowledgement. Whether the percentage of contribution needs to be equal or if one party can contribute more and then gain more of the non-economic acknowledgement would need to be clarified. Since other solutions could address the issue better than joint inventorship the following discussion will cover the concept of physical person as an inventor.

A person can be both the inventor and the owner of a patent. But the question to examine is who the inventor is when artificial intelligence, alone or in cooperation with a human, is working towards a goal. The goal can be something the artificial intelligence has been programmed for or an invention

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<sup>173</sup> European Helpdesk IPR, 'Fact Sheet Inventorship, Authorship and Ownership' (2013), p. 2.

it creates by itself which it has not been programmed for. When it on its own creates an invention it should be awarded the recognition of that mental act it has done. Therefore, Abbott's solution of separating the inventorship and ownership is a better solution. Especially, since the artificial intelligence entity's legal rights when contributing to an invention is unclear in patent law and by allowing it to be the inventor this would be clarified.

As mentioned in the introduction analogies to who the inventor can be done by applying copyright law. This is an IP that has had an interesting development following case law in the U.S. The reason for artificial intelligence being more debated in copyright is because the technology has allowed for works being recreated but also since it can create works such as songs, which are protected by copyright. Analogies have been made that artificial intelligence is creative in the same way as the human mind. Copyright law states authorship and not inventorship regardless thereby, the discussion in relation to copyright is if creativity is a human characteristic.

The Monkey selfie case, is one of the famous U.S. copyright cases, where a photographer gave cameras to monkeys who then took pictures. The question is whether the monkey who took the pictures or the human who provided the cameras is the owner of the copyright. When the selfies were posted online in 2014 they were listed in the public domain since no one believed that monkeys could be the owner of a copyright. In 2015, People for the Ethical Treatment of Animals filed a lawsuit against the photographer claiming that the monkey's right to copyright should be tried. One year later the claim was dismissed since the court found that animals lack locus standi and that no copyright infringement claim can be brought.<sup>174</sup> However, the proceedings did not stop there. An appeal was brought to the Court of Appeals of the 9<sup>th</sup> Circuit, which gave its ruling in April 2018. The court found that the monkey lacked statutory finding since the U.S. Copyright Act 'does not expressly authorize animals to file copyright infringements suits'.<sup>175</sup> Hence, the copyright could not be extended to cover monkeys and the right remained with the photographer.

The 9<sup>th</sup> Circuit ruled that the photographer was entitled to the copyright despite making changes to the settings for the camera to get a sharper image when the monkeys would take a picture. This contribution can be viewed in light of artificial intelligence and patents as well. Humans can change the algorithms to work differently than what they were designed to and this is, of

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<sup>174</sup> Andres Guadamuz, 'Can the monkey selfie case teach us anything about copyright law?' WIPO Magazine 1/2018 (February 2018).

<sup>175</sup> Case *Naruto v. Slater*, No 16-15469 9<sup>th</sup> Circuit [04.23.2018].

course also, possible for the artificial intelligence itself since it can develop on its own. However, this case adds a bigger question mark to artificial intelligence and patents because if a monkey lacks locus standi then an artificial intelligence entity would likely do that as well. Since the owner brings a possible infringement procedure the monkey selfie case could potentially open up for allowing artificial intelligence as an inventor. The divide between inventorship and ownership should make it possible for artificial intelligence to be named the inventor since the owner, a physical or a legal person, has locus standi. The potential effect this might have on artificial intelligence being acknowledged as an inventor in the EU is hard to predict since the EU is silent on this in comparison to the U.S.

Since no BoA cases can be used as a guideline for understanding if artificial intelligence can be the inventor, the assessment will be made by using art. 31 and 32 VCLT in combination with doctrine. Art. 31 of the VCLT states that the interpretation should be made in good faith and in the context of the object and purpose. As mentioned, the right to the invention belongs to the inventor who has the right to be mentioned.<sup>176</sup> A European patent application shall designate the inventor, but it is further stated that ‘if the applicant, is not the sole inventor, the designation shall contain a statement indicating the origin of the right to the European patent.’<sup>177</sup> Would this formal requirement open for interpreting artificial intelligence under the interpretation of VCLT? Rule 19 in the implementation regulation explains that the designation shall state family name, address of the inventor etc. Further, in rule 19(3) when the inventor is not believed to be the actual inventor by the EPO they shall communicate to the designated inventor for the information needed.<sup>178</sup> As a result, the inventor is still a physical person from the legal perspective, or a legal person, but an artificial intelligence entity is not the inventor yet. Despite the dividing opinions. One possible cause for the problem of identifying the inventor is the perception of what an invention is. Invention is not a concept that can be defined other than in the present and the meaning of it is therefore hard to predict.<sup>179</sup> Since the patent law is not designed based on algorithms being the invention the creator of the algorithms, an artificial intelligence entity without human involvement, will take longer time to acknowledge.

Now that it has been ruled out that artificial intelligence is unable to fall under the inventorship for a physical person it will be assessed if artificial intelligence can be understood under legal person. If it was to be understood

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<sup>176</sup> EPC art. 60 and art. 62.

<sup>177</sup> EPC art. 81.

<sup>178</sup> EPC Rule 19.

<sup>179</sup> Vaver (n 170), p. 288.



as a legal person that would redefine lawyers perception of what a legal person is and could be. Provided that artificial intelligence would fall under legal person it would allow for artificial intelligence to be the owner as well. The challenge is what would need to be changed for it to be considered the inventor of its own inventions. As stated earlier, Abbott is of the opinion that artificial intelligence can be the inventor.<sup>180</sup> Abbott is so far, the only one widely cited because of his believe to allow artificial intelligence to be recognised as inventors. Several artificial intelligence patents have been granted and the inventor is either a physical or a legal person. A granting of the inventorship to artificial intelligence would raise several questions; however, these could also be addressed by separating the inventorship and ownership as suggested by Abbott. Therefore, the following discussion cover certain aspects of his suggestion to assess what challenges the suggestion faces if it is to be categorised under a legal person.

