Liability issues with Artificial Intelligence in the national and international context

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The pro gradu -thesis discusses the liability issues regarding Artificial Intelligence (**AI**) applications, especially liability of robots and other autonomous machines, and it provides an answer to the question "Who is liable when AI makes a mistake?" This problem is looked first from the national and more individual perspective and then from an international perspective regarding the state's responsibility and jurisdiction.

The main issue can is that if, for example, a self-driving car collides with another vehicle, who then can be held liable as instead of a human, the car was driven by an algorithm. As there is no human driver, the responsible party needs to be found somewhere else, and it could be the owner or the manufacturer of the car, the software designer or at some point maybe even the AI itself. Also, no one can be blamed without reasons or applicable law, so there is a need for suitable reasoning to hold the party liable, and the legislations need to be updated to recognise the liable party regarding the new technology. These same aspects are also examined by the point of view of international law and treaties, especially regarding state jurisdiction and responsibility.

The research method of this study is a qualitative and a bit legal dogmatic method. My primary sources are different articles and reports on AI liability and various international books from important international law authors as well as publications from international organisations. Also, different national and international guidelines and legislation have an integral part in regulating AI, and therefore they are also utilised and analysed.

The findings of this research are that there is not just one and simple answer to the questions about the liable party, and the liable person depends greatly on the situation. The manufacturer could often be held strictly liable for any damage caused by the AI product. In addition, the owner of the product could be held liable in the same way as the owner of the animal and in the future robots could get personhood similar to the personhood of the companies, which would make the robot liable for itself. However, the legislation in this area is a bit behind from the technological development internationally and nationally. That means that the law needs to catch up with the technical development so victims can get compensated by the right liable party.

Keywords:

International Law, tort law, artificial intelligence, robots, liability, state responsibility

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Tutkielma käsittelee tekoälyä koskevia vastuukysymyksiä, liittyen erityisesti robotteihin ja muihin autonomisiin koneisiin. Tutkielma myös pyrkii vastaamaan kysymykseen ”Kuka on vastuussa, kun tekoäly tekee virheen?” Tätä kysymystä ja koko vastuuongelmaa tarkastellaan kansallisesta ja yksilöllisestä näkökulmasta sekä kansainvälisestä näkökulmasta.

Pääkysymys on, että jos esimerkiksi itse ajava auto törmää toiseen ajoneuvoon, kuka on vastuussa, koska ihmisen sijaan algoritmi ajoi autoa. Koska kuljettajaa ei ole, joku muu on vastuussa oleva henkilö, joka voi olla auton omistaja tai valmistaja, ohjelmistosuunnittelija tai jopa tekoäly itse. Ketään myöskään ei voida syyttää ilman aihetta tai sovellettavaa lakia, joten vastuunalaisen henkilön löytämiseksi on oltava asianmukaiset perustelut. Myös lakien täytyy olla ajan tasalla koskien uutta teknologiaa ja siihen liittyviä vastuukysymyksiä. Näitä samoja asioita tarkastellaan myös kansainvälisen oikeuden ja sopimusten näkökulmasta, erityisesti valtioiden lainkäyttövallan ja vastuun osalta.

Tutkielman metodi on laadullinen sekä osittain myös oikeusdogmaattinen. Ensisijaisina lähteinä ovat erilaiset artikkelit ja raportit tekoälyn vastuusta, kansainvälisen oikeuden kirjoitukset tärkeiltä kansainvälisen oikeuden kirjoittajilta sekä kansainvälisten järjestöjen julkaisut. Eri kansallisilla ja kansainvälisillä ohjeistuksilla ja lainsäädännöllä on myös olennainen osa tekoälyn sääntelyssä, ja siksi tutkielma tutkii myös niitä.

