Socially Sustainable Artificial Intelligence – An Approach from the Point of View of Article 53 of the European Patent Convention

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Summary of Thesis:
Artificial intelligence (AI) has in the recent years become a widely discussed topic across various sectors. However, AI is also argued to introduce certain risks in societies. In the forefront have been discussions on the ethical and social issues that AI might bring forth in its various operations. In this thesis, those ethical issues are connected to the concept of social sustainability, which refers to taking into consideration social aspects of sustainable development. Social sustainability is strongly ethical by nature.

This thesis will attempt to find an answer for the question: Can and how can social sustainability be implemented to the patent system by focusing on excluding inventions that are immoral or contrary to ordre public? This question is practical because patent systems and offices are in the forefront of new technologies and because sometimes controversies regarding new technologies only surface once the inventions reach patent offices. The question is approached from the perspective of the European patent system and more specifically from the perspective of Article 53 of the European Patent Convention which introduces general ordre public and morality exceptions to patentability.

First, it is argued that patents are instruments of public policy and when new, ethically questionable technologies surface, a demand for regulation is expected. This speaks for enforcement of common European principles, such as those of social sustainability, by means of patent law. Previous cases in which the European Patent Office and the Court of Justice have been forced to assess the ordre public and morality implications are then examined in order to find applicable approaches that can be applied to AI inventions. Also, the different approaches for figuring out the public standard of morality as well as the methods of assessment of morality are discussed. Finally, a suitable method for assessing the morality implication on a case-by-case level with respect to AI inventions is attempted to offer, as well as discussing the benefits of adding social sustainability aspects to the examination of AI inventions.

Key words: Artificial intelligence, patent law, ordre public and morality, social sustainability.

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1 Introduction

1.1 General introduction to the thesis

Artificial intelligence (AI), an outdated term that does not necessarily make clear of all the technologies it is accredited with, holds immense possibilities in changing people's lives. The differences it is likely to bring are far reaching, such as improving healthcare, climate change adaptation and mitigation, increased efficiency in production and in many other ways that we are yet to see.[1] AI has, since its earlier developments, continued to progress in many fields surpassing human capabilities as various different examples show: the robot scientist "Eve" designed to make drug discovery for tropical diseases such as malaria more economical and faster[2]; autonomous vehicles outperforming their human counterparts[3]; and AI being predicted to outperform AI experts in developing AI software[4]. It is foreseeable that AI will, for the most part, make our lives better, but there are almost always downsides to new technologies. In the context of this thesis the different negative consequences relating to the concept of social sustainability are focused by considering whether patent law could help foster socially sustainable AI inventions. The patent law aspects in this respect relate more closely to the question: can patent law, by excluding certain unethical AI inventions, further promote social sustainability?

There are various risk factors that the use of different AI inventions can result to, and to recognise them early on is fundamental in finding a suitable response. For instance, how will we deal with the increasing need to protect individuals' data and privacy along with immense possibilities for illegal behaviour? Also, difficulties such as those relating to loss of humanity in social relationships, lack of transparency, manipulation and surveillance will most likely

[1] COM (2020) 65 final, p.1.
[2] The Royal Society Publishing, 2015: https://royalsocietypublishing.org/doi/10.1098/rsif.2014.1289.
[3] The MIT Technology Review, 2013: https://www.technologyreview.com/s/520746/data-shows-googles-robot-cars-are-smoother-safer-drivers-than-you-or-i/.
[4] The MIT Technology Review, 2017: https://www.technologyreview.com/s/603381/ai-software-learns-to-make-ai-software/.

become even bigger in the future. This thesis will not try to answer these questions directly, but rather it will approach the issues from the possibilities provided by patent law perspectives.

Patent system is a key institution in protecting innovation as well as incentivizing people and corporations into investing in research and development (R&D). Due to this role the patent system will continue to be in the forefront of new technologies and inventions in the foreseeable future. Among those inventions are most likely going to be also those that utilize AI. The need for AI to be taken under the scrutiny of regulators has been recognised recently. This thesis will attempt to map out the common factors brought forward in terms ethical risks, presented in the wider framework of social sustainability, relating to different AI applications and inventions. Thereafter the possibilities that regulation and governance could offer are discussed along with whether the patent system can reduce the spread of certain AI that is deemed to be detrimental by denying these inventions the monopoly of a patent. This will mainly be considered in terms of Article 53 of the European Patent Convention (EPC), the so-called ordre public and morality exception to patentability.

However, it is an important reminder that these technologies and the different ways to utilize AI are above else regarded as a possibility for a positive impact in the society. Acknowledging the greater potential of different AI systems now and in the future, which for examples consists of making driving safer, help children learn, and extend and enhance people's lives.[5] Additionally, AI can help predict risks relating to climate change, help in financial risk management and help law enforcement fight crime more efficiently.[6] The list of possible benefits could be furthered for countless of pages. However, only when the possibilities for negative consequences are taken into consideration, the best possible outcomes can be reached. Science, technological development, law, public policy, and ethical considerations should not be seen as separate fields that only occasionally overlap, but rather as overlapping disciplines, which are to be reviewed simultaneously to achieve a better social order.[7] Adopting this idea, considerations whether the exception to patentability could implement views and tools, to help foster socially sustainable AI, will be made.

[5] Peter Stone, et al. ,2016, p. 6.
[6] COM (2019) 168, final, p. 2.
[7] IEEE, 2017, p. 213.

1.2 Research questions and the scope of the study

The main research question in the scope of this thesis is: Can and how can social sustainability be implemented to the patent system by focusing on excluding inventions that are immoral and against the public order (ordre public) and thus against the concept of social sustainability? Furthermore asking whether it is sensible to do so. In other words, are the potential benefits in favour of such an approach? Also, an additional consideration will be presented in the form of ethical compliance by design, focusing in looking at aspects of getting different AI systems to behave ethically per se, by adding the moral considerations that support social sustainability to the basis of the decision making of AI systems. The lastly mentioned is discussed in this thesis both for giving a concrete example on the issues of adding ethical considerations to AI, as well as to raise the question of whether demanding a specific design philosophy from AI inventions could be feasible.

The scope of the study is limited to the considerations and solutions that patent law could offer for the fostering ethical values regarding AI inventions. More precisely, the questions are approached from the perspective of the ordre public and morality exclusion that the European patent system implements, mainly through Article 53 of the European Patent Convention. Therefore, this thesis will basically restrain itself from approaching broader policy making questions or means to promote the values relating to social sustainability with laws outside the scope of patent law. Also, different aspects of patent law, outside the scope of exclusion, for furthering the values relating to social sustainability, are not discussed here further.

1.3 Methodology and structure

The legal research method generally applied in this thesis is that of legal dogmatics, by attempting to find a suitable approach to the research questions mainly from existing laws and regulations.[8] Article 53 of EPC (exception from patentability) is examined in attempting to find a suitable application to the problem introduced. The interest is to find whether there is suitable

[8] J. Husa et al., 2008, pp. 20-22.

approach applicable with the current legislative framework and additionally, whether there is a need for further development in the legal state in order to properly take the social sustainability issues into consideration. In the context of legal dogmatism, the interest is therefore to make reasonable arguments based on how the current rules and regulations can be used to deal with the problems at hand.[9] There is also *de lege ferenda* type of an approach to the research questions, referring to the presentation of arguments on how the laws and regulations should approach these issues brought forward in the future.[10] The main reason for this approach is, as it will be made clear later on, that the aspects discussed in this thesis are novel and thus not been under much scrutiny previously.

In the assessing and arguing how the legal frameworks and courts could or should approach the issues relating to social sustainability and foster certain values, the arguments presented are strongly ethical by nature. This is also the case with the ethical compliance by design aspects. Furthermore, the social sustainability aspects can be approached from various aspects, and in addition to the legal approach it will be to some extent be discussed from the perspective of certain social and economic sciences.

The thesis will begin by giving definitions for both AI and AI inventions as well as introduce some approaches of European institutions towards AI in relation to the perspectives that this thesis focuses on. The European approaches will be those of the European Union (EU) and the European Patent Office (EPO) as the most relevant parties in this regard. Then the thesis will proceed to the explanation of the relevant concepts from which AI is approached: ethics, social sustainability as well as the ordre public and morality provision for the exclusion of patentability, along with how such an exclusion is justified in the patent system.[11] Following the explanation of the most important concepts, the relevance of certain fundamental values regards to AI and how AI can in fact endanger social sustainability are explained and discussed. With these aspects a specific approach of compliance by design will be introduced as a possible solution for some of the issues.

[9] A. Kolehmainen, 2015, p. 2.
[10] Ibid, p.3.
[11] It is noteworthy that the "explanations" that are given for both ethics and social sustainability cannot be seen as comprehensive or exhaustive, as these terms are rather ambiguous by nature.

From there on, in chapter 4 an assessment of the previous interpretation of the ordre public and morality exception to patentability is conducted in order to systemize the interpretation of the exclusion. Also, the applicability of these different interpretations to AI invention that might propose sustainability issues is discussed. In chapter 5 the questions of how to evaluate AI that with possible means of use that are not in accordance with the values of social sustainability, are raised. Also, determining on what is to be understood as constituting to the public standard of morality, a concept on which the ordre public and morality exception to patentability builds on, will be discussed. Then the different approaches and methods offered by European courts and patent offices as well as legal scholars and professionals to be used for in fact ascertaining the threshold for morality, with respect to the excepting inventions from patentability, are evaluated and explained.

After this, in chapter 6, taking into consideration all that has been discussed previously, answers are sought to the questions of how to ascertain morality with regards to AI inventions and how to assess whether or not an invention in fact is to be considered against the ordre public and morality requirement, to the extent that it has to be excluded from patentability. Also, with regard to this, the sufficiency of the current methods and approaches to the issues that AI promotes is questioned and some additional methods for consideration are proposed. Then, in chapter 7, the entire idea of adding values of social sustainability to the patent system and especially with regards to its means for excluding certain AI inventions from patentability, is weighted. Finally, all that has been presented throughout this thesis is attempted to be put together in a very concise manner and some final remarks are discussed.

2 Artificial intelligence, ethics and social sustainability

2.1 What is Artificial intelligence and what is an AI invention?

It is common for AI to be thought of as a phenomenon that only recently surfaced, taking over multiple fields of life. But in reality it has a long and eventful history. However, the growth rate has been exponential in the recent years, which explains the boom of AI into our everyday life. Big data, enhanced processing power (better computers), connected globe (through social media platforms etc.), open source software and data, better algorithms and the heating competition all have led to the "AI revolution", which is furthering innovation fast.[12] Taking into consideration that this is a mostly judicial writing, it is not reasonable to go into depth analysis on the development of AI. However, it is important to understand the development of these technologies and the way they have rooted in societies as well as what AI basically is about, for understanding the context of some relevant points made throughout this thesis.

Artificial intelligence is usually defined as the science and engineering of imitating, extending and augmenting human intelligence through artificial means and techniques to make intelligent machines.[13] John McCarthy, who coined the term in 1956, described AI as a machine that behaves "in ways that would be called intelligent if a human were so behaving".[14] However, there is no specific definition that has universal consensus in describing AI. When compared to the intelligence of humans, AI aims to imitate, augment and extend human intelligence by achieving machine intelligence.[15] Defining AI can also be approached from the perspective of what AI researchers in fact do, as "a branch of computer science that studies the properties of intelligence by synthesizing intelligence".[16] Finally, Nils J. Nilsson has provided a useful, and simple definition: "Artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment."[17]

[12] World Economic Forum, 2018, p. 7.
[13] Z. Shi, 2011, p.1.
[14] J. McCarthy ET AL, 1955, p.11.
[15] Z. Shi, 2011, p.1 & 10.
[16] Peter Stone, et al., 2016, p.13 and the sources mentioned therein.
[17] N. Nilsson, 2010, p. 13.

Intelligence, on the other hand, is generally understood as capability of a person to understand the objective world and solve problems by applying ones knowledge. Intelligent behaviour of an individual consists of multiple capabilities, for example: gaining of experience and acquiring knowledge, applying this knowledge for analysis and problem solving, reasoning, judgement, association and decision making, as well as discovering, innovating, creating, making of predictions of how things may develop and much more.[18] However, as intelligence is a rather vague concept, AI researchers commonly use the concept of rationality, which refers to choosing the best action in order to achieve a certain goal, given the certain criteria and resources to be optimized. AI systems generally achieve rational choices by a) perceiving the environment (by utilizing sensors for example) b) interpreting the acquired data c) deciding what is the best action and d) acting accordingly to the best action or solution. [19]

Setting a specific-enough definition for the purpose of this thesis, which is the perspective of (European) patent law, is useful. However, the EPO does not go very far in defining AI as a technology.[20] The EPO generally refer to the technologies falling within the scope of AI and machine learning[21] in the Guidelines for Examination as: "Artificial intelligence and machine learning are based on computational models and algorithms for classification, clustering, regression and dimensionality reduction, such as neural networks, genetic algorithms, support vector machines, k-means, kernel regression and discriminant analysis."[22] The aim of the approach of the EPO is to attach AI generally to the patentability of mathematical methods, thus not going into describing the nature of AI or giving a definition for the term.

As this thesis will approach AI from a European perspective, AI will be referred here with the definition given by the European Commission in its Communication on AI[23]:

> *"Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals.*

[18] Z. Shi, 2011, p.9.
[19] AI HLEG: A Definition of AI, 2018, p.3.
[20] As the main approach to the patent aspects of AI will be that of the European Patent Convention and the EPO.
[21] Which is generally described as a sub-field of AI.
[22] See EPO, Guidelines for Examination G-II, 3.3.1, available at: https://www.epo.org/law-practice/legal-texts/html/guidelines2018/e/g_ii_3_3_1.htm.
[23] COM (2018) 237 final, p.2.

> *AI-based systems can be purely software-based, acting in the virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications).”*

Most often AI is embedded as a component of a larger system rather than being a standalone system by itself.[24]

Finally, an invention will refer in the scope of this thesis to the concept of “patentable invention” under the European Patent Convention.[25] “AI invention” is basically an invention that implements and utilizes AI in its operations. Generally, this thesis does not discuss how to treat AI generated inventions[26], which refer to inventions for which the inventive process has been completely or for the most part has been conducted by an AI system. The patent law questions raised in connection to these inventions relate in general to questions of inventiveness, state of the art, discoveries and other factors with connections to the basic requirements of invention and the granting of a patent.[27] Rather as described above, the focus is on assessing the issues that AI inventions can impose to societies and consider how the patent system can help reduce the negative impacts. The latter question, as mentioned, will be approached mainly from of the ordre public and morality requirement, provided by Article 53 EPC.

2.2 European Approach to AI

2.2.1 Principles and schemes

Although this thesis will generally approach the patent law issues on the basis of the EPC and the EPO, entities that are independent from the European Union and not bound by its rules or case law, a key aspect as it will be described later on, is finding a common European approach

[24] AI HLEG: A Definition of AI, 2018, p.3.
[25] According to Article 52 of the EPC: *“European patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application.”*
[26] Or differentiate between an AI invention and an AI generated invention, however recognising that there might in some cases difference in the treatment of the two.
[27] On the topic of the issue of using AI as a tool for inventive process see: Peter Blok: The inventor's new tool: artificial intelligence - how does it fit in the European patent system?, EIPR, 2017.

in assessing and setting the bar for morality and ordre public. In this regard, EU legislation as well as different views expressed by the Commission will be taken into consideration in helping to find such an approach.[28] Additionally, the EPO has implemented the Biotech directive and is not precluded from using EU sources to help in its legal interpretations.[29] Also the general rule that immoral inventions or inventions that are likely to cause disturbances of public order (ordre public) cannot be granted patents, is common across Europe and supranational entities such as the EPO often have harmonising influence on national systems (European States reflect the EPOs' actions to their national patent systems).[30] The views on assessing the ordre public and morality requirements expressed in this thesis could be useful also for other jurisdictions and organisations[31], as the difficulties proposed by AI are the same in most jurisdictions.