If artificial intelligence would legally have the right to be named as the inventor under legal persons - how would that be displayed in the law? The BoA could express it in their guidelines in relation to art. 60 EPC seeking support from a ruling. EPO's guidelines is titled 'Chapter II – Persons entitled to apply for and obtain a European patent – Mention of the inventor'.<sup>181</sup> This could indicate that artificial intelligence is to be understood as a legal person or it could refer to several physical persons. The meaning of a legal person is not defined in the EPC and if the BoA were to rule to allow artificial intelligence as a legal person this ruling would be highly criticised. The BoA does not have the competence to change fundamental legal terms and this could be one reason for the EPC being designed as it is, where purely the substance of patentability is addressed. It is therefore not impossible that a higher court, such as in the Monkey selfie case, needs to address the question of substantial standing for artificial intelligence to get a definite answer. This is certainly risky considering that it would have wide impacts on legal systems. Perhaps it would therefore be better to leave artificial intelligence uncategorised. By not allowing artificial intelligence to fall under a legal person the legal system would remain unchanged, but then legislative measure would have to be taken to provide an exception for artificial intelligence being acknowledged as the inventor. However, the structure of the EPO and the EPC most likely prevents this question from being answered. If so, a solution needs to be found using different methods. Maybe it should be possible for the BoA to refer questions to WIPO in a similar way as the member states do to the CJEU. However, this is not on the agenda. Still the

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<sup>180</sup> Ryan Abbott, 'I Think, Therefore I Invent: Creative Computers and the Future of Patent Law' (2016) Volume 57, Issue 4, Boston College Law Review.

<sup>181</sup> EPC art. 60.

question is whether the BoA alone should be entitled to set the legal development of artificial intelligence in patents or if the CJEU should be allowed to assist with the interpretation despite the EPC not stemming from the EU. As noted, the legislation prevents the CJEU from being asked these questions since the EPC is not a part of the EU's legislative framework. Perhaps that would change if the owner of a patent would invoke the Charter art. 17 claiming that the patent shall be protected even if the inventor is an artificial intelligence entity. That would be an interesting case to read if it would reach a court.

Nevertheless, artificial intelligence cannot fall under legal person if it is not considered a creation of the mind. Despite the vagueness, which mind it is referred to it is interpreted to be the human.<sup>182</sup> The concept of mind and creative thinking is of utter importance for the concept of invention. A physical person is defined as an inventor since a human can 'conceive the idea, materially contribute to the development of the invention, provides solution to problems and implements the innovation'.<sup>183</sup> Artificial intelligence is already capable of achieving this today and is only getting better but perhaps there would be a clash if artificial intelligence is not to be categorised under legal persons since only a physical person has a human creative mind. If the concept of creative mind for artificial intelligence impose an obstacle for it to be categorised under legal person that could be solved by granting the artificial intelligence the inventorship since it has been creative. For this to be the case the creativity of artificial intelligence has to be acknowledged and interpreted into WIPO's definition.

No legal document at the time support artificial intelligence falling under a legal person therefore neither does the VCLT. For this to be posted on the agenda more legislative organs and professionals need to address it. The redefinition to allow artificial intelligence under legal person would take time to accept. The legal concept could potentially open a possible flood-gate of other concepts seeking to be interpreted as a legal person due to the strengthened legal protection it would give them.

The BoA's opinion to this matter is unknown since it has not been addressed. Either they do not see it as a question or they are unable to address it due to their competence. Hypothetically the BoA may have the opinion that the question if artificial intelligence can be an inventor is not of relevance and any opening for allowing it to be an inventor could mean a rewriting of the major patent legislations and guidelines additionally to provoking a debate.

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<sup>182</sup> Fraser (n 171), p. 329.

<sup>183</sup> European Helpdesk IPR (n 173) p. 3.

Especially, since the question of who the inventor is, is a procedural requirement and not a substantive the competence of the BoA would be questioned if it would be addressed. The BoA only assess the patentability requirements novelty, inventive step and industrial application.<sup>184</sup> However, if the BoA would rule that artificial intelligence is the inventor and thereby indicating that the law needs to be rewritten the question whether it is proportionate to revise legislation because of the technical development arises. Although as Abbott points out the technical development is being driven further along by artificial intelligence he therefore argues that the legal field of IP should follow. However, no one knows if it will or if the artificial intelligence bubble needs to get bigger before the problem is addressed.

Since the BoA-cases show that artificial intelligence is a patentable invention, the inventor question needs be addressed as the fourth industrial revolution continues. Perhaps the Unified Patent Court will help guide practitioners in the legal clarity as the court is planned to open in 2018.<sup>185</sup> Although the Unified Patent Court can be an important part of the puzzle, other components such as clearer definitions of various concepts and more certainty in the meaning of the application of them need to be established.

Until the Unified Patent Court is established other complex aspects of the inventor assessment of artificial intelligence need to be addressed. For e.g. should the assessment be different if the artificial intelligence solves a technical problem identified by a human or when the artificial intelligence alone identifies the technical problem and provides a solution? In the first scenario, the questionable legal question corresponds to the current patent situation to artificial intelligence where a physical or legal person is the inventor. If the latter is true, questions as how that relate to obviousness and a person skilled in the art arises. This will be covered later. The inventorship requirement in the latter situation when artificial intelligence on its own, without a human involvement, detects the problem and solves it by its intelligence then it should be the inventor. A creation by the mind has been done but not in the traditional way humans or legislators perceive a mind. Despite that, artificial intelligence shows that it is capable of creating and solving a problem. A compromise would be possible where a distinction is made when the artificial intelligence generates a new invention and when the artificial intelligence along with a human generates an invention where the artificial intelligence contributed.