Tutkielman johtopäätöksenä on, että vastuunalaista henkilöä koskeviin kysymyksiin ei ole vain yhtä vastausta, ja tilanteesta riippuu, kuka on vastuussa. Valmistaja on usein ankarasti vastuussa robotin aiheuttamista vahingoista. Lisäksi tuotteen omistaja voi olla mahdollista saattaa vastuuseen kuten eläimen omistaja ja tulevaisuudessa robotit voisivat saada oikeushenkilön kaltaisen henkilöllisyyden, jolloin robotti voisi olla itse vastuussa. Lainsäädäntö on kuitenkin jäljessä tekniikan kehityksestä niin kansainvälisesti kuin kansallisesti tekoälyn suhteen. Lain tulisi pysyä tekniikan kehityksen mukana, jotta vastuussa oleva henkilö voidaan löytää ja vahingonkärsijä saa korvauksensa.

Asiasanat:

Kansainvälinen oikeus, vahingonkorvausoikeus, tekoäly, robotit, vastuu, valtion vastuu

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ABBREVIATIONS

AI	Artificial Intelligence
AV	Autonomous Vehicle
Commission	The European Commission
EU	European Union
Fifth Report	Report from the Commission on the Application of the Council Directive on the approximation of the laws, regulations, and administrative provisions of the Member States concerning liability for defective products (85/374/EEC)
GM	General Motors
ILC	The International Law Commission
IoT	Internet of Things
ITU	the International Telecommunication Union
NHTSA	The National Highway Transportation and Safety Administration
OECD	The Organisation for Economic Co-operation and Development
PETL	Principles of European Tort Law
Recommendation	The OECD Council Recommendation on Artificial Intelligence
UN	United Nations
US	The United States of America
WP.29	The World Forum for Harmonization of Vehicle Regulations

1 INTRODUCTION

1.1 *Background*

1.1.1 Study context

The name "Artificial Intelligence" (**AI**) could probably bring things like "Terminator" and "Skynet" from the movie series Terminator, "Hal" from the movie 2001: A Space Odyssey, or even "KITT" from the series "Knight Rider" to people's mind. Things that are just science fiction and nothing to do with real-life or things that exist only in our imagination and in television/videogames. However, as one can see when just looking around, AI is not just science fiction anymore. From industrial robots to videogames and electric kettles, AI is almost everywhere and in everything, so even though the household robots are not terminators and Siri is not KITT, we use AI nearly every day. And as it has been with all the new inventions (cars, computers, bitcoins), there needs to be legislation for those, and lawmakers need to implement new laws and regulations to regulate the innovations. One crucial aspect to consider is the tort law aspect, in other words, who is liable to compensate for the damage and for what reason. That is also the case with AI as there could be multiple responsible parties, and it is even more important with the self-learning applications like a self-driving car. '

There is no one-size-fits-all approach to addressing liability and regulatory issues associated with the new growing technology. The solution is to have the correct balance between encouraging innovation and entrepreneurship and also on addressing real safety and privacy concerns.[1] As new technologies, among other things self-driving cars, drones, augmented and virtual reality as well as the internet of things (**IoT**)[2], get more and more popular, rules and laws governing the new technology need to keep up. As the U.S. Chamber Institute for Legal Reform stated in their report:

> "[a]s products become more capable of learning, making decisions on their own, and developing their own "personalities," will existing legal principles prove sufficient to determine liability for

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[1] Silverman – Wilson – Goggans 2018, p. 6.

[2] OECD 2016, p. 80. "IoT comprises devices and objects whose state can be altered via Internet, with or without the active involvement of individuals. The term goes beyond devices traditionally connected to the Internet, like laptops and smartphones, by including all kinds of objects and sensors that permeate the public space, the workplaces and home --."

injuries or resolve disputes? When such cases arise, plaintiffs' lawyers will look at everyone involved, including the inventor of the AI product, its manufacturer, and its owner."[3]