The European Commission introduced, in its communication in 2018, so called "European Approach on Artificial Intelligence and Robotics", dealing with technological, ethical, legal and socio-economical aspects relating to AI.[32] In this communication, the Commission put forward an European initiative that builds on three pillars "supporting" the European approach on AI: 1) Boost the EU's technological and industrial capacity and AI uptake across the economy; 2) Prepare for socio-economic changes brought about by AI; and 3) Ensure an appropriate ethical and legal framework. [33] The approach brings forward some relevant issues and shows that the EU has recognised the importance of AI in fact on every aspect of life. Similarly, the need to have an approach to acknowledge and prepare for the changes and challenges proposed by the new technologies is relevant here.[34]

Regarding the first pillar, the Commission increased its annual investment in AI for 70% under the research and innovation program Horizon, including the support of AI development in key sectors, such as health, transport and manufacture.[35] To support the member states in preparing for the socioeconomic changes, the Commission is focusing in setting up training and re-

[28] Also, the lack of relevant material that would be directly applicable to the EPO forces to seek somewhat applicable information elsewhere.
[29] A. Nordberg, 2018, p.71
[30] P. Drahos, 1999, p.3.
[31] For example, the Unitary Patent and Unified Patent Court, a new system that is currently expected for the end of 2020. See: https://www.epo.org/law-practice/unitary.html.
[32] COM (2018) 237 final.
[33] COM (2018) 237 final, p.4.
[34] Different challenges will be discussed further in chapter 3.1.
[35] For Horizon 2020, see: https://ec.europa.eu/programmes/horizon2020/en.

training on key technologies, anticipating labour market changes, encouraging digital skills and business-education partnerships.[36] The most relevant, in the context of this thesis, is the third pillar on recognition that new technologies[37] are prone to raising new legal and ethical questions related for instance to liability aspects, safety and explicability of AI.[38] Relating to this, the Commission welcomed the Ethics Guidelines for Trustworthy Artificial Intelligence, prepared by the High Level Expert Group on Artificial Intelligence (AIHLEG), published in April 2019.[39] Also, a Report on Liability for Artificial Intelligence and Other Emerging Technologies, prepared by an expert group on Liability and New Technologies was published on November 2019, focusing on how liability regimes should be designed or changed in order to answer to the challenges that technological developments are likely to raise, mainly in terms of causing harm.[40]

In EU there has been a strong focus on AI approaches building on human-centric considerations and fundamental rights. In addition to the aforementioned guidelines and communications, the Commission published a communication: "Building Trust in Human Centric Artificial Intelligence" in April 2019, expressing the importance of having European values at a central position in creating an "environment of trust" with the aim towards successful development and use of AI.[41] Also, especially concerning the development regarding the mentioned third pillar of ethical and legal nature, the White Paper on AI - a European Approach to excellence and trust, was published on 19th February 2020. The purpose of the paper is to set out policy options on achieving regulatory and investment oriented approach that promotes the uptake of AI, and also to address the risks relating to certain AI technologies.[42] The idea that as the digital technologies are taking a central role in people's lives, trustworthiness of the technologies becomes critical, along with attaching the technologies to core European values, such as those listed in the Charter of Fundamental Rights of the European Union[43], are themes which the White Paper builds upon.[44]

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[36] COM (2018) 237 final, p.14.
[37] Or the new developments and uses of pre-existing technologies.
[38] COM (2018) 237 final, pp.15-17.
[39] These guidelines are taken widely into the considerations that are presented in chapter 3.
[40] For the report on the Liability for Artificial Intelligence see the Report from the Expert Group on Liability and New Technologies (European Commission): https://ec.europa.eu/transparency /regexpert/index.cfm?do=groupDetail.groupMeetingDoc&docid=36608.
[41] COM (2019) 168 final.
[42] COM (2020)65 final, p.1.
[43] 2012/C 326/02: Intrinsic values such as those of human dignity, freedom, democracy and equality.
[44] COM (2020)65 final, p.1.

As a more concrete example of the values emphasized on an EU level, the Commission welcomed seven key requirements, introduced by the AIHLEG, for ensuring the respect of fundamental human values referring to "trustworthy AI".[45] These include: human agency and oversight; technical robustness and safety; privacy and data governance; transparency; diversity, non-discrimination and fairness; societal and environmental well-being; and accountability.[46] A European regulatory framework, which ensures sustainability and compliance with European legislation, principles and values, would be used in building trust in AI across different sectors, speeding the implementation of AI further.[47]

As a conclusion, within the EU the different aspects of AI have been widely recognized in recent years and various approaches and guidelines have been presented and brought forward. Also, the approaches, communications, guidelines and such are not introduced or implemented independently but they rather rely and build on each other, forming a European AI approach.[48] Recurrent themes from the social, ethical and legal aspects consist of building trust in the technologies, making sure that they are "human-centric" and in accordance with fundamental values.[49] Recognizing the possible risks in terms of fundamental rights, rule of law, personal data and privacy for example, are central in this respect, as well as making sure that in the development of new technologies the goals relating to sustainable development, fundamental rights and well-being are properly taken into consideration.

Similar approaches, relating to requirements for AI, have been taken by other international organizations, such as the OECD with its Principles on AI, which promotes for the stewardship of trustworthy artificial intelligence in pursuit of beneficial outcomes for the people and planet, through means such as augmenting human capabilities, reducing inequality and protecting natural environments.[50] Also, the collaborative work of The Institute of Electrical and Electronics Engineers (IEEE): Ethically Aligned Design, was established to serve as societal

[45] See AIHLEG, 2017, p. 2 on the concept of trustworthy AI.
[46] AIHLEG, 2017, 14. The principles were restated in the Commission's white paper on AI, COM (2020) 65 final, p.9.
[47] COM (2020) 65 final, p.10.
[48] Ibid, p.1.
[49] Along with the aspects relating for example to the need to boost investments and education to keep Europe competitive in terms of new technologies.
[50]OECD, 2019, Section 1.

and policy guidelines for the purposes keeping AI systems human-centric, serving humanity's values and ethical principles.[51]

2.2.2 The approach of the European Patent Office towards AI

The EPO has recognised the importance of AI in various aspects. In December 2017, the EPO published a study[52] regarding patents and the fourth industrial revolution (4IR), a concept describing far reaching impacts of new technologies in societies, providing both challenges and opportunities.[53] The study focused on mapping out the dynamics of the 4IR technologies as they show from patent applications, based on a recognition that the 4IR is driven by technological progress and therefore by patented inventions.[54] As expected, the study shows that there is a higher rise in patent applications relating to the 4IR technologies[55] as compared to other fields, and that these (4IR) technologies are going to be present in a large number of sectors within the European economy.[56]

The EPO also hosted its first conference on patenting artificial intelligence in May 2018, focusing however mainly on points regarding questions of how patent offices will be affected by emerging AI technologies.[57] For example the protection of AI in terms of patents and different strategies; using AI in development of inventions and drafting or prosecuting patent application relating to AI; using AI in the patenting process as well as other patent law considerations were discussed.[58] The importance for the EPO and other patent offices to recognise the challenges and possibilities in terms of AI and to take measures to support the AI industry, was recognised and stressed in the course of the discussions held.[59] Of more relevance

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[51] IEEE, 2017, p. 2.
[52] EPO: Patents and the Fourth Industrial Revolution, 2017.
[53] Ibid, p.3. The of fourth industrial revolution is referring to the *"full integration of information and communication technologies (ICT) in the context of manufacturing and application areas such as personal, home, vehicle, enterprise and infrastructure. It is, however, more than a mere continuation or even acceleration of the development of ICT."* See also p.17.
[54] Ibid, p.14.
[55] Ibid, p.23. The study divides 4IR technologies into "core technologies", "enabling technologies" and "application domain", placing AI in the enabling technologies, because it relies on core technologies (Hardware, Software and Connectivity) as the building blocks of 4IR technologies.
[56] Ibid, p.84.
[57] EPO news 2018: https://www.epo.org/news-issues/news/2018/20180530.html.
[58] Ibid.
[59] See: https://www.epo.org/news-events/events/conferences/2018/ai2018.html.

to this thesis, the conference included discussions on ethical and societal considerations in relation to patenting AI inventions, as well as relating to the compliance with law and considerations of the importance of having human-centric values promoted in AI technologies.[60]

So far the EPO has not taken official stand on issues relating to the ordre public and morality provision or otherwise on the ethical and moral problems connected to AI and has only linked the treatment of AI inventions in the EPO to the relevant guidance on mathematical methods.[61] However, as demonstrated above, the EPO has recognised both the problems and the possibilities relating these technologies, and it seems that it might be prepared to answer for the needs that the technologies portray now and in the future.

2.3 Ethics, social sustainability and the ordre public and morality requirement of patent law. How are they connected?

2.3.1 Ethics

This thesis approaches the patent law aspects of AI from ethical and social perspectives, which on the other hand are considered as a part of a wider concept of social sustainability. The approach might at first seem rather far-fetched. However, as it will be explained here, the aspect of patent law for excluding certain inventions are in fact built on strongly ethical considerations.[62] Also as previously discussed, the ethical issues regarding AI have been widely recognised and discussed in the recent years. It is furthermore important that these different concepts and aspects are defined and explained. The question of what constitutes to ethics and ethical conduct and how they are to be evaluated as a part of an AI system is of relevance here. Also, what is the relation of these aspects to the notion of social sustainability? The ideas and arguments presented throughout the thesis are, by their nature, strongly ethical. Additionally, the ethical compliance by design aspects are discussed from the point of view of ideas that are

[60] The recordings of the event are available at: https://e-courses.epo.org/course/view.php?id=151#section-1.
[61] See EPO Guidelines for examination G-II, 3.1.1 Artificial Intelligence and machine learning.
[62] See the arguments presented in chapter 2.3.4.

in accordance with some of the classical ethics theories. Therefore the notion of ethics must be discussed here.

Ethics refers to the study of morality, and morality refers to the system of rules and values that guide human conduct as well as principles for evaluating those rules. Ethical behaviour is behaviour that complies with those rules and principles.[63] AI ethics, on the other hand, is a sub-field of ethics that focuses on the ethical issues of AI in its different stages, such as development, deployment and use.[64] Many argue that there is value in adding ethical considerations with regards to AI, for example by implementing ethical behaviour into the AI system's awareness or teaching ethics to the creators of AI, such as engineers.[65] Below a few ways and ideas of how classical ethical traditions could be implemented into AI are discussed briefly.

Virtue Ethics. According to Aristotle, a goal for humans' is Eudaimonia ("flourishing"), which is achieved by a moral agent[66] by balancing different factors, such as family, social environment, material needs, one's own self and so forth.[67] To develop, one has to practise and strengthen virtuous actions through habituation, which requires balancing between two extremes, excess and deficiency.[68] Virtue ethics could be argued to have some practical use for AI. As it promotes moral values that are dependent on the context as well as practise, rather than merely complying with a memorised set of rules, it could offer AI systems a possibility of ethical behaviour that could be adjusted to the context. Also, it might provide as counterbalancing some tendencies that are in today's world towards excess, especially in the economically driven societies.[69] The ideas of virtue ethics could also as be taught to the AI developers to have the means necessary for ethical balancing of interest for reaching a well-balanced approach to different AI applications.[70]

[63] A. Walz and K. Firth-Butterfield, 2019, p.4, and the sources mentioned therein.
[64] AIHLEG, 2019, p.9.
[65] IEEE, 2017, p. 38.
[66] A person (or possibly an AI sysem) that has the ability to discern right from wrong.
[67] IEEE, 2017, p. 38.
[68] *The Stanford Encyclopaedia of Philosophy,*2018: https://plato.stanford.edu/archives/win2018/entries/ethics-virtue/>.
[69] IEEE: 2017, p. 40.
[70] Ibid.

Deontological Ethics. Deriving from the thoughts of the German philosopher Immanuel Kant and his categorical imperative: "Act only on that maxim through which you can at the same time will that it should become a universal law."[71] Basically deontological ethics guides what kind of choices we ought to do and is therefore what is called a duty-based ethics; rules, producing duties (such as don't steal or harm other people) have value by themselves and are in fact a necessity to our existence.[72] In terms of AI, Deontological Ethics could encourage developers to act according to what is best for the human dignity and humanity and for instance AI systems could be programmed with certain core values (such as health care robots should respect the patients will but also to always protect life and health).[73]

Utilitarian Ethics. According to the utility principle, the correct action is the one that maximises the "overall good" (or pleasure, as according to the classical utilitarians Jeremy Bentham and Stuart Mill) which includes the good of others as well as one's own good.[74] The danger in adopting an utilitarian approach, is the possibility for adopting superficial or short term evaluation for utility. Therefore, one possible application for AI could be for AI developers to consider the long-term effects of the specific AI application, in order to reach socially justifiable outcomes. Any benefits achievable should be obvious to all stakeholders.[75]

Taking the aforementioned theories and examples into consideration, there seems to be room for classical ethics in AI development and implementation into the systems themselves.[76] Take for an example, an autonomous vehicle that makes various decisions in the course of its operations. These decisions undoubtedly have moral and societal consequences, especially considering that the vehicle can cause harm.[77] It is therefore important to think what kind of ethical "base" the decision making is built on.[78] As it is more or less necessary, in a market economy, for the creators of these inventions to protect their innovations, patent offices and

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[71] Encyclopaedia Britannica: https://www.britannica.com/topic/categorical-imperative.
[72] *The Stanford Encyclopaedia of Philosophy* (Winter 2016 Edition): https://plato.stanford.edu/archives/win2016/entries/ethics-deontological/.
[73] IEEE: 2017, p. 39.
[74] *The Stanford Encyclopaedia of Philosophy (*Winter 2016 Edition) https://plato.stanford.edu/entries/utilitarianism-history/.
[75] IEEE: 2017, page 41.
[76] See especially chapter 3.2 on the matter if compliance by design regarding the implementation of ethical aspects into the AI systems.
[77] A. Etzioni and O. Etzioni, 2017, p.2.
[78] This will be further discussed in chapter 3.2.

patent laws are often the first entity, in addition to the developer of the AI, to have the opportunity to assess the ethical matters of the invention.[79]

According to the European Commission's communication on human centric AI, trust is an essential prerequisite in ensuring a human-centric approach to AI: "AI is not an end in itself, but a tool that has to serve people with the ultimate aim of increasing human well-being".[80] It seems that AI is strongly required to cope with inherently ethical considerations and trust in AI systems could be fostered if commonly accepted moral rules were agreed upon and implemented for the AI systems and their development. Additionally, speaking for the implementation of classical ethics into AI systems, it is good to realise that as machines do not comprehend the rules which they follow and operate accordingly to what the programmers have designed to be moral, the relevance of what requirements we set for the developers and deployers of AI becomes vital.[81]

2.3.2 Social sustainability

Social sustainability is a multi-dimensional concept. However, an underlying question of social sustainability can be recognised as: "what are the social goals of sustainable development?"[82] Social sustainability can be described as the evaluation of moral and societal implications and impacts of systems, processes, organizations, and activities on people and social life.[83] It can also refer to identifying and managing business impacts on people. Companies' operations for example, have direct and indirect effects on their different stakeholders and the efforts which companies take on social level largely impacts employees, customers and local communities.[84] Social sustainability can and should be approached from different perspectives, such as: quality of life as focusing on the human dimensions of the concept; equity, referring to a society providing equal opportunities and outcomes for its members; inclusion, which basically is the opposite of social exclusion; access, in terms of resources, services and opportunities; and

[79] See WIPO Magazine, Bioethics and Patent Law: The Case of the Oncomouse, (June 2006).
[80] COM (2019) 168 final, p.1.
[81] IEEE, 2017, p. 42.
[82] N. Dempsey and G. Bramley, 2011, p.3.
[83] Science Direct: Social Sustainability: https://www.sciencedirect.com/topics/engineering/social-sustainability.
[84] See UN on social sustainability: https://www.unglobalcompact.org/what-is-gc/our-work/social.

having a future focus, which means taking the future into consideration to strive for a lasting and continuing social justice.[85]

Sustainable development has been recognised as a key goal within the EU, as well as in many other organisations internationally. The 2030 Agenda for Sustainable Development, a resolution adopted by the United Nations General Assembly in 2015, is a plan of action with 17 sustainable development goals, balancing three dimensions of sustainable development, economic, social and environmental.[86] The EU has committed to the implementation of the Agenda 2030 and the sustainable development goals by adopting a strategic approach for achieving sustainable development in Europe.[87] This entails, among many other things, making sure that all policies take the three pillars of sustainable development, into account.[88]

Social sustainability is therefore is a well-recognized part of sustainable development and as discussed alongside the economic and environmental aspects, the different social implications, as mentioned above, are to be considered when making assessments on sustainability. Sustainability, as a broader concept, is closely connected to ethics. It requires to be constructed on inherently ethical values, which need to be explicit.[89] In the agenda 2030 for example, it is clear that the goals are based on ethical values.[90] Moral values, human rights and judgements of what ultimately is right and fair are in a central role in determining sustainability.[91]

Furthermore, the role of AI in helping achieve sustainable development has been recognized on the EU level. In the Commission's White Pater on AI, it is stated that: "*The use of AI systems can have a significant role in achieving the Sustainable Development Goals, and in supporting democratic process and social rights."*[92] AI can be useful in achieving the sustainable development goals for example in terms of help achieving greater gender balance, help fight climate change, enhance health and mobility and in monitoring how the sustainability goals are

[85] E. Partridge, 2017, p.4-5.
[86] UN, 2015, A/RES/70/1.
[87] EC press release: https://ec.europa.eu/commission/presscorner/detail/en/IP_16_3883.
[88] Ibid.
[89] M. Norton, 2012, p.21.
[90] UN, 2015, A/RES/70/1. Goals such as gender equality, quality education, no poverty and clean water are based on our perceptions of what ultimately is ethical.
[91] M. Norton, 2012, p.86.
[92] COM (2020) 65 final, p.3.

met.[93] Therefore, considering what has been presented above, it can be said that AI is inherently connected to ethical evaluations and considerations, which on the other hand are part of a broader concept of social sustainability. Subsequently, the patent law aspects will be added to this combination to find a way to promote social sustainability in terms of patenting AI.

2.3.3 Ordre public and morality exception to patentability

AI, with its various applications and possible means of use, provide opportunities in terms of achieving better (social) sustainability across different sectors. However, as unethical use of AI can also pose threats in terms of sustainability, well-functioning methods for mitigating the risks are necessary for the best possible results to be achieved.[94] The patent law considerations of excluding certain inventions from patentability will be discussed briefly before the risks and values of an ethical AI framework are introduced. This is, above all, important for recognising that the prohibition to grant patents for inventions that are against morality or public order has as an integral part the recognition of ethical considerations.