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<sup>184</sup> EPC art. 21.

<sup>185</sup> EPO, 'Unitary Patent and Unified Patent Court'.

It is undebatable that the BoA has used the VCLT to interpret computer programs to be inventions.<sup>186</sup> A rewriting of the legal framework would be necessary for artificial intelligence to fall under the VCLT interpretation as an inventor. The debate between the incentive to keep on inventing versus recognising artificial intelligence as an inventor is in contrast. Additionally, legal uncertainty appears when asking if the person who patented the artificial intelligence should be entitled to subsequent work done by the artificial intelligence's alone.

Creating a change is a slow progress and artificial intelligence patents are being granted already so does something have to change? Yes, although what should change is subject for debate. It could suffice with a wider interpretation of the concept inventor. The situation can be solved by allowing artificial intelligence to be categorised as a physical or legal person. As has been covered, legal person is closest to hand and would allow companies to assign the right from the artificial intelligence entity, as is established with employees. The artificial intelligence is the inventor but the owner is a legal person capable of representing the right of the artificial intelligence. It would be displeasing to leave the situation as is when artificial intelligence is increasing in patent applications. The current legal limbo needs to be broken. Instead of ownership an applicant for just the inventorship would perhaps suffice. After all, the EU do not have a sanction for not naming the inventor, which is the case in the US for a patent application.<sup>187</sup> However, not mentioning the inventor can from an administrative and mainly liability aspect create legal issues since the identification is made more difficult or even impossible. It would therefore likely not be approved in the EU. Nonetheless, the non-economical factor argues against allowing merely an applicant on the patent application. Moreover, the legal reasons for naming an inventor is important for legal consequences.

Further arguments for artificial intelligence to be the inventor and the legal person to be the owner is raised by Abbott. Abbott argues that the company behind the artificial intelligence is very much concerned and interested in the subsequent inventions the artificial intelligence creates since it creates a financial benefit. He sheds light on who is entitled to subsequent work by stating 'If you own the software you own what it comes up with'.<sup>188</sup> The author of this thesis agrees with Abbott that artificial intelligence should be able to be the inventor. If that would be too drastic, then artificial intelligence

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<sup>186</sup> G-0003/08 (n 70).

<sup>187</sup> Ed Sanders, 'Improper Identification of Inventors May Invalidate Patents' (Gallagher & Dawsey November 2002).

<sup>188</sup> 'Can a computer be the inventor?' (ScienceNode, 19 October 2016)

should be able to be co-inventors with physical persons, whilst the ownership could be either a physical or a legal person. The issue is how various jurisdictions are going to address this. A different interpretation may impact the patentability applications in a certain area, which potentially will have a larger use of artificial intelligence. As demonstrated in chapter two big tech giants such as IBM, Google and Amazon are investing in this technology and are more likely to get an invention by artificial intelligence patented. The patent courts might be reluctant to grant artificial intelligence patents since it would predominantly only be given to a few big companies with power and influence over the patent field. This could potentially lead to a reduced innovation of smaller companies.

Nevertheless, the patent law is dynamic since computer software can be patented and the law was amended to find it patentable. In other words, change is possible within the patent field; however, if this change weighs as heavy as naming artificial intelligence the inventor is uncertain. Time will tell but as the artificial intelligence patents increase this question will reappear and continue to fit in an old-fashion system poorly designed to adapt to a digital society.

To conclude, there is no obvious answer to the research first question of artificial intelligence can be the creator if its own invention since it may shift over time. By looking at the current legal situation an inventor can either be a physical or a legal person by acquiring the right from an employee. As of right now only a company falls under the meaning of legal person, thus artificial intelligence is not the inventor in the patent application at this point of time. An expansion of the term legal person to include artificial intelligence is not something that has been expressed from a legislative organ. Abbott's opinion about differentiating inventorship and ownership appears to be the most preferable approach for naming artificial intelligence the inventor. There is a need for the legislators to address whether the machine or the artificial intelligence entity should be the inventor. The artificial intelligence could be an easier approach since a computer consists of several different components and is therefore reasonable more complex to be named the inventor although it is with help of a computer that a human can perceive the invention created by the artificial intelligence.

## 5.2 The inventive step in artificial intelligence – a patent killer?

The assessment of the inventive step is a matter of fact.<sup>189</sup> The document selected to analyse the inventive step should be within the same technical field since the documents for the analysis should have comparable traits with the invention seeking the patent.<sup>190</sup> A patent is a complex right not only from a legal point of view but also from a technical perspective which can be shown by what knowledge the person skilled in the art finds not obvious. The inventive step has been named the most efficient way to kill a patent.<sup>191</sup> This subchapter aims to highlight the problematic aspects of the inventive step in artificial intelligence. As mentioned in Comvik and Hitachi the technical character has a predominant position in assessing the inventive step for the BoA. Firstly, the concept of technical character will be problematized in relation to artificial intelligence. The technical character will be problematized by generally first examining how the BoA has addressed it. Secondly, the EPO guidelines and computer software will be discussed to highlight the method of assessing the inventive step. Finally, the largest part of this subchapter consists of applying the problem-and-solution approach to artificial intelligence and its impact on artificial intelligence.

A two-step approach has been taken from the BoA for addressing the technical character. Firstly, the approach examines if the patent claim entails a technical feature. In artificial intelligence, this step cannot be considered as hard to fulfil considering the meaning of artificial intelligence and the definition as it is known today. Artificial intelligence consists of algorithms, which give directions to a computer, hence the first step in this approach cannot impose an obstacle for this assessment. Despite this perception technical feature impose obstacles for patenting artificial intelligence and merely the fact that artificial intelligence has an algorithm element does not fulfil this requirement. Secondly, the invention needs to solve a technical problem. If no technical problem can be found then it is not an invention within art. 52 EPC.<sup>192</sup> Further the BoA has also found that a claim can consist of both technical and non-technical feature.<sup>193</sup> This second assessment is harder to fulfil legally by applying the necessary conditions. Previously the technical problem has been addressed from a contribution approach where a

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<sup>189</sup> Rees (n 113) p.1.