Why is it so important to give some thought for the liability of AI-systems? There are many answers to that, but one crucial part, which concerns everyone, is to know the party from whom one can claim compensation for the damages. Be it privately owned robot destroying property or authorities' AI-system giving the wrong answer or decision which causes harm. Now and especially in the future, the liable party in AI-related accidents is not so clear anymore, which means that the answer to the question "who is liable, if X makes a mistake" is not so clear anymore. The question about liability is also considered by the Chancellor of Justice of Finland, who is trying to find the answer to this question, which he says is one of the critical legal ethical issues now in Finland as well as internationally.[4] Furthermore, according to the European Parliament's "*Report on the safety and liability implications of Artificial Intelligence, the Internet of Things and robotics*", it is essential that victims of AI-accidents have the same level of protection compared to similar other products and services. Otherwise, the societal acceptance of these new technologies could be reduced.[5]

Woodrow Barfield, professor emeritus from the University of Washington, states in his article that by using machine learning[6] techniques, robots can learn tasks that are beyond the capabilities of, among other things, industrial robots that operate with a static set of instructions. In addition to these robots, many machine learning approaches use algorithms that let the software learn by itself, to perform tasks like speech and image recognition. As, for example, the algorithms control a robot by directing its actions, algorithms could be a contributing factor to injuries or property damage.[7]

What comes to AI liability, the courts should, according to Barfield, focus on their decisions, which involve determining liability, more on the machine learning software and algorithms

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[3] Silverman – Wilson – Goggans 2018, p. 12.

[4] Helsingin Sanomat / Oikeuskansleri Pöysti kiirehtii pelisääntöjä tekoälyn käyttöön: "Kenen on vastuu, jos kone tekee virheen?". The Finnish Counsellor of Justice wondered for example that if machine makes mistake in medical examination, who has the liability: doctor, software maker or the instructor of the machine.

[5] European Commission 2020, p. 13. More of this report will be discussed on the sub-subsection 3.2.2.

[6] Systems or machines that learn by their own and improve their performance in a given task from examples and previous examples. See more in sub-subsection 1.1.2.

[7] Barfield 2018, p. 194.

controlling a robot. When robots learn to solve problems with solutions entirely unknown for a human operator and at the same time increase their independence in decision making and mobility, they gain skills and abilities that could lead to entirely unpredictable actions. So if this would be the situation, who has the liability if or when damages to property or people take place, especially if any human was not aware of the robot's activities or did not know of the workings of the algorithms controlling the robot's behaviour?[8]

Globally the liability issue with AI might not be so huge at this moment, but AI is already almost everywhere[9] , and for example, more and more cars are using or soon using AI to drive itself. Also, according to Tractica, the worldwide revenue of AI software will grow from $1,4 billion in 2016 to almost $60 billion by 2025.[10] These numbers show that besides AI being a significant and profitable market, in a few years the amount of AI products will grow significantly and when there are more AI products, the probability of problems and liability issues will also grow up. The consultant firm PwC has also reported that AI will have an immense impact on the following industries: healthcare; automotive; financial services; retail and consumer; technology, communications and, entertainment; manufacturing; energy; and transport and logistics.[11] All of these are that kind of industries where one would not want any accidents and errors to happen (with the AI), even though it is inevitable. So when the accident does occur, in addition, to get the answer to the question "why this happened?", people also want the answer to the question "who is liable for this?".

Finally, why the issue about the liable party is essential here, is because often AI products are integrated into intricate IoT-environments where many different connected devices and services are interacting together. What this means is that the liable person may be hard to identify when there are many digital components combined in one intricate ecosystem, and many actors can be involved. Hence because of this complexity, victims may find it quite challenging to identify

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[8] Barfield 2018, p. 194.

[9] For example we have AI helpers in our smartphones, we use streaming services, which utilize AI in giving recommendations to us, we use robots to vacuum our houses and cut the crass and factories use robots to make cars and other commodities.

[10] See: https://tractica.omdia.com/newsroom/press-releases/artificial-intelligence-software-revenue-to-reach-59-8-billion-worldwide-by-2025/.