The exclusion from patentability of inventions, the commercial exploitation of which would be immoral or contrary to ordre public, can be described as a provision from the past, when ground-breaking, ethically questionable, technological developments were not common.[95] All that was required was the broad and undefined prohibition of inventions that were not preferred to develop further and reach the position of a monopoly in societies.[96] These types of prohibitions have existed in European systems for a long time, for example the U.K. Patents, Designs and Trademarks Act of 1883 gave comptroller a right to refuse from granting a patent if its use would be "contrary to law or morality".[97]

Today, Article 53 (Exceptions to patentability) of the European Patent Convention (16th Edition, 2016) states:

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[93] AIHLEG, 2019, p.4.
[94] See COM (2020) 65 final, p.1.
[95] A. Warren-Jones, 2007, p.1.
[96] Ibid.
[97] See P. Drahos, 1999, p. 1, and the sources mentioned therein.

European patents shall not be granted in respect of:

(a) inventions the commercial exploitation of which would be contrary to "ordre public" or morality; such exploitation shall not be deemed to be so contrary merely because it is prohibited by law or regulation in some or all of the Contracting States;

(b) plant or animal varieties or essentially biological processes for the production of plants or animals; this provision shall not apply to microbiological processes or the products thereof;

(c) methods for treatment of the human or animal body by surgery or therapy and diagnostic methods practised on the human or animal body; this provision shall not apply to products, in particular substances or compositions, for use in any of these methods.

The focus will mainly be on the section (a) of Article 53, as the general ordre public and morality provision. The concept of "ordre public" is generally understood as relating to public safety and order.[98] "Morality", on the other hand, can generally be explained as "a set of social standards for good behaviour".[99] However, explicit definitions of these concepts do not exist. For example, during the drafting of the revised Article 53 EPC, there were no attempts to define the scope of the exclusion nor the terms of "morality" or "ordre public". [100] The lack of explicit standard, or even implicit guidelines, creates issues such as different approaches being adopted regarding the interpretation.[101] This clearly makes the provision difficult in terms of applying by patent law practitioners. It also makes the legal state of the exclusion unclear, not to mention making the conducting of legal research difficult. The Technical Board of Appeal brought, in the case T 356/93 (Plant Genetic Systems v. Greenpeace), forth that the EPC working party had recognised that there is no "European definition of morality" and made an effort to suggest a definition:

"The concept of morality is related to the belief that some behaviour is right and acceptable whereas other behaviour is wrong, this belief being founded on the totality of the accepted norms which are deeply rooted in a particular culture. For the purposes of the EPC, the culture in question is the culture inherent in European society and

[98] D. Thomas, G.A. Richards, 2004, p.2.
[99] V. Prifti, 2018, p.4. Social standard can be argued to be referring to ethics in general.
[100] The Act revising the European Patent Convention on 29.11.2000.
[101] Y. Min, 2012, p.2.

civilisation. Accordingly, under Article 53(a) EPC, inventions the exploitation of which is not in conformity with the conventionally-accepted standards of conduct pertaining to this culture are to be excluded from patentability as being contrary to morality." [102]

Also, regarding "ordre public", the Technical Board concluded that: *(it) "covers the protection of public security and the physical integrity of individuals as part of society. This concept encompasses also the protection of the environment."*[103]

Respectively, Article 53 (a) of the EPC is restated in Article 6 (1) of the Directive 98/44/EC of the European Parliament and of the Council on the legal protection of biotechnological inventions (Biotech Directive).[104] Article 6(2) contains an inclusive list containing examples of subject matter that would "in particular" be unpatentable on the grounds of ordre public and morality requirements, in the scope of the Directive[105]:

a) processes for cloning human beings;

b) processes for modifying the germ line genetic identity of human beings;

c) use of human embryos for industrial or commercial purposes;

d) processes for modifying the genetic identity of animals which are likely to cause them suffering without any substantial medical benefit to man or animal, and also animals resulting from such processes.

Although the kind of inventions that fall within the scope of the Biotech Directive, do not directly fall within the category of inventions on which this thesis focuses on (AI inventions), they can be used in assessing what kind of inventions are in fact so "abhorrent", that they cannot be patentable within the European society. Also, because most of the relevant case law and legal writing in terms of ordre public and morality requirement is dealing with biotech inventions, it is useful to include the Biotech Directive into the wider consideration of the

[102] T356/93, Reasons for the Decision at 6.
[103] T356/93, Reasons for the Decision at 5.
[104] Although the EPO is not an EU institution and the directive would not be applicable to it as such, the contents of the directive have been transferred to the implementing regulations of the EPC. See: Implementing Regulations to the Convention on the Grant of European Patents, Chapter V: Biological Inventions at: https://www.epo.org/law-practice/legal-texts/html/epc/2016/e/rcii_v.html.
[105] Article 6(2) has been reproduced in rule 28 EPC.

exclusion. This can help in determining on how to assess the question of ordre public and morality exclusion in general and offer some perspective towards assessment of AI inventions.

It seems rather clear that patents should not be granted for inventions against the moral perceptions of the vast majority of people. Generally this means that, even after a patent applicant establishes that the invention is new, involves an inventive step and is susceptible of industrial application, as required by Article 52 of the EPC, she/he still needs to "pass the requirement of morality".[106] However, as it was mentioned before, despite of the morality requirement being in the patent system for a long time, it has not raised much difficulties in the past and it is stated in the EPO's Guidelines for Examination: "*This (Article 53 (a)) provision is likely to be invoked only in rare and extreme cases"*.[107] However, as mentioned before, and as will be further discussed in chapter 3, many stakeholders have awoken to the reality that ethical and social sustainability issues are relevant factors that need to be properly addressed with regards to AI.

It is relevant to point out here that the issues and threats caused by AI go far beyond and are wider questions than just those regarding patentability and, even in this context, need to be discussed more widely than merely from the point of view of excluding certain inventions as immoral and socially unsustainable.[108] Governments and different organisations are in any case free to take steps to outlaw certain technologies or means of research as simply inherently unethical.[109] However, a relevant notion in this regard is that some issues, relating to these new technologies, surface once they reach the patent office.[110]

2.3.4 Is the ordre public and morality-based exclusion from patentability justified? Should patent law promote social sustainability?

[106] Y. Min, 2012, p.1. And the sources mentioned therein.
[107] See EPO, Guidelines for Examination: G-II, 4.1.
[108] As the European approach in chapter 2 showed. The exclusion will most likely continue to have a marginal role to play in the patent system.
[109] WIPO Magazine, Bioethics and Patent Law: The Case of the Oncomouse, (June 2006).
[110] Ibid.

Even though the formal connection with morality has existed in the patent system for a long time, the patent community has often expressed an opinion that the patent system is the wrong place to consider issues relating to morality.[111] In fact, the ordre public and morality aspects have only been discussed in the EPO (and in EU courts) only in a few previous occasions. The opposition proceedings launched often times by NGOs, have forced the EPO to take the moral aspects under closer examination.[112] However, the few cases implementing ordre public and morality do confirm that patent law incorporates ethical considerations, which are to be considered overriding when comparing to economical or scientific justifications for the grant of a patent.[113]

As a response to the arguments for the patent system being wrong legal devise to deal with moral aspects, a few relevant counterarguments can be pointed out. Firstly, the patent system has been used explicitly to exclude some inventions from patentability due to moral considerations and can be argued to be a system inherently embodying certain moral and ethical values, thus allowing only particular innovations to pass into the mainstream commercial life.[114] Also, as some argue that the grant of patent is a public reward for the contribution to scientific progress and therefore to the well-being of the mankind, then immoral and dangerous inventions (and patents) that, by their nature pose a threat to sustainability, cannot fulfil this basic requirement of furthering well-being.[115] Therefore, they should not be granted with the right that is a patent. Finally, as the granting of a patent almost always affects someone's interests, in terms of excluding others from accessing the informational resources of the patent, the argument that patent system is ethically neutral, cannot be sustained.[116]

Patent right is generally understood as a "negative right", as it does not grant the owner with rights of exploitation but merely the right to exclude others.[117] In other words, the effect of a patent right is that it creates "a zone of non-interference", in which the patent holder may exercise rights of commercial exploitation of the invention.[118] The function of patents is not to

[111] P. Drahos, 1999, p. 4.
[112] See the previous cases in chapter 4.2.
[113] E. Bonadio, 2012, p.3.
[114] A. Huxley, 1994, p.2.
[115] E. Derclaye, 2009, p.1, and the sources mentioned therein.
[116] P. Drahos,1999, p.1.
[117] E. Bonadio, 2012, p.3, and the sources mentioned therein.
[118] P. Drahos,1999, p.4.

grant authorization, introduce a product to the market, certify quality nor is a patent right meant as an ethical endorsement to a given technology.[119] This implies that patent system alone is a poor way of dealing with technologies that society would not want to see exploited, as the proprietor of the technology is practically able to exploit his/her invention, regardless that a patent office would have deemed it to be against ordre public or morality (and refuse to grant it the monopoly of a patent).[120]

However, even though a patent does not grant the applicant with positive rights there are effects to when a patent office excludes an invention as immoral or contrary to ordre public. Companies would not be encouraged to invest in research and development of these types of technologies as the fruits of their labour would not be protected.[121] Also, a decision by the patent office or a court, to refuse the granting of a patent, serves as an indicator regarding the wider public acceptability of the technology thus serving a regulatory-like role.[122]

As to the question of whether the patent system should take social sustainability aspects into consideration, and more specifically promote them with regards to AI, a few things can be pointed out. Firstly, a strong demand for regulation is an expected response when new, pioneering and sometimes questionable technologies and scientific developments enter the field or start occurring in everyday life.[123] Such was the case with the aforementioned Biotech Directive and the debate on STEM-cell patenting, which was strongly ethical by nature.[124] As often times the issues of ordre public and morality (and in a wider sense of social sustainability) first surface when inventions reach the patent offices, it would be a logical stage to enforce the public response to technologies. Additionally, as patents are instruments of public policy, it is difficult to support an argument of why they should not enforce principles that are commonly accepted in the European framework.[125]

[119] A. Nordberg, 2018, p.67.
[120] Y. Min, 2012, p. 5.
[121] Y. Min, 2012, p.2.
[122] A. Nordberg, 2018, p.68.
[123] A. Nordberg, 2018, p.63.
[124] In chapter 4.2 cases regarding biotech patents are discussed.
[125] E. Derclaye, 2009, p.3.

Additional consideration that is brought up in this context[126] is, that it might be difficult to challenge AI patents due to the asymmetry in terms of resources and capabilities between the patent holders that are typically large multinational companies and those who might be adversely affected by the patents or have an interest in challenging them (individuals, non-governmental organisations and such).[127] If the challenging party is remarkably weaker, the likeliness of challenging the patent is considerably lower than if the parties were equal in terms of resources and capabilities.[128] In this regard, it is argued here that there are possibilities in drawing parallels between gene patenting and certain AI technologies for example due to the fact that AI can be used for creating technologies that enhance human capabilities: physical, cognitive, emotional and moral, which therefore are prone to raising questions and face opposition similar to biotech inventions and patents.[129] Also, taking for example into consideration that approximately 2/3 of the global investments in AI is done by the "tech giants"[130], it is reasonable to expect that the asymmetry in resources and capabilities is likely to grow even further. This may be another reason for taking into consideration the social sustainability aspects in an early stage. The idea can be criticized at least on the same argument that was presented before: It is not for the patent system, as a grantor of negative rights, to take wide and unclear ethical considerations into account when granting patents.

[126] That is also taken from the situation in the field of biotech patenting.
[127] A. McMahon, 2019, p.2.
[128] Ibid.
[129] See the Sienna (*Stakeholder-informed ethics for new technologies with high socio-economic and human rights impact)* project as regards to different human enhancement technologies, AI and robotics. Available at: https://www.sienna-project.eu/robotics/
[130] S. Chitturu et al., 2017, p.5.

3 Socially sustainable AI

3.1 Relevant values and risks regarding AI

"Working out how to build ethical robots is one of the thorniest challenges in artificial intelligence", concludes Boer-Deng in his article "Machine Ethics: The robot's dilemma".[131] In the course of recent years, an increasing amount of actors have become aware of the various challenges proposed by AI.[132] The ethical questions have, due to the nature and possibilities of AI, been considered to have a major role in governing the use of AI across different fields. As an example, the "Trustworthy AI", as a concept adopted within the EU, has three components: 1) it (AI) needs to ne lawful (compliance with applicable laws); 2) ethical (adherence to ethical values) and; 3) robust (from both technical and social perspectives).[133] As it will be demonstrated below, the adoption of trustworthy, sustainable and ethical AI is essentially grounded on fundamental freedoms and rights such as those set out in EU treaties, Charter of Fundamental Rights of the European Union and international human rights.[134] Below, some of the risks that have been recognised as most pressing, along with the values that are necessary to be promoted as an answer to the risks, are discussed, in order to shed some light into the problems.

Respect of human dignity and democratic values

Human dignity is encompassed by the idea that every human has inherent value.[135] In the development of AI systems, physical and mental integrity as well as the sense of identity and satisfaction of the essential needs of humans as moral subjects, should be respected, served and protected.[136] Furthermore, AI should, throughout its development and deployment, foster and respect democratic values, citizens' rights and respect the plurality of values as well as life choices.[137] Certain governance frameworks and standards could be put into place to oversee the processes which ensure that the use of AI does not infringe basic human rights such as the

[131] Boer-Deng, Nature, 2015.
[132] Including the EU, as explained above in chapter 2.2.
[133] AIHLEG, 2019, p.2.
[134] See COM (2020) 65 final, p. 23, the compliance with the relevant European rights and values need to be enforced by competent European and national authorities.
[135] See Article 1 of the Charter of Fundamental Rights of the European Union.
[136] AIHLEG, 2019, pp.12-13
[137] Ibid.

respect of human dignity.[138] Policies regarding AI should be reviewed as to whether they in fact embrace democratic values or concentrate power and advantages of the technology in the hands of a selected few, especially as different technologies are already being used for purposes such as supressing votes and gerrymandering, while inversely they could rather be used for enabling greater transparency in the political field.[139]

Transparency

Transparency can be illustrated as an answer to questions of how and why an AI system made a particular decision, or in case of a robot, why it acted the way it did.[140] Transparency includes: the users' knowing what the system is doing and why; creators' knowledge of the processes and input data; for accident investigators, to know how has the system made its decisions; for the persons in legal processes to have access to the decision making information; and for the sake of general confidence of the public.[141] The potential risk relating to opacity in the processing of information can be a consequence of so called "black box effect", which relates to deep learning technologies.[142] The effect makes it very difficult to understand why a certain decision was made by the AI system, which is be strongly contrary to the requirement for transparency.[143]

For instance if an AI system would make a decision, which would be inexplicable and result to an accident, not understanding the rationale on which it had based the decision would raise a series of ethical and legal issues, not to mention making the investigation almost impossible.[144] Additionally, the lack of transparency could make it impossible to identify possible breaches in laws and hinder the enforcement of different legislations.[145] For the user of the technology,

[138] IEEE: Ethically Aligned Design, p.21.
[139] P. Stone, et al., 2016, p. 48.
[140] IEEE: 2017, p. 29.
[141] IEEE, 2017, p. 29.
[142] See: D. Castelvecchi. Nature, 2016. Deep learning technologies essentially operate by feeding a vast amount of data through non-linear neural networks that classify the data based on the outputs from each successive layer, resembling the functioning of a human brain. But because the system learns in this way, the information is spread out in the networks and can be extremely difficult to decipher, hence creating a "black box".
[143] See: Information Commissioner's Office (UK), 2017, p. 11. A good example of the AlphaGo system, which was powered by deep learning, and developed to play the board game Go, making several decisions in the playing of the game that strike as "inhuman", therefore being beyond of our comprehension.
[144] A. Walz and K. Firth-Butterfield, 2019, p.6.
[145] COM (2020) 65 final, p.14.

transparency is important in order to understand what the AI is doing in certain circumstances, but also in terms of building general trust to the system.[146] Understanding the operations minimises the possibility of unexpected behaviour. As AI is likely to be making increasingly crucial and essential decisions in the future, it seems that making transparency a must-have feature, is critical for all stakeholders.

Privacy

Another major concern regarding the widespread adaptation and use of AI across various sectors, is the loss of privacy. AI applications generally need to collect and process massive amounts of data in order to work efficiently and accurately.[147] Access to data is therefore a requirement for the further development and deployment of many of these technologies, but it is also a point of debate, much of which is ethical by nature. Within the EU, different AI practitioners are already subject to legislation protecting fundamental rights, such as those relating to data protection and privacy.[148] The General Data Protection Regulation (GDPR, EU, 2016/679), is constructed for ensuring high standards for the protection of personal data. The GDPR introduces general principles of data protection, including data protection by design and by default (which are quite relevant in terms of AI) as well as ensures the free flow of personal data within the union.[149]

Additionally, the IEEE introduced three core ideals regarding to human agency, a concept referring to individual's ability and right to make informed decisions regarding the use of their personal data, which are: create, curate and control.[150] Create means that individuals should be provided with means to create their own terms, relating to the use of their personal data; curate means that individuals should be curated with a "personal data or algorithmic agent", which would then curate to represent their terms and conditions in any format or environment necessary; and control meaning that individuals should have the means to create an identity to control the safe, specific and finite exchange of their personal data.[151]

[146] A. Walz and K. Firth-Butterfield, 2019, p.14.
[147] Peter Stone, et al., 2016, p.11.
[148] COM (2020) 65 final, p.10.
[149] COM (2018) 237 final, p.15.
[150] See: IEEE, 2017, p. 110. For more specific explanations, examples and more readings see pages 110-116.
[151] Ibid.