<sup>190</sup> T-0650/01 Medrad, Inc./*Magnetic resonance imaging system* [14.10.2004] unpublished.

<sup>191</sup> Arnie Clarke and Jack Shepard, 'EPO: Inventive Step the most efficient patent killed' (Managing Intellectual Property, 27 September 2016).

<sup>192</sup> T-0026/81 Imperial Chemical Industries, Limited/*Containers* [28.10.1981] OJ EPO 1982, 211.

<sup>193</sup> T-0026/86 (n 131).

patent was granted when the invention involved a contribution to a patentable field.<sup>194</sup> Now a problem-and-solution approach has been adopted by the Comvik case. The problem-and-solution approach has three steps to examine the inventive step. First the closest prior art is determined, second the objective technical problem to solve needs to be identified and finally if the closest prior art and the technical problem would be obvious to the skilled person.<sup>195</sup> The first step determining the closest prior art can be determined by using the mosaic method by combining already disclosed documents. By assessing several documents this can change the view whether the invention technical character appears obvious or not. However, this method of mosaic has not been well received among the member states judging patent cases.<sup>196</sup>

The hurdle to show the inventive step has been confirmed by professionals since it entails the technical problem-and-solution approach.<sup>197</sup> The U.S. has cases addressing the issue of patentability and thereby providing more clarity in the interpretation. Although, these cases have been claimed to cause disarray in the legal field since practitioners lose the predictability. In the EU, the situation is different. The legal clarity is progressing slower due to the lack of jurisprudence. However, for each year the EU system is getting more predictable.<sup>198</sup>

The inventive step is hard to define in artificial intelligence and from the EPO's point of view artificial intelligence can only be inventive by falling under technical character. The inventive step consists of a balance between what can be considered as new and what is not a mathematical method. Since mathematical methods cannot be protected how can it be argued that the algorithm in the artificial intelligence falls under technical character instead? The BoA conclusion in the Hitachi case is interesting considering that artificial intelligence algorithms cannot be patentable since it is a mathematical method.<sup>199</sup> Artificial intelligence consists of algorithms and the BoA balance between determining what is a mathematical method and what is not is not always clear. The method used in the Hitachi appears to differentiate enough for the BoA to be patentable.

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<sup>194</sup> T-0038/86 (n 151), Headnote 2.

<sup>195</sup> EPO, 'Guidelines for Examination', Part G – Patentability, Chapter VII – Inventive Step, 5. Problem-and-solution approach.

<sup>196</sup> Miquel Montaña, 'Spanish Supreme Court confirms that "ex post facto" mosaics will not do the trick' (Kluwer Patent Blog, 18 September 2017).

<sup>197</sup> Michael Loney, 'Highlights from the MIP European Patent Forum USA' (Managing Intellectual Property, 3 January 2018).

<sup>198</sup> Ibid.

<sup>199</sup> Dr. Harry Strange and Dr. Karl Barnfather 'Patentability of Artificial Intelligence and Machine Learning Inventions in Europe' (Withers and Rogers, 22 March 2018).

The EPO guidelines have been criticised due to the trivial aspect of computer related patents. It is the opinion of the author of the thesis that, the issue to understand is what should be understood as new knowledge and what is obvious. This is a difficult and necessary distinction for the legal certainty. The standard of the EPC, which sets the bar for what is obvious by looking at the present case law presented by the BoA and by applying it to the inventive step which is more connected to the definition of novelty. Therefore, the author questions if the interpretation of art. 56 EPC considering the VCLT interpretation differ from the case law presented above. The point is that the case law and legislation is not inline for a coherent application and understanding of the law. The EPC itself is dated and needs to be updated to be able to address the legal challenges IP is facing. The BoA interpretations means to the patent requirement inventive step in the EPC is connected to the concept technical character and obviousness need to be interpreted by case law. However, they have become a dominant part of the assessment and the EPC should then be rewritten to better cover this new development pushing the boundaries of the patentable field. The BoA examiners need to agree on an understanding of the concepts for artificial intelligence to result in an understandable and accurate application of the inventive step requirement.

Surely the EPO attempts to grasp the issue daunting in front of them as it is increasing; however, the pressure and stake is raising as innovation by artificial intelligence continues. There are certainly voices raised that the EPO needs to act fast and change the procedure for the BoA since it is a slow and partly ineffective process. Critique has been raised that the situation is so bad that the EPO could potentially risk breaching art. 6 of the European Convention of Human Rights.<sup>200</sup> Throughout the thesis the BoA and the EPO has faced some criticism for addressing the emerging issue. The amount of cases stacking up has been addressed internally within the organisation and the patent application has also increased during the last year increasing the workload. As a regional patent office, they live up to high expectations in managing the patent applications and hopefully the changes that have been made will help the BoA to deliver rulings within a reasonable time. BoA rulings are essential to understand the future interpretation of the patentability requirements and in which direction increasing technology fields such artificial intelligence is heading.