[11] See: https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html#explorer.

the liable person and prove all necessary conditions for a successful claim, as required under national law. Besides, products and services, which rely on AI, will also interact with traditional technologies and that leads to more complexity in terms of liability, as is the case with cars, as autonomous vehicles will share the road with regular cars for some time. There will be similar complexity in some service sectors like healthcare, where automated AI systems will support humans in making decisions.[12]

1.1.2 Defining Artificial Intelligence

Even though in this thesis I'm mainly focusing on autonomous products and robots, it is good to know what AI is, how it is defined and what kind of forms of AI there are. We watch series from "Netflix", listen to music from "Spotify" and clean our houses with "Roomba". These are all modern things using or being some form of AI. Things like Netflix and Spotify use algorithms to get to know their user for giving better entertainment experience by suggesting series[13] and music[14], which best corresponds to the user's likings. But what AI really is? In fact, "Artificial Intelligence" is an umbrella term for different kinds of products, even though people generally use that term to define and mean all the things which are intelligent machines. So, all in all, it is quite hard to give a definite answer about what is AI, and that would require its own thesis.

Artificial Intelligence means many different things, and it has been defined in numerous ways. One definition was given by John McCarthy, who was one of the pioneers of AI. His definition

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[12] European Commission 2020, p. 14.

[13] According to Netflix website https://help.netflix.com/en/node/100639 their service tries to estimate the likelihood the person will watch particular title. They use factors such as viewing history, ratings, other members with similar tastes and preferences and information about the titles. This is to help subscribers to find a show or movie to enjoy with minimal effort.

[14] Marr 2019, pp. 173-175: Spotify uses machine learning powered technology, which is used in highly popular "Discover Weekly" playlists. They are made AI made playlist, where AI makes new playlist every week about new music which it thinks the user likes, based on the user listening habits. This is done by process called collaborative filtering. This is done for example that person A listens lots of artists X and Y. Another person B listens lots of artists W and Y. By this data the algorithm deduces that person A then may then enjoy artist W and B may enjoy listening artist X. Of course in reality this is much more complicated system, because Spotify has tens of millions of users who listen many different artists and that why AI is made for this job. The recommendation system uses also audio analysis and natural language processing when determining most suitable songs for the user. This includes inter alia breaking down every song in smaller parts like instruments used, tempo and beat to determine even better the user's music taste to people who listens to music with same kind of tempo, instruments and beat.

for the AI was "*The goal of AI is to develop machines that behave as though they were intelligent*".[15] Other definitions given for an AI are, inter alia, Elaine Rich's description for AI according to which it is the study of how to make computers do things at which, at the moment, people are better. Encyclopaedia Britannica's definition is as follows: "*AI is the ability of digital computers or computer controlled robots to solve problems that are normally associated with the higher intellectual processing capabilities of humans ...*"[16]. Also, the Organisation for Economic Co-operation and Development (**OECD**) has defined AI and according to them, "*AI is defined as the ability of machines and systems to acquire and apply knowledge and to carry out intelligent behaviour. This means performing a broad variety of cognitive tasks, e.g. sensing, processing oral language, reasoning, learning, making decisions and demonstrating an ability to move and manipulate objects accordingly. Intelligent systems use a combination of big data analytics, cloud computing, machine-to-machine communication and the [IoT] to operate and learn*".[17]

Although they all define AI in some way, they have some flaws in them, which does not make them suitable definitions for AI on their own.[18] After these definitions, it is easy to see that AI cannot be easily explained or defined, and it is not easy to answer the question "what is Artificial Intelligence?". Therefore, as AI is more like an umbrella term and it consists of several sub-fields, even though in everyday language it is as "default" word for all AI products, I listed a few different categories/subfields of AI and their definitions:

Deep learning = In deep learning, lots of data is analysed, and the algorithm will perform the task repeatedly, each time twisting and editing the job a little to improve the outcome. That means that the increased computing power of modern computers has allowed researchers to increase the complexity of a mathematical model to reach levels that are quantitatively and qualitatively different from before.[19]

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[15] Ertel 2017, p. 1.