Restriction in plurality of opinions and competition – the information bias of AI and autonomous systems.

AI can have negative outcomes relating to the existing biases and imbalances in power. For example, an employer's possibilities to monitor their employees and their work, can lead to the unfair labelling of some employees as "productivity risks", making them face a risk of termination.[152] Values relating to equality, non-discrimination and solidarity mean that unfairly biased outputs are not acceptable as a result of processes and operations of AI and also that the respect necessary for groups that are in a more vulnerable position must be adequately taken into consideration (minorities, employees and children for example).[153]

Error proneness and susceptibility to manipulation of AI.

In its communication, Artificial Intelligence for Europe, the Commission recognises the fact that: "Advanced robots and IoT related products empowered by AI, may act in ways that were not envisaged at the time when the system was first put into operation".[154] AI generated decisions are resulting from algorithms using statistical models analysing specific data, meaning that there are many factors that may lead to errors in the decisions or results provided by AI. For one, the data used may be biased, incorrect or may fail to reflect the individual circumstances at hand, or the statistical model (or algorithm) may be faulted or incomplete.[155] The EU product safety framework, with its various directives[156], addresses the issues of intended use and the foreseeable misuse of products in the markets and has already led to standards in different AI enabled devices, adapted to technological progress.[157] However, new forms and uses for AI applications could likely bring forth new issues in the future, ones which have not been appropriately dealt with by existing legal framework.[158]

[152] EPSC, 2018, p.7. And the sources mentioned therein.
[153] AI HLEG,2019, p.11.
[154] COM (2018) 237 final, p.16.
[155] A. Walz and K. Firth-Butterfield, 2019, p.18 and the sources mentioned therein.
[156] For example, the Machinery Directive 2006/42/EC (MD) and the Radio Equipment Directive 2014/53/EU.
[157] EPSC, 2018, p.16. And the sources mentioned therein.
[158] COM (2020) 65 final, p.13.

AI applications are prone to errors and failures and as AI becomes increasingly present in our daily lives it will be crucial in the future to have better understanding overall of the systems and their decisions in order to prevent drastic failures.[159] It has been for instance proposed that internal and external audits regarding machine learning algorithms should be undertaken to explain rationale behind the decisions made by the algorithms and to look for biases, errors as well as possibilities of discrimination.[160]

Manipulation, surveillance and illegal behaviour.

Freedom of the individual means freedom from unjust disturbance but it also requires intrusion by the government to ensure that individuals are able to enjoy (are free from threats such as surveillance) their freedoms such as conducting business, freedom of expression, private life and so on.[161] Sophisticated manipulative technologies utilizing AI can cause restrictions to fundamental freedoms, such as freedom of choice. For instance, when consuming content individuals can be manipulated widely without them even realising the extent of the manipulation.[162] Furthermore, technologies utilizing facial recognition may be abused to spy and control citizens.[163] Efficient means must be put in use also to protect different AI applications against abuse, which might go further than violating ones' privacy. For example, manipulation of an automated vehicle operating with a connected mobility system, might be used to cause a serious traffic accident.[164]

Various threats, including those introduced above, need to be addressed properly for AI systems and applications to reach their full potential of increasing collective and individual well-being and the aforementioned human "flourishing".[165] Key ethical principles that need to be respected in the development, deployment and use of AI as proposed by the High- Level Expert Group of AI, set by the Commission, provide valuable guidance for mitigating the threats of AI presented above[166]:

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[159] P. Stone, et al., 2016, p.42.
[160] Information Commissioner's Office (UK), 2017, p. 99.
[161] AI HLEG, 2019, p.12.
[162] IEEE: 2017, p.85.
[163] B. Smith, 2018: https://blogs.microsoft.com/on-the-issues/2018/07/13/facial-recognition-technology-the-need-for-public-regulation-and-corporate-responsibility/.
[164] A. Walz and K. Firth-Butterfield, 2019, p.7.
[165] AI HLEG, 2019, p.6.
[166] AI HLEG, 2019, pp. 11–13.

1. *Respecting human autonomy,* requires above all, that human centric design principles are applied to AI, meaning that the AI systems do not manipulate, herd, coerce, deceive or condition humans, but are rather used for augmenting, complementing and empowering human cognitive, cultural and social skills.[167]

2. *Prevention of harm,* refers to the requirement for AI systems and the environments in which they operate to be safe, secure, and robust as well as protected against malicious means of use, which means that they should not have adverse effects on humans nor to the natural environment.[168] Additionally, for the goals relating to social sustainability, a certification process and system could be used for the promotion of independent assessment of the ethical and safety factors for AI.[169]

3. *Fairness*, as a requirement is identified in report by the AIHLEG on two different dimensions, the substantive and procedural.[170] The substantive dimension promotes aspects such as ensuring equal dividing of both benefits and costs (of AI) along with making sure that there are no unfair biases or discrimination in the systems.[171] The procedural dimension on the other hand consists of things such as the possibility for contesting the decisions made by AI systems (and the human in charge of operations of such) and seeking for redress when needed.[172]

4. *Explicability,* as a requirement, which has already been approached from the perspective of risks for transparency, is essential for building trust towards AI. It requires that the processes are transparent and the purposes and capabilities of systems are openly communicated.[173] Basically, it should always be possible to reduce the AI system´s computations to a form that is comprehensible by humans.[174]

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[167] AIHLEG, 2019, p.12.
[168] Ibid, p.14.
[169] IEEE, 2017, p.136.
[170] AIHLEG, 2019, p.12. It is however good to acknowledge that the concept of "fairness" can be interpreted and understood in many different ways.
[171] On page 20, the biases and discriminating issues of AI was discussed.
[172] AIHLEG, 2019, pp.12-13.
[173] Ibid, p. 13.
[174] See European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics, ethical principle 12.

3.1.2 Conclusions on the assessments and the ethical considerations. Connection with AI and sustainable development.

As a conclusion, the concerns that were seen as the most pressing, regarding the different AI applications, included things such as: negative impacts in terms of human dignity; loss of privacy and personal autonomy; proneness to errors and biases; threats to democratic values and justice; discrimination; manipulation and issues relating to the general freedom of individuals. Respectively, promoting certain core values in the applications of AI was identified as an important factor in responding to these issues and threats, as well for the promotion of the ethical aspects of AI. These aspects include, in a wider sense: the respecting of human dignity, privacy and autonomy; ensuring explicability and transparency; respecting the requirements of democracy, justice and the rule of law; ensuring equality, fairness and citizens' rights; as well as addressing risks relating to liability, manipulation and such.[175] The risks and values to be promoted are relevant in this context due to their nature as being closely connected to the field of social sustainability.[176]

Below, in order to show a clearer link between the AI risks and values that need to be fostered and on the other hand the notion of social sustainability, some parallels are brought up. These are built on the aspects of social sustainability, ethics and the risk and value assessments that were discussed above. This is useful in seeing the connections between the risks and values as a mean to foster a more ethical and sustainable approach to AI:

1) Equity in terms of reducing the disadvantages of certain groups, was mentioned as one of the key factors to promote, for example in the course of a business operation. However, inequity was seen as a risk that might be further endorsed by AI, through increasing imbalances in power, lacking of transparency and aforementioned risk factors.
2) Diversity, with references for example to assessing whether and how a given project recognises diversity is another aspect in which AI systems can have negative outcomes.

[175] See AIHLEG, 2019, pp. 10-11.
[176] See COM(2020) 65 final, p.25, concluding that AI can have strong impact of improving well-being and finding solutions to some of the pressing social issues at the moment, but only if it is "human-centric, ethical, sustainable and respects fundamental rights and values".

Problems may arise through biased outcomes that strengthens a specific polarized view as well as lack of transparency in outcomes of the use of different systems.

3) Social inclusion, which can refer many things, but in this case most of all to participation and a common sense of belonging, is another thing that should be assessed as an aspect of social sustainability. However, as speculated earlier, risk factors such as loss of privacy and threats to certain democratic values were among the threats that could be a possible outcome of some AI technologies.
4) Quality of life as another element which should be examined, in assessing social sustainability, can also be negatively affected by some uses of AI. As it was described, proneness to manipulation, surveillance and for example the aforementioned loss of privacy can seriously affect the quality of life dimensions.
5) Democracy and governance can be approached by asking is a diverse range of people allowed to participate and to be represented in the decision making. Again, restriction in the plurality of opinions, among other things due to biased outcomes, manipulation and lacking in transparency were presented as possible risks caused by the increasing use of AI systems and applications.

It seems that in terms of fostering socially sustainable AI, fundamental rights and values hold a central role and their implementation is of vital importance. A well-implemented ethics regime could help individual and collective well-being by creating prosperity, maximizing wealth, helping achieve a fair society that fosters equality by means of equal distribution of economic, social and political opportunities.[177] New innovations, emphasizing ethical values, can help in achieving sustainable development goals such as those of the Agenda 2030 as well as support democratic processes and social rights[178].

Another thing is that emphasizing ethical considerations could also lead to new innovation that further fosters social sustainability.[179] Various fields of law are both affecting and being affected by the development of AI along with all the impacts it has on the society, and the effects of choices made by legislators can be looked as how the law responds to the new technical innovations, but also how it is possible with the means of law, to guide and set

[177] AIHLEG, 2019, p.11.
[178] COM (2020) 65 final, p.2.
[179] A. Walz and K. Firth-Butterfield, 2019, p.12.

conditions for the innovation.[180] The patent law aspect that are presented later, are referring to this exactly, as in using the patent law to foster some valued ethical considerations that are beneficial to all of society.

3.2 (Ethical) Compliance by design

AI with its immense possibilities requires, as a counterbalancing exercise, for the mapping of possibilities for mitigating the risks discussed above and strive towards the best possible benefits.[181] Particularly those in terms of social sustainability, trust, security and ethics are of interest in the scope of this thesis. The question ultimately is: how can we ensure that the decisions and actions made by AI are based on acceptable ethical considerations? The idea that complying with norms can be implemented into the design of the AI systems is a key aspect in this respect.[182] As AI developers and deployers are bound by European fundamental rights, such as non-discrimination and privacy, consumers can expect the same level of safety and respect from products utilizing AI.[183]An interesting consideration of a by design-approach, will be presented here with regards to this.

The compliance by design[184] aspects, while they are not irrespective the regulatory approaches, should be discussed separately before connecting them to the patent law aspects. It is necessary to consider the possibilities of constructing the AI systems in a manner that they operate ethically per se, at least in critical situations (ethical compliance by design).[185] In order for AI to be dependable and trustworthy, it needs to be secure by means of processes, data and outcomes and to achieve this it needs to be designed to be solid for example against adverse data and forms of manipulation.[186] Moral judgement is a complex activity that humans often make wrongly, not to mention that it is extremely difficult to find agreed (between individuals and cultures) upon criteria for how to correctly make moral decisions.[187]

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[180] IEEE, 2017, p.211.
[181] IEEE: 2017, p.17.
[182] AIHLEG, 2017, p.21.
[183] COM (2020) 65 final, p.10.
[184] There are already other "by-design" concepts being used in the European framework, such as privacy by design and security by design.
[185] A. Walz and K. Firth-Butterfield, 2019, p.11.
[186] AIHLEG:2017, p 23.
[187] W. Wallach and C. Allen, 2008, pp. 1-2.

Mainly two ways for implementing ethics by design for AI have been presented by scholars: the top-down and the bottom-up approach.[188] The idea of the top-down approach is that ethical principles and rules are programmed into the AI system.[189] This basically means building a moral system[190] by feeding it moral facts and designing the system to do inference with them, or by defining a value function which is maximized by the consequences of the "right behaviour".[191] The set of ethical principles can basically be anything the programmers choose and wish to implement.[192] They could be in accordance with the virtue, deontological or utilitarian theories of ethics.[193] Also the so called "three laws of robotics", introduced by the science fiction author Isaac Asimov in 1942, have been presented as an alternative.[194]

However, blindly following a specific moral philosophy has the potential to make the ethical choices radical and unyielding.[195] The main question therefore seems to be: which ethical rules or moral philosophy should AI adhere to since all of them could arguably lead to morally unacceptable outcomes? Most ethicists in fact apply multiple ethical theories of different schools when making well-balanced decisions to moral dilemmas instead of merely following the doctrine of one specific school.[196] Furthermore, people do not generally base their moral assumptions or decisions to a certain ethical theory or even a "mix" of multiple ethical theories, but rather acquire moral values from a variety of sources (such as their parents, society and

[188] See A. Etzioni and O. Etzioni, 2017 as well as W. Wallach and C. Allen, 2008.
[189] A. Etzioni and O. Etzioni, 2017, p.405. Note that in the paper the scope of the study relates to different implementations of ethics with regards to smart cars.
[190] See W. Wallach and C. Allen, 2008, p.3. A computer system, robot or android that is capable of making moral judgements, could also be referred to as an Artificial Moral Agent (AMA).
[191] N. Berberich and K. Diepold,2018, p. 6.
[192] A. Etzioni and O. Etzioni, 2017, p. 406.
[193] As explained in chapter 2.3.1 on ethics.
[194] These rules were introduced by Asimov, in a short story "Runaround" (1942) in which human-like robots (or commonly "androids") roam the world as servants of man. The three rules are as follows: 1) A robot may not injure a human being or, through inaction, allow a human being to come to harm 2) A robot must obey the orders given it by human beings except where such orders would conflict with the First Law 3) A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws. These rules are sometimes brought forward and propositions made in regards of the threshold of complexity, which might be too high as regards to most of the AI applications today and making the rules in general more suitable for the 21 century, see: https://theconversation.com/after-75-years-isaac-asimovs-three-laws-of-robotics-need-updating-74501.
[195] See A. Etzioni and O. Etzioni, 2017,p. 406. As argued by Benjamin Constant, the following of the maxim, by the utilitarian theory of Kant, would in some situations mean that a person (for this purpose a machine) would have to reveal to a murderer, the location of his prey (as speaking the truth would be seen as the maxim to live by). See: Constant: On Political Reactions, 1797.
[196] A. Walz and K. Firth-Butterfield, 2019, p.26.

inputs from different groups and cultures).[197] It is difficult to program a computer into making moral decisions on its own[198], and unlike humans, which are capable of making decisions that are ambiguous by nature and partially based on nuances, computer programmers find this to be particularly problematic.[199]

The top-down approach can be executed on a casuistic or on a dogmatic basis. The casuistic approach means that machines would be taught to react accordingly to specific situations in which they would have to make an ethical decision.[200] An example would be for an autonomous vehicle to have a highest priority to not cause harm to humans, which it would apply also in extreme cases where a crash would in fact be inevitable.[201] The dogmatic approach on the other hand would base on programming systems on certain specific school of ethics or moral codes, as described above. The latter approach would at the very least spare the programmers the work relating to anticipating the different situations in which the AI system would be required to make ethical decisions.[202]

The bottom-up approach on the other hand, is based on an idea that machines would learn to make ethical decisions by observing real-life human behaviour and learn morality, without any particular moral philosophy programmed into them.[203] The bottom-up approach has two goals: 1) building systems that are complex enough to create a foundation for artificial morality[204], and 2) allowing these systems interact and hope that some suitable moral capacities have been created.[205] This approach has been adopted to the non-ethical aspects of driverless cars'

[197] A. Etzioni and O. Etzioni, 2017, p.406.
[198] Whether on applying one single doctrine of ethics or a combination of many.
[199] A. Etzioni and O. Etzioni, 2017, p.406.
[200] A. Walz and K. Firth-Butterfield, 2019, p.10.
[201] Which leads to questions such as of whether to protect the health of the passenger or that of pedestrian in a situation in which a crash is inevitable. As a clear example, under the utilitarian theory the car would have to save five people for the "price" of one (as the classical trolley problem presents), and the one to suffer the consequences could be the sole passenger of the car. See: Self-Driving Cars Will Teach Themselves to Save Lives—But Also Take, Wired 06.09.16. Available at: https://www.wired.com/2016/06/self-driving-cars-will-power-kill-wont-conscience/.
[202] A. Walz and K. Firth-Butterfield, 2019, p.11.
[203] A. Etzioni and O. Etzioni, 2017, p.407.
[204] With discrete capacities peculiar to humans.
[205] W. Wallach and C. Allen, 2008, p.7.

learning.[206] However learning ethics by observing people simply teaches what is common, not what is ethical.[207]

The success of these models seem at the moment to be quite far-fetched in terms of a well-functioning artificial morality. Ultimately the difficulties raised by the top-down and the bottom-up approaches are not by nature technical, but rather relate mainly to the structures of moral and ethical philosophies.[208] It would therefore seem, that the compliance by design is so far only feasible in terms of the casuistic approach, built on specifically programmed decision-making structures, as in the autonomous vehicle example above. The approach seems to be sustainable in narrow, clear goals where risks are reasonably foreseeable and predictable.[209] Additionally, it still remains for the AI developers to decide which design philosophy they wish to follow with regards to the decision-making algorithms.[210]

The ethical compliance by design aspects are nevertheless promising. However, it might not be the most suitable approach to leave the designing of the artificial morality entirely in the hand of the AI developers, due to the widespread effects that the actions of these AI moral agents could in fact have. So called "prior conformity assessment", which includes procedures for testing, inspection or certification has been considered by the European Commission as a necessity for verifying and ensuring that certain mandatory requirements that are applied to high-risk applications of AI are complied with.[211] The AIHLEG suggested a set of "white list rules", comprising of behavioural rules and states, which a system should always follow, along with a set of "black list rules", comprising on the other hand of behaviour and states what the systems should in no circumstances pursue or execute, referring together to an "architecture for trustworthy AI".[212] These could be used to ensure ethical compliance by design, by providing clear links between the abstract principles that the AI is supposed to follow and the implementation decisions of those principles.[213]

[206] A. Etzioni and O. Etzioni, 2017, p.407.
[207] Ibid.
[208] A. Etzioni and O. Etzioni, 2017, p.408.
[209] W. Wallach and C. Allen, 2008, p.9.
[210] A. Walz and K. Firth-Butterfield, 2019, p.11.
[211] COM (2020) 65 final, p.23.
[212] AIHLEG: 2019, p.24.
[213] AIHLEG, 2019, p. 23.