The cases covered in the thesis have mainly addressed rejections from the BoA which upheld the examination division. However, the BoA has overruled the examination division in 2017 where they found that the

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<sup>200</sup> Thorsten Bausch, 'The EPO and the Problem of the Right Speed (IV) – Appeal Proceedings' (Kluwer Patent Blog, 7 April 2017).



invention was solving a technical problem compared to the examination division, which did not consider it to be a technical problem. The BoA disagreed with the examination division that words such as system, engine and IP-address are non-technical features. Thereby, the BoA concluded that there was a technical problem to be solved and the non-technical features was important to solve it.<sup>201</sup>

This third part aims to apply the problem-and-solution approach to artificial intelligence and assess its impact on artificial intelligence. One suggestion that could result in an inventive step without compromising the inventiveness at large for artificial intelligence would be to make the problem-and-solution approach more flexible for these inventions. The complex structure of the technical character along with the common mix of technical and non-technical features requires a mix between the contribution and the problem-and-solution approach. The cases by the BoA occasionally cause debate but they are willing to adapt their rulings depending on the technological development in the society. On the other hand, even though the EPC's technical character requirement has been claimed to be too high the patent application for artificial intelligence is increasing. Artificial intelligence is perhaps benefiting from the curiosity and potential surrounding it. The curiosity and legal room for interpretation has led to artificial intelligence being discussed by the EPO and the inventive step is certainly given a lot of thought.

The identified problematic aspect in relation to artificial intelligence is the change in assessing the inventive step from the contribution approach to problem-and-solution approach. This change appears to have made it harder for artificial intelligence patents to be viewed as inventive. The change in the technology has gone from a lower percentage being implemented in software to being dominant with 90 %. This has questioned the patent being non-technical.<sup>202</sup> Therefore, artificial intelligence is very likely to be used in apparatus such as in the X-ray case where the artificial intelligence can add a value to the typical non-technical features. As a result, the BoA will assess more mixes of technical and non-technical features and whether the identified fallacies in the Nokia case will have an impact on that is to be determined. It is preferable for the law to adapt based on other developments in the society and that is what the patent law has done since computer programmes now can

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<sup>201</sup> T-1028/14 WatchGuard Technologies, Inc./*Reputation-based method and system for determining a likelihood that a message is undesired* [22.08.2017] unpublished, Reasoning 1.1.3.

<sup>202</sup> Claudia Schwarz and Sabine Kruspig, *Legal Protection for Computer-Implemented Inventions: A Practical Guide to Software-Related Patents* (e-book Kluwer Law 2017), p. 57.

be patented. However, this takes time with a global legal framework such as IP. As mentioned in the introduction chapter there are countries who sees computer programmes patentable without the ‘as such’ element. Nevertheless, for the legal debate it has benefits of being cautious when assessing the patentability of a new invention. The inventive step and technical character is a step higher than novelty and the reason for this is because the inventive step is the definite way of denying a patent application. By reviewing the case law development, the BoA is logical in developing the legal concepts by interpreting it with case law. Further the fact that the EPO has published guidelines on the patentability enables an overview along with transparency. The understanding of the legal concept from case law has to be taken into account when applying the VCLT on the question of the inventive step. Artificial intelligence patents are being granted and found to solve technical problems.

The BoA change in Nokia to look at the overall effect of the features and the three fallacies used to address the mixture of technical and non-technical features made the BoA more aware of the structure of the application. The BoA puts big emphasis on how the patent claims are drafted and it is therefore possible for the applicant to increase its chances by submitting a well drafted application. Claims that have been rearranged by the applicant has led to the patent being granted.<sup>203</sup> The procedure is different in comparison to a court where two parties both submit their arguments. In the BoA, the applicant’s application is being examined again in relation to the EPC and a patent lawyer can assist in drafting it for increasing the chance of patentability. The applicant brings forward the arguments of the inventive step in the BoA and the burden of proof is placed on the applicant that the invention meets the patent requirements. However, since the assessment is being made by the BoA and no counterparty to argue against the strategical presentation of the patent requirements is important to give a clear structure to the BoA. It might not be long until practitioners will gain more knowledge of the patentability of artificial intelligence since conferences are being held to discuss the patentability of artificial intelligence.

The additional element as such to the technical character was the BoA previous solution for allowing computer software being granted patents. The fact is that it has been patentable for a longer time now and imposes difficulties when a new smarter generation of software, artificial intelligence, is pushing the legal boundaries even further. Since computer software was highly questioned when it came to the inventive step it is hard to see a global

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<sup>203</sup> Hazel V J Moir, ‘An Inventive Step for the Patent System’ (2013) Volume 3, European Intellectual Property Review, p. 3.

change in the patent law for artificial intelligence. Therefore, the most likely solution long term is to work artificial intelligence into the already existing criteria of technical character but that the requirement could be different depending on if it is computer software or artificial intelligence. The distinction needs to be clear for the BoA and other courts deciding on the matter. Therefore, other legislative solutions such as the one EU suggested with a common definition and a flexible one is a good start. The solution is hypothetical from the author of the thesis. Patents should not be granted for every invention instead the discussion is how artificial intelligence can fit into the system. The technical character requirement stands in the discussion since there is no current legal debate around the artificial intelligence to change it. In other words, the technical character is a well needed element in assessing the patentability of artificial intelligence.

The artificial intelligence examination of technical character is the same as computer software. Artificial intelligence will have to adapt into the already existing principles for assessing a computer programme but there also needs to be a dynamic approach when assessing these inventions since their impact could be bigger than computer programs considering that they can develop on their own and detect problems it wasn't designed to do. Despite certain aspects of the VCLT can be questioned the legal interpretation of technical character is logic and needs to be taken into consideration for a predictable patentability process. There should be limitations of the patentable scope and since the BoA changes the examination of the inventive step there are still cases guiding the patent lawyer, enabling a predictability for certain inventions. The BoA's balance between granting a patent and not letting too simplistic elements being subject for patent is determined by the inventive step. A patent application covering an artificial intelligence entity is covered within the developed computer software patent law. Artificial intelligence needs to continue to grow within that concept and will hopefully create more flexibility for a better application of the patent requirements of an artificial intelligence entity.