The requirements for specific ethical compliance by design rules are by themselves closer connected to other policymaking and liability aspects rather than directly to patent law.[214] Still, one can argue that similarly as an biotech invention cannot constitute "cloning of humans, modifying their germ line genetic identity and such"[215], the requirement for AI adhering to certain fundamental design philosophy rules, could ultimately be implemented. However, the ethical compliance by design aspect could also be useful in the evaluation of what is the practise in the field of AI development as well as what is acceptable "current practise".[216] Recognising these aspects could provide valuable guidance that could be used for the assessment of ethically questionable AI inventions.[217] Furthermore, the aforementioned considerations of ethical compliance by design provide a good insight on the difficulties that relate to the adding of ethical fundamental values to AI.

[214] A. Walz and K. Firth-Butterfield ,2019, p.11.
[215] See chapter 2.3.3 on the ordre public morality exception in the Biotech Directive.
[216] See chapter 5 on the "current practise" approach to assessing the opinions of the public to inventions.
[217] That could be implemented in guidance for patent offices when assessing ordre public and morality implications of AI inventions, see chapter 6.

4 Previous interpretations of the ordre public and morality exception

4.1 Connecting patent law to socially sustainable AI

Law and morality are connected. Within various fields of law legal professionals have to give weight to moral factors in the decision-making process, also with regards to patent law, despite that it is often characterized merely as a tool of economic regulation.[218] It is not enough to look at how the law responds to the technological developments, such as AI, and rather consider on how the law guides these developments, what kind of conditions it sets and what kind we want it to set for it.[219] Some argue that people and companies will only start implementing and using AI in a sustainable and ethical manner if they are committed to these requirements by binding legal rules or if they believe that an ethically aligned and socially sustainable system is beneficial to them (in economic terms or otherwise).[220] It would seem that there are appropriate grounds for adopting, by means of regulation, systems to promote socially sustainable AI.

Social institutions[221] can have a large impact on aligning the focus and aim of science and technology with values such as ethics, social sustainability and human well-being.[222] Therefore determining what kind of innovation the patent system grants protection for could largely effect on the developments of technologies.[223] The idea is that, by not granting certain AI applications protection due to their unethical nature (Art 53 EPC), the law would lead businesses to invest in other types of AI that would be applicable to patenting.[224] Furthermore, regulatory means have without a doubt certain clear and well-defined advantages, as they provide with binding and enforceable rules that are established and generally also accepted by means of a democratic law making process, which is transparent and secures the rights of participation in for different people and interest groups.[225]

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[218] P. Drahos, 1999, p.1.
[219] IEEE: 2017, p.213.
[220] A. Walz and K. Firth-Butterfield, 2019, p. 27.
[221] In this context especially patent law, and its exclusion clauses.
[222] IEEE: 2017, p.211.
[223] See P. Drahos, 1999, p.5, the goal of the patent system is essentially to encourage development of science and technology, which are the developments of science and technology are bound to the belief that the patent system contributes to economic growth and progress.
[224] See E. Derclaye, 2009, p.3 discussing the same issue from the point of view of green inventions and fostering environmental sustainability.
[225] A. Walz and K. Firth-Butterfield, 2019, p.12.

Patent systems are territorial and national, meaning each system must figure out its approach to questions of morality and patenting of AI.[226] The co-operation of the most relevant patent jurisdictions, both in terms of the number of patent applications and AI research for example, could have a wide-spread effect in discussions of the effects of AI in the patent field and finding a suitable and compatible approach[227] to dealing with some of the issue presented above. The issues of patenting AI have been recognised in the scope of the IP5[228] co-operation, within which some issues in AI patenting have already been discussed.[229]

4.2 Previous cases of ordre public and morality

For the purpose of this thesis, it is unfortunate that the ordre public and morality provision has only been invoked on a few occasions previously. However, an assessment based on the previous cases is conducted here to explain the different approaches taken previously and attempt to find suitable connections applicable to AI and the threats and issues it proposes. So far European courts and the EPO Boards of Appeal have considered the meaning and practical applicability of Article 53 (a) of the EPC and Article 6 (1) of the Biotech Directive in five main cases. These cases then project three different general approaches to the ordre public and morality exclusion.[230]

The relevant cases that are discussed below include also assessment of the sections (b) or (c) of Article 53 EPC as well as Section (2) of Article 6 of the Biotech Directive that include provisions constituting subject matter that would in particular be considered as unpatentable,

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[226] See P. Drahos, 1999, p.4 from the perspective of biotechnology. Each patent jurisdiction has to work out its answers to the legal questions relating to patenting of biotech inventions in terms of morality.
[227] That would promote legal certainty and guide the impacts of AI developments if necessary.
[228] A forum of the five largest intellectual property offices in the world (accounting for 80% of the global patent market) with the focus of improving the efficiency of the examination process for patents worldwide. See: https://www.fiveipoffices.org/about.
[229] However, so far focusing in issues such as: Inventorship/Ownership, Patent Eligibility, Sufficiency of Disclosure and Inventive Step, See: Report from the IP5, 2018: https://www.fiveipoffices.org/wcm/connect/fiveipoffices/5e2c753c-54ff-4c38-861c-9c7b896b2d44/IP5+roundtable+on+AI_report_22052019.pdf?MOD=AJPERES&CVID=
[230] J. Pila and P. Torremans,, 2016. p. 159.

thus going into specifics rather than the general ordre public and morality provision.[231] However, assessments of these sections can provide some useful insights when reflected with the general ordre public and morality exclusion and, where possible, some applicable implications with respect to AI. Also, inventions that fall within the scope of Article 53 (b) or (c) as well as Article 6 (2) of the Biotech Directive, are also prohibited according to Article 53 (a) of EPC as the general rule of morality and ordre public.

4.2.1 First approach – cases Brüstle v Greenpeace and Warf

The judgement of the Court of Justice of European Union (CJEU) in Brüstle v Greenpeace eV (C-34/10) case[232] is relevant regarding the morality requirements in the patent system. Dr. Olivier Brüstle had obtained a German patent concerning isolated and purified neural precursor cells (cells capable of dividing into different specialized cell types, which can also self-renew to produce more cells), which were produced from human embryonic stem cells. The invention basically involved culturing stem cells, which required the destruction of a blastocyst (a human embryo in an early stage of development), for therapeutic purposes (for treating of patients with damaged organs, such as Parkinson's disease by transplanting the produced cells into the nervous system).[233] Greenpeace successfully challenged the patent in Federal Patent Court on the grounds of morality, by basically arguing that patenting an invention based on a human embryo, which at a later stage is destroyed, is unethical.[234] Dr. Brüstle appealed to the German Supreme Court which then referred the case for the CJEU.

CJEU interpreted Article 6 (2) of the Biotech Directive, prohibiting the granting of patents for the use of human embryos for industrial or commercial purposes as well as Article 6 (1), as the basic ordre public or morality requirement, which meant that where invention's commercial exploitation would be contrary to *ordre public* or morality, it would be unpatentable. The court

[231] As the articles were reproduced and explained at 2.3.3, the additions to the general ordre public and morality provisions (sections (b) and (c) of the Art 53 EPC and the section (2) of the Art 6 Biotech Directive) consist of subject matter that would "in particular" be unpatentable, such as plants and animal varieties; methods for treatments; cloning humans or modifying their germ line genetic identity; or using of human embryos for industrial purposes.
[232] Case: Brüstle v Greenpeace eV (C-34/10) EU:C: 2011:669 (Grand Chamber).
[233] On the issues on patenting stem cells in Europe see: Marton Varju and Judit Sandor: Patenting STEM Cells in Europe: The Challenge of Multiplicity in European Union Law, Common Market Law Review 49: 1007–1038, 2012.
[234] See E. Bonadio, 2012, p.2.

had to firstly give a definition to what is to be regarded as a "human embryo", as the lack of a uniform definition would create a risk of biotech patents being sought in countries with the narrowest definitions.[235] Also, the expression under art. 6(2)(c): "uses of human embryos for industrial or commercial purposes" was interpreted, as the question of whether the use of embryos for research purposes amounts to use with commercial aim was raised. The court concluded that, even though scientific purposes must be held separate from those of industrial or commercial nature, patent rights are in principle connected with activities of industrial and commercial purposes. The use of human embryos for the purposes of research cannot be separated from the patent itself and cannot thus enjoy protection.[236]

Is an invention that includes the destruction of human embryos then patentable, if the patent application does not specifically mention the destructive use? CJEU held that these sorts of inventions are not patentable because to not exclude these inventions would allow patent applicants to avoid the exclusion of patentability by drafting misleading patent applications. The court however distanced itself from the decision's ethical nature by stating that: "The Court is not called upon, by the present order for reference, to broach questions of a medical or ethical nature, but must restrict itself to a legal interpretation of the relevant provisions of the Directive".[237] It does still seems that the court took a moral stance by adopting a broad interpretation of human embryo and arriving at a conclusion that inventions involving the destruction of human embryos are immoral and not patentable. The decision, at least implicitly, confirms that patent law is not neutral, but rather that it has incorporated ethical and ordre public restrictions that can be overruling with regards to otherwise patentable technical innovations.[238]

The decision by the EPO Enlarged Board of Appeal in Use of embryos/WARF[239] is similar to that of the CJEU in the Brüstle case. Wisconsin Research Alumni Foundation (WARF) filed an European patent application for an invention in 1996, involving a method regarding the obtaining of human embryotic stem cells (claims covered the culturing of these cells). The

[235] The CJEU, in this case, gave a wide interpretation for what constitutes "human embryo" as any human ovum, as soon as fertilised should be considered as human embryo, if it would be able to commerce the development of human being. This covers cells that are artificially stimulated or manipulate, not fertilised however, but are able to trigger the mentioned development.
[236] Meaning that applying a pantent on the basis of research purpose or such, is not possible.
[237] See Brustle (C-34/10) decision at 30.
[238] E. Bonadio, 2012, p.3.
[239] Case: Enlarged board of Appeal: Use of Embryos/WARF (G0002/06).

described method involved, as a necessary step, the destruction of human embryos from which the cells were derived. The patent application was first refused by the examiners at EPO for claiming subject matter that was excluded from patentability under the Rule 28 (c) (formerly 23d(c)) of the EPC[240], for using of human embryos for industrial or commercial purposes.

WARF appealed the decision to the Technical Board of Appeal of the EPO, which then referred the question of patentability to the Enlarged Board of Appeal (EBA). The questions at the EBA were in short: 1) Does the Rule 28(c) apply regarding the application by WARF; 2) if it does, does it exclude the invention from being patentable; 3) if not, is the invention anyhow excluded by Article 53 (a) EPC; and 4) could scientific developments change the matters?[241] Indeed, the answer to the first question was straight-forward as the Rule 28(c) was confirmed to apply to the case. With regards to the second question, WARF argued that the invention was aimed at research and therapy, not for commercial or industrial use, and that the differences could and should be recognised. To this the EBA concluded that:" Making the claimed product remains commercial or industrial exploitation of the invention even where there is an intention to use that product for further research".[242]

EBA concluded that the full technical teaching of the invention has to be taken into consideration as to how the invention is to be performed (rather than merely the claims of the applicant), as a response to WARF's argument that the use of human embryos had to be specifically claimed. And as the invention at hand involved the use of human embryo, an appellant cannot evade the patenting prohibition by means of clever patent drafting. The *ratio legis* of the rule is the non-commercialisation of a human embryo, argued EPO president, who was represented in the hearing. As the use of the claimed invention involved destruction of an embryo as an integral and essential part of the industrial or commercial exploitation, it violated the prohibition of Rule 28(c) EPC.

Regarding the third question, which is a fundamental one here, the relevant norms were the respect for human dignity and the non-commercialization of a human body. According to the

[240] Which is by its contents same as Article 6(2) of the Biotech Directive and amended to the European patent system by decision of the Administrative Council of the European Patent Organisation.
[241] See: S. Sterckx, 2008. pp.2-5.
[242] See: Warf G0002/06 at 25.

EPO president, the moral assessment that is required by Article 53(a) of EPC, should not consist of balancing human dignity against any possible benefits of destroying the embryos. However, the third question needed not to be answered, as the answer to the second question had been yes. The fourth question did not cause much debate and it seems clear that what happens after the filing of the application is an external question in relation to the invention at suit and does not hold relevance in the assessment.[243]

The question, in both cases of Brüstle and WARF, was basically whether the biotech inventions involved the use of human embryos for industrial or commercial purposes as excluded from patentability. The Enlarged Board of Appeal and the CJEU arrived at conclusions that the inventions involved such use and were therefore to be excluded. The idea in these decisions was to interpret expansively Article 6(2) of the Biotech Directive in order to give full effect to the intention of the EU legislator and the EPC, and by doing that essentially protect human dignity.[244] The exclusion covers any invention, the preparation of which involves the use of human embryo, even if the invention itself in fact does not include such. Also, as the nature of patent right is closely connected to the commercial or industrial exploitation, arguments that the inventions are intended to be used solely in research purposes cannot be used to overcome the exclusion from patentability.

The willingness to interpret the meaning of rule 28(c)/Article 6(2)(c) or Article 53 (a)/Article (6)(1) was more present at the CJEU expressing that the issue of patentability of an invention that involved human biological material involves necessarily fundamental rights such as those of human dignity and will therefore require analysing.[245] The ruling has faced criticism for multiple reasons. Biotech industry for example has stressed the possible brain-drain effect towards countries such as the U.S., which are more biotech friendly and have no patent eligibility limitation regarding human embryotic stem cells (HESC)[246] on moral and ordre

[243] See: S. Sterckx, 2008, p.2-5.
[244] J. Pila and P. Torremans, 2016. p.159.
[245] J. Pila and P. Torremans, 2016. p.159.
[246] Note that there could be room here to expand hypothetically arguments to the field of AI, which has, as demonstrated 2.2.1, been under much scrutiny in the European context.

public grounds.[247] This would be due to the lack of protection in a heavily R&D intense field, such as that of HESC.[248]

4.2.2 Second Approach – Oncomouse case (Harvard/Transgenic Animal)

The Oncomouse ("onco" being a Greek word for cancer) case[249] has raised a lot of talk on the topic of bioethics and patenting. Scientists at Harvard Medical School produced, in the early 1980´s, a genetically modified mouse that was highly susceptible to developing cancer as a result of a so-called oncogene, which triggers the growth of cancerous tumours.[250] The purpose of the genetic modification of the mice was to further cancer research. One of the mice developed a mammary tumour in the groin area, the other, from which the breed of Oncomice was established from, developed solid tumours in the neck and groin as well as having the cancer spread out to its lungs.[251] There was no doubt about the fact that the mice were caused severe pain as a result of the genetic manipulation.[252]

Patent applications for the Oncomice were treated differently in different jurisdictions. In the U.S., the Patent Office granted a patent in 1988 claiming: "a transgenic non-human mammal whose germ cells and somatic cells contain a recombinant activated oncogene sequence introduced into said mammal…"[253] The exclusion of "humans" in the scope of patent could be seen as reflecting moral and legal concerns on "patenting" humans as well as gene editing performed on humans.

Within the EPO the treatment of the Oncomouse patent was not as straight forwards as in the U.S. There were several complications along the way as the application has been examined in four different occasions, twice by the examining division and once by the opposition division

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[247] E. Bonadio,2012, p.2.
[248] See A. Smith: "No" to ban on stem-cell patents, Nature April 28, 2011: https://www.nature.com/articles/472418a.
[249] Case: HARVARD/Transgenic animal (T315/03) (2004).
[250] WIPO Magazine, Bioethics and Patent Law: The Case of the Oncomouse, (June 2006).
[251] See. T. A. Stewart, P. K. Pattengale and P. Leder: Spontaneous mammary adenocarcinomas in transgenic mice that carry and express MTV/myc fusion genes, PubMed, 1984.
[252] See. T315/03, at 12.2.1: "Animal suffering is not just a likelihood but an inevitable consequence of the very purpose of the patent".
[253] WIPO Magazine, Bioethics and Patent Law: The Case of the Oncomouse, (June 2006).

and the TBE. The initial application was filed on 24 June 1985 claiming a priority date of 22 June 1984 and the proceedings came to an end on 6 July 2004 by the decision of the TBA. Only a few of the most relevant points of the Oncomouse proceedings can be taken into consideration here. The EPO's examining division took in first instance a stance according to which: "patent law is not the right legislative tool for regulating problems arising in connection with genetic manipulation of animals"[254], thus declaring, that Article53 EPC was irrelevant in the case. However, the Board of Appeal decided to overturn examining division's decision considering: "that precisely in a case of this kind there are compelling reasons to consider the implications of Article 53(a) EPC."[255] The TBA's decision T315/03 is a final stage in a very lengthy process of the Oncomouse.

The most discussed aspect of the Oncomouse case has been the possibility to exclude the patent with the provision provided by Article 53 (a) EPC, as the general ordre public and morality exclusion.[256] The TBA pointed out first of all, that Article 53 (a) does not in fact concern the morality of patenting an invention, but rather the morality relating to the exploitation and publishing of the invention. In other words, if it is deemed immoral to publicise or use a particular invention, it cannot be patented.[257] The Board had stated in an earlier stage with regards to the Oncomouse that: "The decision as to whether or not Article 53(a) EPC is a bar to patenting the present invention would seem to depend mainly on a careful weighing up of the suffering of animals and possible risks to the environment on the one hand, and the invention's usefulness to mankind on the other."[258]

The TBA conducted a two-stage test on the grounds of Article 53 (a) EPC, concluding that there was an absolute bar to a patent if animal suffering was established but there was no medical benefit. Also, the medical benefit claimed, must have a necessary correspondence to the use of the invention. Finally, if there was a benefit, it must then be considered whether morality nevertheless dictates against granting of a patent. The TBA adopted what is called the "utilitarian approach", as to weighting in the benefits and the disadvantages of the invention.[259] Practically the TBA weighted the benefits of genetically modifying a mouse for the purposes

[254] EPO, Harvard/Oncomouse, (T19/90) (1990) At 5.
[255] EPO, Harvard/Oncomouse, (T19/90) (1990) At 5.
[256] Although questions relating to inventive step and sufficient disclosure were also discussed.
[257] D. Thomas, 2006, p. 2.
[258] EPO, Harvard/Oncomouse, (T19/90) (1990) At 5.
[259] WIPO Magazine, Bioethics and Patent Law: The Case of the Oncomouse, (June 2006).

of furthering cancer research and treatment and, on the other hand, weighted the animal suffering and the possibility of environmental disadvantages that the spreading of the gene in to the environment would cause. This was referred in the case to as the "necessary correspondence between suffering and benefits".[260]

The TBA concluded that the potential benefits in the invention, meaning the likelihood of substantial medical benefits, outweighed the suffering caused to the animal. The invention contributed to the development of cancer treatments; used fewer animals than other methods comparable to it, reducing overall animal suffering; there were no equally reliable test models available; and the unwanted release of the invention into the environment was limited.[261] Therefore the overall balance, provided by the test applied by the TBA, did not indicate that the invention would be immoral or contrary to ordre public. In the course of the proceeding the patent was however amended to only consist of claims limited to mice.[262]

4.2.3 Third Approach – cases Howard Florey/Relaxin and PGS

In the case of Relaxin/Howard Florey Institute[263], the invention involved an isolated human gene encoding for H2-relaxin (a hormone that relaxes the uterus during childbirth). The invention concerned the gene coding of the relaxin and the synthetic form, which was produced by means of cloning. The invention involved, as a necessary step, the removing of tissue from a pregnant woman, and its patentability was opposed on grounds that DNA represents "life", the patenting of which is immoral and is to be prohibited under Article 53 (a) EPC. [264]

To allow such a patent, according to the opposition, would lead to the abuse of pregnant women from whose bodies the mRMA had been isolated from, thus leading to return to slavery and a "piecemeal sale of women to industry".[265] Regarding Article 53 (a) EPC, the opposition

[260] See T315/03 [at 9(1-7) and 13 (2)(1) to 13(2)(4)], on the weighing up of benefits and disadvantages.
[261] See J. Pila and P. Torremans, 2016, p.162.
[262] As it was initially applied for a transgenic non-human mammalian animal.
[263] Case: Howard Florey/ Relaxin, (T 0272/95).
[264] The invention was also challenged for constituting a discovery rather than invention and for lacking novelty and inventive step.
[265] Oppositions by Fraktion der Grünen im Europäischen Parlament; Lannoye; EPO 6/1995 at 388.

division of the EPO had to discuss three main questions in assessing whether the grant of patent would offend morality and public policy: a) using pregnancy for a technical process with a goal of making profit; b) supporting of dismembering and selling of women to commercial enterprises; and c) enabling the patenting and owning of human life.

Since the women had given their consent for the removal of their tissue, and the reproduction of the relaxin would not require further extraction of tissue (as it would be achieved by chemical synthesis of the already gathered tissue), there was no violation of human dignity with regards to the invention. As the women, after the one extraction of tissue, ceased to be involved in the matter, there could not be an infringement to their right of self-determination on this behalf. Finally, the patenting of genes as mere chemical substances, which can be used in the production of therapeutically useful proteins, does not constitute to patenting life. The opposition division however did not provide for an explanation as to why the patenting of genes amounts to the patenting of chemical substances, rather than patenting life, neither it did not consider the effect of the gene patents for third parties.[266] The opposition division concluded that morality exclusion was limited to a few extreme cases where it is probable that the public in general would regard the invention as "so abhorrent that the grant of patent rights would be inconceivable".[267] Only in situations where this is the case, an objection under Article 53 (a) could successfully be raised.

The Plant Genetic Systems/Glutamine Synthetase Inhibitors (PGS) case[268] is similar to that of the Howard Florey. The case involved genetically engineered plants (the actions within plant cells were controlled) and related methods. The Technical Board rejected the arguments presented by the opposition (Greenpeace), according to which the claimed invention was contrary to ordre public and morality as it would likely damage the environment and promote human dominion over natural world. Interestingly enough, the board did express that inventions, the use of which are likely to cause serious prejudice to the environment, are against ordre public and therefore to be excluded from patentability.

[266] A. McMahon,2019, p.9.
[267] Howard Florey/ Relaxin, (T 0272/95) at 549-550.
[268] Case: Plant cells, (T 0356/93).

The Technical Board concluded that: "Invention did not belong to that extreme category of inventions which could be regarded as so abhorrent to the vast majority of the public as to render the granting of a patent inconceivable, and which therefore were to be excluded from patentability under Article 53(a) EPC."[269] The board also asserted that the EPO cannot engage into an exercise of imagining risks that have not been proven regarding the claimed technology. As the EPO is not going to start speculating possible issues relating to morality and ordre public, without any relevant proof of such risk, it is up for a third party to show that.

The conclusion regarding Article 53 (a) EPC, in the cases of PSG and Howard Florey, was that the entire reason for the mentioned article and the only case in which it could (and should) be applied, is in case of inventions that are universally regarded as "abhorrent"[270]. Exclusions to patentability are to be interpreted narrowly, maximizing the scope of patentability, but it is noticeable that this approach is not reconcilable for example with inventions falling under the scope of Biotech Directive, patenting of human biological material, and the decision made in the Oncomouse case. [271]

4.3 The different approaches to the ordre public and morality exception and their applicability for AI inventions

In the cases Warf and Brüstle, the main purpose for the exclusion was to ensure human dignity and integrity along with the non-commercialization of the human body. This was achieved by determining whether there is a possibility that the invention offends the dignity or integrity of certain persons (which will be true if the invention includes the destruction of human embryos as demonstrated above). Also, as the nature of a patent is closely connected to commercial and industrial purposes, the purposes for research or scientific development cannot be separated from this nature and be protected by themselves.

The Oncomouse case can be useful for providing tools for the assessing of the usefulness of an invention to society and counterbalancing that with the ethical risks and possible negative

[269] Plant cells, (T 0356/93) at 361.
[270] Which is not per se a self-explanatory concept.
[271] J. Pila and P. Torremans, 2016. p.163.

consequences, by utilizing the neutral risk/benefit assessment. Whether an invention can be patented depends on the results of the carefully conducted weighing-up exercise. If the immoral aspects are outweighed by e.g., the usefulness of the invention, it can be patented. As it was described above, in this case the usefulness, in terms of furthering cancer research, outweighed the negative aspects of the invention, namely the suffering of mice and the possibility of environmental risks.

Finally, the cases of Howard Florey and PGS can give guidance for ensuring that patents are not granted for inventions that are regarded "outrageous" and likely to breach public peace, social order or conventionally accepted standards of European culture. This is achieved by determining the opinion and attitude of the public and the social and other effects of the applied invention.[272] However, the methods applied in Howard Florey/PGS have a rather unclear status because they are inconsistent with a) the Biotech Directive and b) EU principles regarding the reconciliation of competing rights and interests.[273]

It is indeed troubling that different approached and standards regarding morality have been adopted and applied differently and since certainty is a fundamental value with regards to law, the equivocality of morality standards is problematic.[274] In terms of attaching the aforementioned cases to other new technologies, in particular for the purpose of this thesis to AI, there are aspects that could in theory be separated from their biotech context in order to try and find the essence and applicable legal rules.

Firstly, defining what constitutes AI, similarly to as was done in the Brüstle case (defining embryo), for the purposes of uniform treatment of AI inventions within the European context would surely be meaningful. There are various ways of defining these technologies, as the discussion on some of the key properties of AI earlier on showed.[275] Also, when a patent applicant claims that the invention is not intended for commercial use, but merely to further research, conducting analysis or other such activity, it is regardless necessary to evaluate the

[272] J. Pila and P. Torremans, 2016. see figure 6.2 on page 164 on the assessment of the cases.
[273] J. Pila and P. Torremans, 2016, p.163.
[274] Y. Min,2012, p.4.
[275] However, as AI constitutes a variety of different techniques and technologies and the field is constantly evolving, caution must be taken when giving a definition.

morality of the invention on the basis of commercial or industrial exploitation, due to the nature of the patent system. The same goes for making sure that the claims of the applicants are not decisive in determining how the invention is performed, as the judgement in the WARF case shows, by not allowing immoral inventions to be granted patents due to clever patent application drafting, which can hide the underlying dangers relating to the immoral means of use. Also, when it seems appropriate, examiners, boards of appeal and courts should interpret expansively the rules refusing the granting of patents for immoral inventions as being contrary to fundamental rights such as human dignity and life, making sure *the ratio legis* of the rules building on fundamental rights is recognised and respected.

As the TBA pointed out in the Oncomouse case, Article 53 has to be assessed from the point of view of exploitation and publishing of the invention in the real world, and so the question is not directly on the morality of the patenting itself. In essence, one could say that morality determines patentability.[276] The weighting up of risks and benefits, an exercise that was concluded in the Oncomouse case, seems like a reasonable approach. In cases of questionable inventions, a substantial benefit should be asserted. From the Howard Florey case a strong requirement for the respecting of self-determination for people could be seen as a useful guideline, especially for inventions that would require the utilizing of something with a strongly intimate nature. Also, as the Technical Board recognised in the PGS case, EPO does not have the means to speculate the issues that are possible in terms of morality and ordre public, without some proof of such risk. This relates above all to the idea of introducing guidelines providing the EPO with tools to better ascertain morality of AI inventions.[277]

[276] See D. Thomas, 2006, p. 2.3.4.
[277] See chapter 5.1.3 on discussions relating to this.

5 Excluding unsustainable AI based on ordre public and morality

5.1 How to evaluate AI with potential ordre public and morality implications?

An invention utilizing AI for hiring people or predicting crime is a good example of an invention for which a patent could be applied and which could raise questions relating to social sustainability. The issues might arise with regards to these types of inventions due to their involvement of predictive analysis. Say, such an invention, used for picking suitable candidates to go further in the employment process, adopts biased information that favours male candidates.[278] Or an invention, used for finding similarities and patterns for the purposes of crime prevention, makes different assessments due to peoples' race or gender (learning the discriminative behaviour from the data that is derived from human decision making).[279] These problems seem to relate closely to the data used, from which the AI learns and which has to be free of biases, but making sure the AI itself builds its decision making on ethical factors is nevertheless important.

Another example, of unethical behaviour by AI that has been present, relates to things such as misinformation and fake news. Techniques referred to as "deep-fakes" have been surfacing in the public during recent years, referring to AI implementing technique that imposes video, image and audio onto others.[280] This creates possibilities for creating seemingly original media content, creating false impressions and opening possibilities for unethical uses. However, these technologies, alongside most AI technologies, have both acceptable and unacceptable means of use (such as in movies for entertainment purposes, or alternatively to manipulate people) and it is in fact entirely up for the user to decide on how to use them. The issues with deep-fakes and relating technologies might relate more closely to things such as copyright infringement of someone's picture or with regards to deceptive or insulting means of use from the perspective of criminal law. Regardless of how it seems at the moment, various patent law related issues are always possible with new technologies.[281]

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[278] E. Smith, 2019: https://blog.remesh.ai/top-11-a.i.-ethics-dilemmas-affecting-tech-right-now.
[279] J. Angwin et al., 2016: https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing.
[280] E. Smith, 2019: https://blog.remesh.ai/top-11-a.i.-ethics-dilemmas-affecting-tech-right-now.
[281] See A. Nordberg, 2018, p.54.

With regards to many inventions that are potential threats to human interaction, dignity or humanity in some sense, the question often lies in striking a balance between the freedom of choice of individuals and deciding to restrict technologies that could impose adverse effects.[282] Many of these choices fall outside the scope of the IP regime and, as it has been expressed earlier, it is up for governments to ban technologies that are inherently unethical.[283] AI, with its capabilities, has the possibilities to draw attention towards beneficial actions that foster human well-being, but it also has the power to go towards a harmful and detrimental way.[284] The mentioned concrete risks that AI can imply are directly connected to the values and risks introduced earlier at chapter 3.1. However, as they show, the problems are not typically straightforward and it is difficult to label AI application as simply ethical or unethical. Rather the solutions seem to be complex and require multiple aspects to be considered and balanced.[285] Also, it would likely cause the EPO or other patent offices and professionals' immense trouble to assess whether, and in which ways, could an AI invention be contrary to ordre public or morality.[286]

In this regard, the ethical compliance by design aspects, introduced in chapter 3.2, provide a good example on how to take social sustainability factors into consideration from the very beginning of the design phase of AI systems. This approach would provide for some clear lines for different stakeholders of AI research, development and business.[287] Guidance would make patent offices' examination, in terms of the ordre public and morality aspects, easier and more reliable and it would be less likely that immoral AI inventions would be granted patent rights. Similarly, as discussed before, inventions that would likely be contrary to the compliance rules and guidelines (e.g. for basing their decision making on unethical considerations) would unlikely be focused by companies in terms of R&D.[288]

[282] See AIHLEG, 2019, pp. 12-13.
[283] See at 2.3.4.
[284] J. Bossman, 2016: https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/.
[285] Which was the situation also in the Oncomes case that was discussed above.
[286] See E. Derclaye. 2009, p.3, in complex situations the EPO does not have the tools for deciding on ordre public and morality.
[287] See A. Walz and K. Firth-Butterfield, 2019, pp. 10-12.
[288] See chapter 2.3.4 on the justification of the ordre public and morality exclusion.

Many of the issues, risks and threats are likely to become apparent to the wider public at a later stage than in the designing phase of the AI systems[289], such as at the patent office by examiners or opposition.[290] The EPO is required to make a decision whether an invention is against ordre public or morality when it is invoked, and in complex cases it is argued that it does not possess the tools to make such an assessment.[291] Furthermore, it could be inappropriate to leave decisions such as this for the EPO[292], as it lacks the democracy of a legislative body. [293]

The aforementioned seems to imply that, as it is likely that AI will increasingly raise moral questions, the best solution could be to implement legal devices or guidelines to ensure that the development of AI is in accordance with core European values.[294] Whether or not patent law (especially its possibilities for exclusion) is seen as an efficient tool for promoting these values, it should in some manner be specifically sorted out with clear attachment to how the public generally wants the ethical concerns of AI to be dealt with.[295] The situation could lead, if necessary, to a similar situation as regards to biotech inventions, meaning the adopting of specified legislation to implement prevailing ethical concerns into law. Nonetheless, the rather unstable situation of having multiple different standards of morality to adhere randomly to, cannot be described as sustainable.[296]

According to the Guidelines for Examination of the EPO: Special attention must be paid to applications in which the invention has both an offensive and a non-offensive use, with the example of process for breaking up locked safes: the use of such an invention by a burglar certainly constitutes an offensive use, whereas if used by a locksmith for example in a case of emergency surely is not to be deemed as offensive.[297] The differentiation of the offensive and non-offensive use is particularly important for the assessment of AI inventions, since they often

[289] At least without a well-functioning ethical compliance by design framework.
[290] WIPO Magazine, Bioethics and Patent Law: The Case of the Oncomouse, (June 2006).
[291] E. Derclaye, 2009, p.3.
[292] At least without any specific enough guidance.
[293] E. Derclaye, 2009, p.3.
[294] See COM (2020) 65 final, pp.24-25, on discussion of an European governance structure that should "play a key role in facilitating the implementation of the legal framework, such as through issuing guidance, opinions and expertise."
[295] See A. Walz and K. Firth-Butterfield, 2019, p.13
[296] Y. Min, 2012, p.6.
[297] European Patent Office, Guidelines for Examination G-II, 4.1.2.

are of such nature that the separation between ethical and unethical use is particularly difficult.