In conclusion, the impacts of the problem-and-solution approach to artificial intelligence has created a higher legal hurdle for an already special type of invention, computer software, which is closely connected to the non-patentable mathematic method. Artificial intelligence is still found patentable but the problem-and-solution approach together with the mix of non-technical and technical feature raises the bar for what is inventive for artificial intelligence since it is often reliant on other features to solve a technical problem. The technical character has gone from static to dynamic and although legal issues remain for the inventive step of artificial intelligence it

is refused when the person skilled in the art holds the technical problem for obvious. The BoA and the examination division is not always on the same page and the dissident opinion is one factor why the legal field is harder to comprehend. If one requirement should be pointed out as a patent killer in is it the inventive step due to the difficulty of making the assessment. In the upcoming subchapter the person skilled in the art will continue to discuss the assessment of the inventive step.

### **5.3 Is the not obvious requirement for the person skilled in the art suitable – a need for changing the requirement?**

This subchapter attempts to problematize the inventive step from a different perspective than the previous by examining the person skilled in the art and the legal problems that arise in artificial intelligence inventions. Since the person skilled in the art is a part of the inventive step assessment the discussion and analysis conducted above are partly also applicable to this subchapter. To assess this the subchapter will be divided into three parts. First, the interpretation of the concept person skilled in the art and not obvious will be examined. Second, an examination will be done whether the concept need to change based on how obvious is under stood. Third, EPO's BoA cases to understand obviousness and the person will be covered from an artificial intelligence perspective.

Before going in to the concept of not obvious a small review from subchapter 3.5.2.1 who the person skilled in the art is will be done. The Patent Court in Germany understands the fictional person skilled in the art as an informatics engineer with experience in artificial intelligence.<sup>204</sup> There is no doubt that the person skilled in the art is required to have good extensive knowledge of the area of the invention. Whether an engineer, as found by the German Patent court case and the BoA, is the best fit is under debate. Because of the high level of knowledge the person has there is a risk that the inventive step is harder to obtain. As a result, the innovation is suffering since higher requirements are put on the patent applicant.<sup>205</sup>

EPO's assessment, the so-called problem-and-solution approach, of the second part of the inventive step boils down to the question of obviousness. The legal problem that arise in artificial intelligence it to assess what is not obvious in comparison to the contribution approach where the knowledge needed to contribute to the field of the invention. The assessment of what is

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<sup>204</sup> Bundespatentgericht [09.06.2015] 17 W 37/12.

<sup>205</sup> Bronwyn H. Hall, 'Patents and Patent Policy' (2007) Volume 23, Number 4, Oxford Review of Economic Policy, p. 583.

not obvious is based on how much the person skilled in the art knows. Due to the fact that artificial intelligence recently entered into the patent field the level of knowledge can be the knowledge e.g. in the technical field. Artificial intelligence can use a range of various knowledge from the person skilled in the view depending on the invention. This allows the BoA to be flexible in the assessment of what knowledge artificial intelligence is. Since this area will increase it could be developed to be common knowledge within the future. However, the human fear that the artificial intelligence could potentially limit the impact of artificial intelligence. This is potentially one reason for the BoA being careful when ruling on these inventions. Although artificial intelligence might get smarter than the human mind the human still defines the legal boundaries. This means that the humans can prevent the artificial intelligence power over the patent law by restricting its impacts. Since the problem-and-solution approach has added the non-obvious requirement an increased knowledge is required by the person skilled in the art. Although both assessments want to reward new knowledge either by contributing to the already existing knowledge or by not being obvious to someone with extensive knowledge the contribution approach is lower.

Is there a need to change the non-obvious requirement? A rebalancing of the patent requirement has been suggested. By removing the inventive step and replacing it with ‘a reasonable contribution to knowledge’.<sup>206</sup> This suggestion affects the person skilled in the art. The requirement not obvious is a strong requirement in the sense that it is something a person skilled in the art should not have any higher or specific knowledge about. An obvious invention is not patentable since the contribution to the society is low.<sup>207</sup> Obviousness should not be understood as evident.<sup>208</sup> However, what non-obvious mean is not easy to determine. EPO’s inventor handbook elaborates how obvious is to be understood by referring to the meaning behind obvious by explaining that ‘The word ‘obvious’ comes from the Latin term for ‘upon the road’ and in the sense of inventions it means something that would be the next logical step along your path from the problem to the solution’.<sup>209</sup> Based on this explanation it is no wonder that the EPO finds it difficult to decide what is obvious. Further doctrine adds that the meaning of non-obvious has an exceptionally narrow meaning because of the uncertainty what falls under it. Moreover, the EPO explains that several inventions has combining equipment. The combination of equipment result in one products however the

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<sup>206</sup> Moir (n 203), p. 4.

<sup>207</sup> WIPO, ‘Study on Inventive Step Standing Committee on the Law of Patents (SCP) (July 27 to 31, 2015)’.

<sup>208</sup> Schulte and others (n 72) p. 344.

<sup>209</sup> EPO, ‘Is the idea ‘obvious?’.

new products function can be predictable or obvious since it is composed combining existing components meaning that it is obvious.<sup>210</sup>

By applying the non-obvious to artificial intelligence the question is what is obvious for the person. Obviousness can be questioned for not being the most legal certain way of understanding artificial intelligence. Instead a shift in the requirement behind person skilled in the art could be replaced by a reasonable contribution to knowledge. This requirement is significantly lower and in the beginning of the fourth revolution it would allow the EPO to categorise artificial intelligence more appropriate. Although the scope of this thesis is artificial intelligence it cannot be ruled out that this lower requirement would benefit other areas as well. Because of the sudden raise of artificial intelligence inventions, it is reasonably outside a person skilled in the art's knowledge and as a new technical field needs to be assessed to specialists.