5.2 What constitutes to the public standard of morality?

A rather overlooked aspect, regarding the applying of Article 53 of the EPC, relates to the question of what constitutes to the public standard of morality since the Article is built on the specific European standard of morality.[298] In the Guidelines for Examination, regarding the assessment for ordre public and morality exclusion, it is stated that: "A fair test to apply is to consider whether it is probable that the public in general would regard the invention as so abhorrent that the grant of patent rights would be inconceivable."[299] The approach of the EPO suggests that the standard for morality is built on aspects of legal, regulatory and socially sanctioned principles of conduct, which are judged by a majority of public on a standard of "abhorrence".[300] However, there has not been intentions by the EPO to actually figure out the opinion of public in general with certain invention or technology.[301] Since morality and intellectual property rights are very different by nature, to assess whether one should prevail for the expense of the other is as difficult a task as figuring out the opinion of the public in general.[302] Therefore the examiners' probable estimation of the public's view on the invention's "acceptability" is based on an intuitive assessment.[303] This can be criticised with various arguments.

When assessing whether the public in general has an opinion or has had the opportunity to make a moral assessment of an invention, a few things should first be considered. In order to be patented the subject matter of the invention needs to be novel and non-obvious, in other words the invention must be new and it must be a secret, and so it is questionable whether such an invention has fallen into the consciousness of the public.[304] For example, in the case of the Oncomouse, the European public arguably had no knowledge and therefore no opinion of the

[298] A. Warren-Jones,2006, p.1.
[299] See: Guidelines for Examination, Part G, 4.1, Matter contrary to ordre public or morality.
[300] A. Warren-Jones,2006, p.1.
[301] Ibid.
[302] D. Thomas, G.Richards, 2004, p.5.
[303] A. Warren-Jones, 2006, p.1.
[304] Ibid. This is the case especially with cutting edge technology, such as various biotech inventions of which the public might not in any case possess knowledge or interest of.

invention, which means that it did not have the possibility to form a view on the morality aspects.[305] Therefore, a problem seems to be that new technologies, or their new innovative developments, do not sufficiently fall within the publics' consciousness for a possibility to be morally and ethically assessed.

In addition, the appointment of a common European morality can hardly be tribute to the knowledge of one (or few) person(s) and should therefore be built up from external factors and information.[306] So, what information can be used in determining the public opinion, or can the public be surveyed to form its opinion? In the view of the Technical Board in the PGS[307] case, the public standard of morality is to be determined by the belief "being founded on the totality of accepted norms, which are deeply rooted in a particular culture", while it also concluded that opinion polls and surveys "do not necessarily reflect ordre public concerns or moral norms that are deeply rooted in European Culture".[308] The Technical Board did not agree with the opinions of the appellants in the case regarding the weight of opinion polls as evidence and continued by concluding that, if polls were to be relied on, they would have to be made *ad hoc* on the basis of specific questions relating to the particular subject matter claimed.[309]

Also, in the case of Howard Florey/Relaxin[310], the Opposition Division refused the request by the opponent to undertake a referendum with the purpose of ascertaining the opinion of the public relating to the technology at hand based on the argument that the EPO was not the right forum for deciding on fundamental ethical questions. However the Opposition Division also noted that if the opponents "felt that such a survey might assist their case, it was up to them to carry it out", which could be interpreted that the EPO was willing to accept public opinion as evidence in the matter, if such had been presented.[311]

The problem with surveys, opinion polls and other similar ways of assessing the view of the public is that they can be unreliable, easy to manipulate and the lack of objectivity could

[305] D. Thomas and G. Richards, 2004, p.6.
[306] See A. Warren-Jones,2006, p.1 and the sources mentioned therein.
[307] Plant cells, (T 0356/93).
[308] PGS T 0356/93, Reasons for the decision at 6 and 16.
[309] PGS T 0356/93, Reasons for the decision at 15.
[310] Howard Florey/Relaxin T 0272/95
[311] Y. Min, 2012, p. 5 and the sources mentioned therein.

negatively impact the patent system, were polls taken into widespread use.[312] Also, some argue that regulatory framework reflects the prevailing ethical values of the community.[313] This would mean that recurrent elements in regulatory norms could be interpreted as evidence of the acceptance or non-acceptance of a given technology.[314] However, the morality provisions have been a rather overlooked aspect in the patent system and AI specific regulation is scarce.[315] Evidence of the ethical values could be looked from other fields of law drawing parallels, where possible, to the common acceptability of a certain AI applications at hand.

If the problems relating to opinion polls, surveys and interpretation of regulatory framework seem insuperable, consultation with an expert group could strike as an alternative for figuring out the social acceptability of a given AI application at hand.[316] For example, the Commission Decision 2016/835, Article 2 states that: "The task of the European Group on Ethics in Science and New Technologies (EGE) shall be to advise the Commission on ethical questions relating to sciences and new technologies and the wider societal implications of advances in these fields, either at the request of the Commission or on request by its chair with the agreement of the Commission service".[317] The EGE is currently working on aspects relating to AI.[318] It is problematic however to argue that the view of such an expert panel is representative of the public and it would rather seem that the voice of the public is absent from the ethical decision making, which cannot be justified by any rational arguments.[319] Even though, the EGE or similar expert group cannot be deemed as representing the general public of the European population, it could in some cases function as a useful tool in helping point out current ethical issues and make technology specific guidance based on them. This is due to the aforementioned fact that the general public can rarely be said to have an informed opinion on cutting-edge technologies.

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[312] A. Warren-Jones, 2007, p.12.
[313] D. Thomas and G. Richards, 2004, p7.
[314] A. Nordberg, 2018, p.73.
[315] However different product safety and data protection regulations are applicable to AI in certain situations and could provide some guidance in this respect.
[316] A. Warren-Jones, 2006, p.2.
[317] (EU) 2016/835: https://eur-lex.europa.eu/legal.content/EN/TXT/HTML/?uri=CELEX:32016D0835&from=EN.
[318] https://ec.europa.eu/info/research-and-innovation/strategy/support-policy-making/scientific-support-eu-policies/european-group-ethics-science-and-new-technologies-ege_en.
[319] A. Warren-Jones, 2006, p.2.

The Opposition Division in the case of Howard Florey/Relaxin, was prepared to accept public opinion if it could be showed to reach an "overwhelming consensus".[320] Opinion polls can be a good way of getting to understand the view of the public in general.[321] For instance the EU has been using opinion polls for decades with Eurobarometer (since 1974), which is used to monitoring the evolution of public opinion and has helped in the preparation of different texts and decisions.[322] If polls are a legitimate tool in the formulation of European legislation, why could they not be used in the evaluation of general European public opinion?[323] It could even be argued that the EPO has to utilize (efficient and credible) opinion polls if it is to construct a European morality and apply it in the ordre public and morality assessment.[324] Even in situations where there is other relevant indicators of morality, there are no reasons to not utilize opinion polls to figure out the public morality.[325]

Still, as the EPO Guidelines describe, the ordre public and morality provision (Art. 53) is likely to be invoked only in rare and extreme cases[326] and as the scarce case law around the provision shows, as was pointed out in the Relaxin case, the exceptions are to be narrowly construed.[327] To say that patent law is not equipped with the capability to solve ethical dilemmas can seem insuperable for even philosophers, does seem rather convincing, and would explain the EPO's unwillingness to make these moral decisions.[328]

5.3 Methods for ascertaining morality

As the development of case law relating to the morality and ordre public exceptions has been inconsistent, it establishes incoherent and inconsistent "standards" of morality in the European patent system.[329] The first, "Unacceptability standard", bases the decision making to the assessment of whether the conduct, constituting the patent, is acceptable or unacceptable and

[320] A. Warren-Jones, 2006,p.2 and the sources referred therein.
[321] E.g. the SIENNA project conducts surveys regarding to the new technologies. see: https://www.sienna-project.eu/about-sienna/.
[322] See on the Eurobarometer: https://ec.europa.eu/commfrontoffice/publicopinion/index.cfm.
[323] D. Thomas and G.A. Richards, 2004, p.8.
[324] A. Warren-Jones, 2007, p.15.
[325] D. Thomas and G.A. Richards, 2004, p.8.
[326] Guidelines for Examination, Part G, 4.1: Matter contrary to ordre public or morality.
[327] Relaxin/ Howard Florey Institute (T0272/95)
[328] A. Nordberg, 2018, p.67.
[329] Y. Min, 2012, p.2.

can be linked to a so called "balancing exercise".[330] A fine example here is the case of the so-called "Upjohn mice"-case, which is quite similar to the Oncomouse, apart from the EPO arriving to a different outcome already on the initial application.[331] EPO conducted the balancing exercise and concluded that the benefit of the invention, which was to cure baldness and hair loss (of humans)[332], was outweighed by the suffering that was inflicted on the mice, which would lose their hair as a consequence of the gene introduced to them.[333] The invention, for which an application was submitted, was therefore deemed unacceptable as a result of weighing up of benefits of "curing" baldness and the moral issues caused by the suffering of the mice.[334] In other words, the fact that the mice were caused pain, could not be justified with curing of baldness, but the furthering of cancer research (the Oncomouse case) was deemed as an acceptable reason as it weights significantly more when conducting a balancing exercise.

Another standard is the so-called "Abhorrence standard", which, is generally focused on a question of whether the public in general would regard the invention as so abhorrent that the grant of patent rights would be inconceivable.[335] This standard, which is largely an intuitive one and often has no clear means of validation, can respectively be linked to the so called "rebuttable presumption" approach.[336] The rebuttable presumption basically means that there is a favourable presumption, for the granting of the patent for the invention applied, that can be rebutted only by presence of immoral aspects so significant that a favourable decision would be untenable.[337] The case that will be referred here regarding the abhorrence standard is that of the PGS, which has already been discussed.[338] Instead of the unacceptability standard, the Technical Board of Appeal (TBA) chose to utilize the abhorrence standard, which in this case meant that the invention could be immoral, and not patentable, only if it would be universally deemed as outrageous, which seems as quite a high requirement.[339] However, the TBA did refer to the unacceptability standard by concluding that as no sufficient evidence of actual

[330] A. Warren-Jones, 2007, p.5.
[331] Transgenic mice for the analysis of hair growth. European patent application no 89913146.0, The Upjohn Company of Michigan, filed on November 17, 1989. Refused on July 25, 1993 and deemed withdrawn.
[332] Which is described as a cosmetic goal above else.
[333] WIPO Magazine, Bioethics and Patent Law: The Case of the Oncomouse, (June 2006).
[334] Y. Min, 2012, p.3.
[335] A. Warren-Jones, 2006, p.1. The abhorrence standard follows the wording of the EPO Guidelines for Examination G II 4.. Also this has been referred to in the Howard Florey and PGS Cases.
[336] A. Warren-Jones, 2007, p.5.
[337] Y. Min,2012, p. 4.
[338] In the chapter 4.2 regarding previous cases invoking ordre public/morality excemptions.
[339] Y. Min,2012, p.3.

disadvantages was presented in the case, the assessment of morality could not be based on the balancing exercise of weighing up benefits and disadvantages.[340]

The mentioned standards also resemble some recognized legal standards. The unacceptability standard is similar to a decision reached through a "balance of probabilities" and the abhorrence standard would respectively be similar to the decisions that require to be displayed "beyond reasonable doubt".[341] This distinction makes clear that there is a distinctive difference in how standard of abhorrence requires much more "proof", in order to exempt an invention from patentability, than the unacceptability standard, which is built on the balancing exercise.

In addition to the inconsistent standards in assessing the level of morality required, for the invention to be patentable, there is also difference in approaches to assessing the view of the public regarding invention, technology or method at hand.[342] According to some scholars, there are two methods for assessing the view of the public in general for the purpose of the assessment of the ordre public and morality exception: the assessment utilizing "surveys and opinion polls" and the "current practise", which entails that if the procedure or technology of the invention has been adopted in the current practise, it refers to the general public accepting it.[343]

The "Current practise"-approach is a good approach with regards to technologies that present strong links to those technologies and developments that are currently in use and in the knowledge of the public and could be described as improvements[344] to the current state of the art.[345] The current practise approach was utilized both in the PGS case as well as in the Howard Florey/Relaxin case[346] by drawing implication of the acceptability of the inventions by the public on the basis that the procedure is already "accepted" in the current practises.[347] However, the TBA pointed out in the PGS case that the fact that the exploitation of a specific invention is permitted in one or more member states, does not imply that the invention complies with the

[340] Plant Genetic Systems (T356/93) Reasons for the decision, section 18.8. Also see: Y.Min,2012, p.3.
[341] A. Warren-Jones, 2007,p.5.
[342] See also in this regard, chapter 5.2.
[343] Y. Min, 2012, p. 5 and the sources mentioned therein. Also: A.Warren-Jones, 2007.
[344] Or something of a logical continuum to the prior art of a certain technology.
[345] A. Warren-Jones, 2006, p.2.
[346] Relaxin/ Howard Florey Institute (T0272/95) has been discussed in chapter 4.1.2,
[347] A. Warren-Jones, 2006, p.2.

requirements of Article 53 EPC.[348] This confirms the existing legal status, since the use of invention is not to be deemed immoral or against ordre public merely because it is prohibited by law or regulation in some or all of the contracting states[349], which would then imply that merely looking at current legislation is not sufficient.

Looking at laws and regulations that are common to most European countries is, according to the Opposition Division in the Oncomouse case, the best indicator as to what is to be considered right or wrong in the European society and as far as to those laws and regulations exist, there is no reasons nor is it appropriate to rely on other means, such as opinion polls, for the assessment of the morality.[350] Whether or not this is the best means for assessing morality, the regulations and laws prohibiting or permitting certain uses of AI could be less useful than one might think, especially since AI can be used and wielded in countless unpredictable purposes and because AI specific legislation is not a reality, at least yet. Therefore, the level of indication of acceptability of different applicable legislation for an AI application is not as strong as in terms of animal testing for medical purpose for which statutory laws, regulating the use of testing can be highly indicative and at best it shows whether or not the use of an invention is prohibited or not.[351] However as already mentioned, data protection regulation, product safety legislation and liability frameworks can work as indicators to some aspects of morality, not to mention these aspects being very harmonised within the EU, thus giving a good standard for the common European view on them.[352]

[348] See. PGS (T0356/93), at Reasons for the decision 7.
[349] See. the wording of Article 53 (a)EPC in chapter 2.3.3.
[350] D. Thomas and G.A. Richards, 2004, p.7. And the sources mentioned therein.
[351] D. Thomas and G.A. Richards, 2004, p.7
[352] AIHLEG: Ethics Guidelines for trustworthy AI, p.22.

6 How to ascertain morality at a case-by-case level to AI inventions?

6.1 Which methods to utilize for AI?

It is argued here that the interpretation of the ordre public and morality provision is also a question of how much weight the patent system is willing to put on the ethical and social sustainability matters and therefore a matter of whether such issues are marginalized (and left for other fields of law) or embraced in the patent system. The patent "universe" has been steadily growing, as the scope of patentable subject matter has been expanding and the scope of what is restricted from patentability has been continuously interpreted narrowly.[353] For example, European approach on biotechnological patents[354] emphasizes in principle the promotion of ethical issues, but in practice the provisions are often interpreted in a technical manner that limits their effect on refusing the patentability.[355] Sometimes analytically weak arguments have been accepted readily in order to adapt the patent system to changing technologies and, while it is good for the patent system to adapt, it should not happen in a manner that casts the broader public and ethical considerations aside in the expense of private purposes.[356] The purpose of the aforementioned is to point out that expanding the scope of patentability to new technologies and inventions, without closely considering the risks and the purposes of the patent system, can propose socially unsustainable developments. The question of which standards to adopt and method to utilize holds relevance in this manner in terms of how broad we want the scope of the morality exception to be.

With regards to the pre-existing standards, the unacceptability standard seems more compelling and reasonable. This is because it is less intuitive than the abhorrence standard and the outcomes, which are achieved by using the balancing exercise, can be better explained. It arguably also holds importance relating to the construction of the ordre public and morality provision in general. As described above, the standard of abhorrence sets the bar (the rebuttable

[353] P. Drahos,1999, p.2.
[354] See, the cases in chapter 4.2 and the 2.3.3 on Biotech directive.
[355] A. McMahon, 2019, p.8.
[356] P .Drahos. 1999, p.3. As an example of a situation in which the patent system has been adapted to suit the needs of the private sector is biotechnology, where the discovery/invention distinction has been a problem for the granting of patents, and was overcome by a so-called re-characterisation strategy. Also, the prohibition of patenting software has been effectively evaded.

presumption) to exempt from patentability higher[357] than the unacceptability standard, for which it is enough to show that the benefits of the invention are outweighed by the risks and negative effects. Some scholars argue that different standards are likely to be adopted with regards to different inventions.[358] This is not preferable for purposes of legal certainty and cohesive treatment of inventions.[359] If both standards are adopted and applied differently with different technologies legal certainty would require for a clear approach, explaining how they are to be applied in different circumstances.[360] It is ultimately a question of how broadly or narrowly the morality provision is wanted to be constructed.[361]

So what should the examiners, boards and courts look at, when assessing an AI invention, being forced to make an assessment regarding the opinion of the public in general? Utilizing both Opinion polls alongside with the current practice approach, which were discussed in the previous chapter, seem to form a comprehensive starting point for a method of assessment.[362] The current practice does in fact give a good indicator from the pre-existing state of what is "accepted" as practice in a given field of technology.[363] It might not always be sufficient to look at current practice though, as it might be outdated or continuously changing or in other ways fail to describe the views of the public in general.[364] Therefore opinion polls, if done well and presented in a "technology specific way", may well represent the public opinion accurately and be a useful tool for assessment.[365] Similarly the approach of utilizing polls for determining the opinion of the public should not serve as the sole basis for decision making due to the various risks the approach promotes.[366]

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[357] As described above in chapter 4.2.3, the abhorrence standard can be seen as similar to the "beyond reasonable doubt" standard, which is well-established in different fields of law.
[358] See. Y. Min,2012, p.4: In the case with biotech inventions the stricter abhorrence standards being adopted for humans and the unacceptability standard is more likely to be preferred for plants and animals.
[359] As described in the white paper on AI by the Commission, COM(2020) 65 final, p.3: "Building an ecosystem of trust is a policy objective in itself, and should give citizens the confidence to take up AI applications and give companies and public organisations the legal certainty to innovate using AI.".
[360] A. Warren-Jones, 2007, p.6.
[361] Y. Min, 2012, p.5.
[362] See A. Warren-Jones, 2006, p.12.
[363] Ibid. Also including the looking at prevailing laws and legislation as indicator of how the European public deems a certain technology.
[364] Ibid.
[365] Ibid.
[366] As discussed in chapter 4.2.3.