When the contribution approach is compared to the problem-and-solution approach for artificial intelligence the contribution approach could be easier to apply in the new technical field of artificial intelligence. Since a contribution to the already existing knowledge can be easier to predict than what is not obvious to an engineer within a specific field. However, the problem-and-solution approach allows for a higher standard as inventions get more complex and involving computer elements thereby gradually excluding the human. As computers are behind more inventions the problem-and-solution approach for non-obvious can appear more suitable and adapted to the current technological development in several patentable areas. If the requirement would change to a contribution approach it would require a well-motivated decision from the BoA. Especially, since the BoA decided to abandon this approach because the fundamental idea behind a patent is that the invention solves a technical problem. The shift can therefore be explained for the technical character but when it comes to the person skilled in the art the contribution approach could fit better in assessing the non-obvious. The legal certainty could be increased by having the problem-and-solution approach to the technical character and the contribution approach to the not obvious for a person skilled in the art. The definition of contribution is lower than obvious and how difficult boundaries such as what a contribution is and how it to be measured would need to be clarified if this divided method of the inventive step would be preferred by the BoA.

The question as to whether the requirement should be changed remains questionable but since the first technical character step is deemed to be very high with the new problem-and-solution approach one option could be to go

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<sup>210</sup> Ibid.

back to the contribution approach for the not obviousness. The old contribution approach is according to the BoA not ensuring the high standard that can be expected. By keeping to the problem-and-solution approach for non-obvious for the person skilled in the art the inventions that are being granted are ensuring that higher standard wanted for EPO-patents. If a transition back to the contribution approach would be successful is hard to know since the shift to the problem-and-solution approach was done almost two decades ago. The difference could therefore be minimal. Either way the patent area is constantly changing and adopts to controversial inventions causing debate so this question will be discussed in the future.

By reading the BoA cases Comvik, Hitachi and Nokia the BoA does not clearly state if the person skilled in the art is a specialist or if the examination is done more generally. One struggle, for the author during the process of this thesis, is to understand the reasoning of the EPO. However, legal professionals around the world are struggling as well, since EPO examiners do not need to provide the reasoning for granting a patent.<sup>211</sup> Guidance has been given for the person skilled in the art. The person skilled in the art in artificial intelligence cases should be addressed from someone who is an expert. By having an expert person skilled in the art assessing the question of not obviousness the scope of the inventive step would ensure the high standard the EPO wants. Compared to a non-specialist which could be more likely to consider it non-obvious and allowing more artificial intelligence inventions. A rewriting of the person skilled in the art would not be necessary since it is up to the BoA to interpret it. Since the person skilled in the art is a dynamic concept it should be adjusted depending on what is being patented and how it was invented. When thinking about the person skilled in the art one way of ensuring the high enough standard it to not get monopoly on patent by setting a higher standard to what is not obvious. By having a higher standard of not obvious only patents which are inventive will be patented. Although there might not be a reason to rewrite the requirement entirely as has been highlighted the BoA is under a lot of pressure and is not ruling on various cases within the timeline. It is possible that they will start incorporating new elements to a person skilled in the art when more artificial intelligence inventions are being assessed.

Spike Jonez asked an interesting question: ‘Is artificial intelligence less than our intelligence?’<sup>212</sup> What is obvious to a person does not have to be obvious to artificial intelligence. Should artificial intelligence be allowed to assess its own intelligence? By replacing a person skilled in the art to an artificial

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<sup>211</sup> Moir (n 203) p. 3.

<sup>212</sup> Marr (n 1).

intelligence skilled in the art the artificial intelligence would know about any prior art which makes an invention obvious. One of the benefit of artificial intelligence is that they can make this conclusion quicker than humans assessing it since it can process vast amount of information quicker. If artificial intelligence would examine its own invention in relation to the inventive step a higher accuracy would be found compared to when a group of humans assesses a hypothetical person in a working field different from their own. However, if this assessment were to be made solely by a computer that is not the most legal certain approach and therefore the assessment should continue to be examined by humans. Humans can communicate with other professionals active in the field where the assessment is to be made a better understanding from the examiners can therefore be a part of the assessment. The artificial intelligence is viewed as a tool in addition to ‘not being a tool the average skilled person would use routinely’.<sup>213</sup> It cannot be excluded that humans and artificial intelligence can both assist in difficult assessments if needed. Especially since a practical aspect of non-obvious is that when examiners have something laying in front of them it can be hard to make that information seem not obvious.

The VCLT does not provide any further guidance on the person skilled in the art. Instead it has mainly limited knowledge to be common knowledge. The interpretation of common knowledge appears to be in line with the VCLT. There might be differences between artificial intelligence, which could motivate the BoA to give the person skilled in the art different knowledge requirements. Based on the BoA cases examined in this thesis this question is hard to answer partly because of the lack of technical understanding of the entire artificial intelligence. The BoA’s interpretation of the EPC by applying the VCLT is consistence with person skilled in the art however, the current overall assessment of inventive step is questionable in relation to the VCLT. The interpretation of the person skilled in the art has become very narrow. Although, the interpretation is narrow the BoA has allowed some flexibility to newer technologies. The matter for the BoA to decide is what knowledge is considered not obvious. New knowledge is not taken into account since new knowledge will most likely be not obvious. Since the hypothetical person has a good set of knowledge along with a specialisation new knowledge can however be obvious to that person depending on the invention. It is all a question of interpretation and depending on the various components the invention consists of. Despite the flexibility, the BoA has demonstrated a high standard of what is obvious. By looking at the case law and applying the law

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<sup>213</sup> Peter Blok, ‘The Inventor’s new tool: artificial intelligence – how does it fit in the European Patent System?’ (2017) Volume 39, Issue 2 European Intellectual Property Review, p. 69.



it can be interpreted that the inventive step is more connected to novelty, which was mentioned in subchapter 3.5. The conclusion can therefore be drawn that the interpretation from the BoA cases is not in consistency with the VCLT. This is problematic considering the shift from the contribution to the problem-and-solution approach. The lack of consistency from the VCLT regarding art. 56 EPC can consist of the interpretation that is being made into the concept of both technical character and non-obvious from the author's interpretation. Although the interpretation is made in good faith with the ordinary meaning of the terms as mentioned in art. 31 VCLT. The question is what other resources may be taken into consideration from art. 32 VCLT since VCLT governs treaties as a part of international law the application to the EPC patent requirements become difficult to apply. Although, the application is possible and the BoA has ruled that the EPC should be interpreted in light of the VCLT. Still one can question how much the BoA can add to the interpretation of the flexible concepts for the patent requirements and still maintaining the predictability and legal certainty. The matter of good faith for the EPC is only up for the BoA to assess in EPO patent applications. Member states national courts certainly need to make a good faith application of the EPC but how the VCLT good faith benefit the patent applicant in the BoA leaves room for interpretation.

In conclusion, the patentability requirement inventive step as set up in the EPC is not being addressed by the BoA from the VCLT perspective that it should. Instead the initial requirement of technical character is too high, which later impose even higher requirements for non-obvious for the person skilled in the art. A certain level needs to be fulfilled to get a legal protection; however, the legislation could within certain technical fields go against its own interest by reducing innovation. Although the innovation of artificial intelligence is not from humans but from computers humans might lose the incentive to keep on inventing which would benefit the economy of union members. Despite this the BoA is most likely to continue developing artificial intelligence within the problem-and-solution approach to maintain the high standard of granting a patent.

## 6 Concluding remarks

The purpose of this thesis is to examine what is legally accepted for inventions created by artificial intelligence by assessing regional patent law and applying it to BoA-cases. The first question is if artificial intelligence can be the inventor of its own inventions. The second question is how the concept of technical character in the inventive step and the concept of non-obvious to a person skilled in art. 56 EPC should be addressed from an artificial intelligence perspective.

The answer to the first question is yes. An artificial intelligence entity can be acknowledged as an inventor; however, not as the owner since the ownership due to legal liability reasons need to be either a physical or a legal person. Whether an artificial intelligence actually becomes entitled to be the inventor is up to the legal framework and case law at this point. Currently, as of 2018 when writing this thesis, no incentive from a country or IP organisation has been taken to enable artificial intelligence to be the inventor. Instead it is the legal doctrine supporting this view. Although no legislative suggestions are on the table big IP organisations such as the EPO are starting to discuss how this question should be addressed. Since there is a difference in inventorship and ownership the VCLT could support this interpretation. Therefore, doctrine argue that artificial intelligence can be the inventor by having a person as the owner for locus standi. This is the best suggestion for allowing an artificial intelligence entity to be the inventor of its own inventions.

The special structure of the patent law in the EU with the EPO and the BoA prevents the BoA from addressing if artificial intelligence can be the inventor since it is not a substantive requirement for patent law. Despite this the question needs to be answered by the BoA. The BoA then needs to categorise artificial intelligence as a person, either a physical or legal person. Although, a legal person seems to be preferable there are questions about the BoA's competence to define the term to include a new technical phenomenon. Patent law is challenged by the substance of the law and the meaning of invention is dynamic in a static legislation. However, as will be shown in the answer to the second research question dynamic interpretations are made to adapt to the current technical development.

The second question combines the examination of the inventive step in two steps. An invention can be patented only if it solves a technical problem by the technical character and that solution is non-obvious to a person skilled in the art. The technical problem can be assessed from a mix of technical and non-technical features. The BoA has shifted from a contribution approach to

a problem-and-solution for examining the technical character of an inventive step. Although this method may ensure the high standard the EPO wants it could also set the bar too high for artificial intelligence inventions. This is because these inventions consist of various technical and non-technical elements and may therefore appear to be obvious to the person skilled in the art. Then no inventive step to the technical problem can be established. The next part of the inventive step assessment concern the hypothetical person skilled in the art and what is not obvious. The assessment is made based on an engineer and the level of knowledge can vary depending on the invention.

Suggestions have been made that the inventive step should be assessed by the contribution approach. This could potentially reduce the high standard of the technical character generally. But it could also make it slightly easier for artificial intelligence patents by assessing what the algorithms are contributing to. There are several concepts that need to be interpreted such as inventor, technical character and non-obvious. Some of these have been clarified by BoA case law but since patent is an expansive area of law further interpretation is needed. It is possible that non-obvious could be interpreted from the contribution approach while the technical character is still assessed from the problem-and-solution approach. Although this would not be a coherent assessment of the same requirement.

The BoA legitimacy in creating jurisprudence has been criticised. Although the author of the thesis to some extent share that critique the recognised status of EPO as an organisation and the legal framework for the BoA makes it hard to hurt their reputation.

The EU is definitely addressing artificial intelligence based on the citizens concerns but not from the patentability. This mainly has to do with the structure of IP between the EPO and European Intellectual Property Office. The EU therefore lacks competence addressing the patentability.

With the help of these two research questions more light has been shed on patents containing artificial intelligence. Artificial intelligence questions are still being answered and the legal development will have to address these issues as more artificial intelligence inventions are being filed. Overall, artificial intelligence has been patentable and it is a question of how lenient the BoA will be in further rulings. There is no doubt that artificial intelligence will continue to grow and by addressing the patent requirements for its inventions not only professionals and citizens are increasing their awareness of the new technology. Knowledge is power and by that the artificial intelligence idiocy which Hawking feared can be reduced.

## Supplement A

Illustration of various artificial intelligence types.



Source: <https://aer.eu/artificial-intelligence-revolutionary-wave/>

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