Both approaches propose difficulties.[367] It is argued here that the fact that something is according to the current practice does not necessarily render it ethical. Also, the difficulties of finding pre-existing, or conducting ad-hoc technology specific questionnaires, with regards to inventions proposing issues in terms of ordre public and morality, can prove to be quite problematic. It is also noteworthy that with all inventions and technologies, especially those that represent a new technology with no "previous version" available, there cannot be identified a current practice, nor existing indicators regarding the opinions of the public in general.[368] This brings us to the question of whether also alternative standards or guidelines for the assessment of morality and ordre public aspects should be adopted.

For patent offices, courts and other actors dealing with applications and complaints, to have non-exhaustive guidelines consisting of factors that are deemed as fundamental for ethical, trustworthy and socially sustainable AI, should be considered to amplify these elements in AI in practice and to assist in the ordre public and morality assessment.[369] This could be an useful addition to the aforementioned standards and methods that the EPO was suggested to further apply in its assessment regarding AI. The guidelines should be consistent with the ethical compliance by design aspects, if those were to be adopted, creating a system in which AI developers and the parties granting or challenging patents would be on the same page on the ethical requirements of the technologies and inventions.[370] Also, there seem to be no obstacles for patent offices to look at different compliance rules adopted for AI and make current practice implications from them, without such guidance being an integral part of the patent system.[371] Having clear and applicable guidance could also reduce the criticism of the EPO not being the right place in which morality can be assessed.[372]

The AIHLEG proposes the adoption of a "Trustworthy AI Assessment List", the purpose of which is to guide AI practitioners to achieve trustworthy AI.[373] The assessment list is not intended as evidence of (legal) compliance and it is primarily addressed towards developers

[367] See. Y. Min, 2012, p.6.
[368] A. Warren-Jones, 2006, p.2.
[369] See AIHLEG, 2019 p. 24.
[370] See IEEE, p.233 regarding various by design arguments.
[371] Similarly as according to the opposition division in the Oncomouse looking at laws and regulations that are common to most European countries will imply what is acceptable, why could not guidelines or compliance by design rules do the same, especially if they are adopted on an EU level for example.
[372] As it was established, patent rights always have moral implications to individuals.
[373] AIHLEG, 2019, p. 26.

and deployers of AI systems.[374] The pilot version of the assessment list introduced several sections relating to the "Requirements for Trustworthy AI", which is a tool for assessing compliance with the requirements of trustworthiness in AI and it introduces several questions to help the assessment with regards to factors of human agency and oversight; technical robustness and safety; privacy and data governance; transparency; diversity, non-discrimination and fairness; societal and environmental well-being and accountability.[375] The assessment list, is argued in the context of this thesis, constitutes a solid example of a tool regarding the overall assessment of an invention in terms of morality, social sustainability and the accordance with the public order.

6.2 An approach for the assessment of ordre public and morality provision with regards to AI inventions

After discussing the issues that AI is likely to propose in terms of social sustainability and the different aspects of article 53 EPC regarding the ordre public and morality exceptions to patentability, a suggestion as to how the EPO could approach AI inventions, for which the exception could be applied, is proposed.[376] This suggestion builds on the ideas of promoting social sustainability aspects discussed before:

1) The EPO should consider whether the technology and invention at hand is likely to seriously endanger any of the relevant ethical values relating to social sustainability such as democratic values or promote illegal behaviour such as manipulation. In doing this relevant guidelines, such as the "Trustworthy AI assessment list", would be useful as tools. Also, the ethical compliance by design aspects could provide with certain design rules to be taken into consideration in the assessment. As a problem which might arise is that the EPO is not equipped to make the assessment by itself, it could suspend proceedings and direct the invention to a relevant expert body, better equipped to

[374] See AIHLEG, 2019, pp. 26-31. The list is therefore directed above else towards different roles in commercial organizations.
[375] As the requirements for trustworthy AI, see also AIHLEG, 2019, p.2.
[376] This suggestion builds on somewhat similar lines as those presented by D. Thomas and G.A. Richards,2004, p.8.

making an assessment, and hold until it has ruled on the issue of morality and ordre public.[377]

2) If the first answer is positive, EPO should then consider whether there is, on the grounds of an objective assessment, a substantial benefit arising from the invention or another fundamental reason for granting the patent and no alternative ways of achieving the outcome.[378] It has to be taken into consideration that the purpose of a patent is to be a public reward for the contribution to scientific progress and therefore to the well-being of mankind.[379] This could be satisfied in the case of an invention that proposes certain risks[380], but also provides for substantial benefit on the other hand, such as furthering cancer treatments. What could constitute as a substantial benefit or other weighty reason could be linked to various standards, the most relevant of which in this context would be those promoting social sustainability goals.

3) After discovering that the AI invention at hand is in some sense unethical, but substantial benefits speak for the granting of a patent, the EPO should finally consider whether the public morality nevertheless dictates that the patent application should be rejected. Again, in this step the current practice approach along with opinion polls should be utilized in the assessment of the public morality in general.[381] In this third phase, the acceptability of the invention should be determined on the basis of the unacceptability standard, with the balancing exercise. Taking into consideration the different evidence of public morality (opinion polls and current practice), arguments based on AI-specific guidelines and the utilization of unacceptability standard, a well-balanced and justifiable explanation should be provided, as to why the invention at hand was deemed ethical or unethical and therefore patentable or not.

[377] E. Derclaye, 2009, p.4.
[378] Referring to the balancing exercise and the approach taken in the Oncomouse case introduced above (chapter 4.2.2), in which substantial medical benefits outweighed the immoral factors, mainly the suffering of mice.
[379] See chapter 4.1.
[380] Some requirements for AI should be seen as more weighty, such as explicability to take into consideration of an AI application that could due to lack of this, cause harm and the reason would be extremely difficult to unfold.
[381] E.g. European data protection regulation shows that the misuse of peoples' personal data is considered very unjustified in European context.

As a conclusion to the very complex question of how to assess the ordre public and morality on a case-by-case basis, it should be pointed out again that further clarification should be introduced even though the exception has not often been examined by the EPO or invoked by third parties. Similarly, patent system should closely consider, whether the marginalisation of the ethical issues of AI is justified and the prevailing trend of maximising the scope of patents is to be adopted with regards to AI inventions, regardless of whether social sustainability aspects are stressed or not. One should keep in mind as a principle with regards the EPO however, that it should be assigned with the duty to search for a common European morality code, but not to invent one.[382] It is not an easy task as it has been demonstrated multiple times, but it can hardly be described as an impossible one.[383]

[382] D. Thomas and G.A. Richards,2004, p.8 and the sources mentioned therein.
[383] Ibid.

7 Final considerations

7.1 Adding ethical and sustainable values into the patent system - risks and benefits

What are the benefits of adding social sustainability considerations to patent law and more specifically to the assessment of ordre public and morality provision with regards to AI inventions?[384] Respectively, what could be the possible downfalls in dealing with the issue by means of patent law? As this is a fresh perspective, arguments supporting the view of taking the social sustainability aspects as a part of the assessment of AI inventions have to be searched elsewhere and applied where suitable. Therefore, many of the arguments and examples used in this context have been derived from writings dealing primarily with environmental law and environmental policy, as well the ordre public and morality arguments being in many occasions taken from the field of biotechnology patenting, due to the lack of case law as well as legal writing. The drawing of parallels from these aspects to social sustainability aspects with regards to AI can be argued to be somewhat functioning, as long as they can be reasonably applied to this different context.

AI has not been under much attention in the European patent community, until recent years that is. So far the discussion of the patent community has concentrated on different technical issues that AI could impose for patenting.[385] Especially the point of view of ethical and social issues that AI might propose and the possibility to exclude some immoral applications from patentability has been widely disregarded. However, as the ethical aspects of AI and the "fostering" of trustworthy AI has been under much discussion in the European Union, and even in some extent within the EPO[386], it is not far-fetched to predict that this discussion will reach the perspectives of denying immoral[387] AI inventions patent rights.

[384] That is not to say that similar considerations could not be taken more widely into consideration within the patent system as a whole or with regards to other technologies, as it was taken into consideration with gene-editing technologies for example.
[385] See e.g:P. Blok The inventor's new tool: artificial intelligence - how does it fit in the European patent system?, EIPR 39(2), 2017.
[386] See chapter 2.2 and 3.1 on European approaches to AI and ethics.
[387] Or socially unsustainable, as this thesis argues.

A system in which certain socially unsustainable inventions are not granted patent rights on the basis of them being contrary to ordre public or morality, is referring to a "negative system" and Article 53 EPC introduces such a system, meaning that if an invention is not in accordance with what morality dictates or it is against public order, it shall not be granted a patent right.[388] The simplest argument for the aforementioned negative system is, that above all, it is an ethical approach.[389] The simplest argument against this on the other hand is the previously mentioned, that patent law should not be making ethical conclusions.[390]

If the patent system would implement stronger requirement for inventions to fit in with, for example the criterion of general well-being[391], there would be various inventions and innovations that should not be protected[392] and naturally inventions deemed to be contrary to ordre public and morality would certainly fall within this category.[393] However, as the rights for private property and rights to benefit from one's intellectual creations are acknowledged as basic rights that apply in case of a patent, the ordre public and morality provision is a limitation to these rights[394] and therefore such a wide well-being approach could hardly be adopted. This is to say that when considering a system that should take social factors more dominantly into account, caution must be taken. Nevertheless, to refuse patenting of inventions that seriously prejudice or harm social sustainability, seems above all ethical and hardly contrary or threatening to other basic fundamental rights.

Additionally, strict requirements could arguably further ethical and sustainable innovation in the fields of technology where the system is adopted. In some circumstances, requiring (or incentivizing) compliance with requirements of socially sustainable, ethical and trustworthy AI would incentivize companies to develop innovative technologies to meet the high standard of compliance.[395] The ordre public morality exclusion can therefore be considered to have an important role in the patent system as refusal to grant a patent for certain unethical inventions reduces the incentives for research and development in what are deemed as unethical

[388] E. Derclaye, 2009, p.2.
[389] Ibid, p.3.
[390] See chapter 2.3.4
[391] See chapter 2.3.4 the arguments of patent being a contribution to scientific progress and therefore to the well-being of the mankind.
[392] Regardless that they would fulfill the other requirements of patentability.
[393] E. Derclaye and T. Taylor, 2015, p.11.
[394] A. Nordberg, 2018, p.67.
[395] A. Walz and K. Firth-Butterfield, 2019, p. 12.

inventions.[396] Therefore its purpose can be to prevent researchers and investors from investing these inventions, technologies and research as they face the risk of not getting awarded for their efforts.[397]

Some argue that if certain unethical inventions would become prohibited, they would, instead of becoming monopolies for some specific parties, fall into the public domain.[398] This would then lead to these inventions becoming more accessible and diffused than the case would be if they were granted patent rights. However, people would likely, instead of inventing unethical and unsustainable inventions, focus on complying with the ethical requirements and sustainability goals in order to get the protection of patent, which is what makes financial gains possible with the invention.[399] This related directly to the risk of not getting awarded from ones efforts.

7.2 Concluding remarks

It seems to be agreed upon that AI proposes certain risks, some of which can be identified as risks relating to the concept of social sustainability. These risks include but are in no way limited to manipulation, transparency, restrictions to certain democratic values and different forms of illegal behaviour. Various issues relating to these risks need to be recognised, dealt with and best practises promoted for the potential of AI to spread into societies as socially sustainably as possible. As demonstrated earlier, especially within the EU, the relevance of fundamental values, rights and freedoms are stressed for the requirements of "trustworthy AI" to be reached.[400] Within the EPO, these aspects are not recognised as promptly, but discussions around other questions relating to the patentability issues around AI are present. This led us to have a closer look at what tools could the patent system provide in minimizing the promotion socially unsustainable AI inventions.

[396] A. Nordberg, 2018, p.67.
[397] E. Derclaye, 2009, p.3.
[398] Ibid.
[399] Ibid.
[400] See AIHLEG, 2019, p.2: The three components of Trustworthy; AI must be lawful, ethical and robust both from technical and social perspectives.

The European Patent Convention introduces the ordre public and morality exception to patentability, which implies that even after patent applicants have established the basic requirements for patentability[401], they still need to pass the requirement of morality. The fact that a patent system introduces an ordre public and morality-based exclusion is indeed justified and it has been argued in the course of this thesis that it would be mistaken to claim that the patent system is neutral and would not make ethical evaluations. Also, it was argued that patent law can potentially have a large impact on aligning the focus and aim of science and technology with values such as ethics, social sustainability and human well-being. However, as the right granted by a patent is by its nature negative, patent system is by no means the only tool or mean to deal with AI issues relating to social sustainability. Still, it was argued that patent office's estimation of a technology is a wider implication for acceptability of the technology in general. Also, the opinion of the patent office is important since often many of these issues surface once the inventions or technologies arrive in patent offices.

Previous case law, relating to the interpretation of the ordre public and morality requirement, sets inconsistent standards as to how the provision should be interpreted. From the discussed approaches the unacceptability standard with its respective method of assessment, the balancing exercise, were argued to provide the more justifiable outcomes, as it gives more weight to actual disadvantages of unethical inventions in the assessment. Also, to the question of what constitutes to the public standard of morality in general, two possible assessments were discussed: the utilizing of surveys and opinion polls as well as the current practise approach. With regards to these, it was argued that the strict attitudes towards opinion polls should also be reconsidered in the assessing of the public opinion, as they are used for providing valuable information of the public opinion in many fields, including in the law-making process. Therefore, there was argued to be no actual barriers for implementing opinion polls along with current practise to construct the most accurate implications of the public standard of morality.

The scope of Article 53, and the exclusion by means of ordre public and morality provision, is not proposed in the scope of this thesis to be "widened" or the "threshold" for an immoral invention to be set lower per se.[402] The most relevant takeaway in this context is to point out

[401] Invention is new, inventive and susceptible for industrial application.
[402] In any case, finding a universal "threshold" for when an invention should be denied a patent is quite impossible to set.

the interconnectedness of various factors that need to be considered in assessing an invention and the importance of recognising which values are seen as important in the European context, to the extent that they could in certain circumstances mean that patent cannot be granted. Recently, the relevance for social and ethical factors has been visible in the European context towards AI, which could entail that certain AI inventions, which would seriously harm these values from the perspective of the ordre public and morality, could ultimately be exempted from patentability.

Also, it is argued that without appropriate and relevant guidance of what makes an AI invention unethical and socially unsustainable, or the possibility to take actual evidence of opinion of the public in general into account when constructing the public standard of morality, the "appropriate" assessment of inventions, especially in the light of social sustainability factors, will be difficult to make. The differentiation of the offensive and non-offensive use is particularly important for the assessment of AI inventions since the differentiation between the two can be particularly difficult and fine lined. The approach that was proposed in chapter 6.2 is meant as an example of a consideration as to how AI inventions, with possibly risky means of use, could be assessed in the EPO. After all it was expressed that when invoked the EPO must make the assessment regarding the ordre public and morality of an invention.

The ethical compliance by design aspects, even though they still propose shortcomings and difficulties, seem as a good way of promoting certain moral and ethical approaches that AI applications are wanted to align with. These aspects are also good for demonstrating the different issues that the implementing of ethical values to AI is likely to cause. Another argument that was presented is that similarly as biotech inventions cannot constitute cloning of humans, modifying their germ line genetic identity and such[403], the requirement for AI adhering to certain fundamental design philosophy rules could ultimately be implemented. This could then lead to patent office's being better equipped to assess the AI in terms of ordre public and morality.

A few concluding remarks as to the question of should we adopt the approach in which social sustainability is to be taken into consideration with regards to assessing the patentability of AI

[403] See chapter 2.3.3 on the ordre public morality exception in the Biotech Directive.

inventions. The main reasons relates to the fact that the approach is ethical, which seems to be a requirement that has become increasingly popular recently, especially with regards to AI. Secondly, the strict requirements could further ethical innovation in the fields of technology where such a system is adopted. Finally,the incentivizing effect of the patent system should not be underestimated, meaning that if inventors and companies would face the risk of not getting awarded for their AI research and development, they would focus on building AI that is ethical and socially sustainable.