[16] Ertel 2017, p. 2.

[17] OECD 2016, p. 86.

[18] Ertel 2017. See author's arguments for the weaknesses of the definitions in question on pages 1-3. For example by the definition in the Encyclopaedia Britannica, AI would be anything which can memorize long texts or make complicated calculations, so any given computer.

[19] Intellipaat/ What is Artificial Intelligence? and Elements of AI.

Machine learning = Systems or machines that learn on their own and improve their performance in a given task from examples. Machine learning can be divided into its own three subcategories. First is *supervised learning* in which input is given, and the mission is to predict the correct output or label. For example, there is a picture of a traffic sign, and the machine needs to predict which traffic sign it is. Second is *unsupervised learning,* where the task is to discover the structure of the data. The third category is *reinforcement learning*, which is usually used in situations where, for example, a self-driving car must operate in an environment and where feedback about good or bad choices is not available immediately.[20]

Robotics = Robotics is basically building and programming robots so that they can operate in complex, real-world scenarios. Robotics is kind of the ultimate challenge of AI because it requires a combination of many areas of AI. These areas are, for example, computer vision (it allows computers to see, recognise, and process images, like human vision does, and then it provides an appropriate output) and natural language processing (develops approaches that help us communicate with machines using natural human languages).[21]

That was just a shortlist of different AI definitions and subfields for an example. In addition to those, there are many other definitions and subfields for AI. Lastly, I will briefly explain a few AI applications to give some background where AI has been used. In addition to explaining different forms, I will also mention which of those subfields mentioned above effects on the application in question and in the end I provide some potential situations in which the application could raise liability issues.

The self-driving car is probably one of the most known AI application, and self-driving cars are quite often referred to in media[22] as different technology companies try to make their own self-driving cars, although self-driving cars have sometimes had slightly negative news around them.[23] However, how those cars work is probably not as known thing as the self-driving car

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[20] Intellipaat/ What is Artificial Intelligence? and Elements of AI.

[21] Intellipaat/ What is Artificial Intelligence? and Elements of AI.

[22] For example about Tesla see https://fortune.com/2019/11/20/tesla-full-self-driving-car-tsla-stock/ and for Alphabet https://www.cnbc.com/2019/10/23/alphabet-exec-admits-google-overhyped-self-driving-cars.html.

[23] The Verge / The world's first robot car death was the result of human error — and it can happen again: Uber's car crashed and killed 49-year-old woman in world's first death by self-driving car, although it seems to have been result of human error.

itself. Basically, AI is used to make decisions based on the road conditions around the vehicle, like the direction where the vehicle is going, the planned destination and the behaviour of the other traffic nearby. Data from the camera is then processed using computer vision to allow the car to understand what it is "seeing" and to react accordingly. This all functions on three different levels; internal, global and local.[24]

In the internal level, the information is gathered and processed internally by the car. In the global level, information is collected and shared between several vehicles. In the local level information is collected by temporary networks of self-driving vehicles which are close to each other. Also, the level of the autonomous is divided into five different levels which portray how autonomous the vehicle is, and here level five means full autonomous. For example, in 2019 the autonomous level Tesla had was level 2, meaning it had autopilot and it could change lanes, park itself and match speeds to traffic conditions, but the driver had to be ready all the time to take charge in any moment.[25]

Medical institutions also use AI to help doctors in treating patients. For example, a Chinese company called "Infervision" has developed technology similar to Google's and Facebook technology that can detect cancers using computer vision, which understands and interprets visual data. So with deep learning, it interprets data from X-rays and other medical data and recognises shapes in the body, which could be cancers. The closest popular product acting this way is Google's image search work.[26] Uses for AI do not, however, end here, because AI can be used and is currently used in many companies to do different things. Unilever uses AI, more precisely machine learning, computer vision and, natural language processing, for recruiting. By this, they can reduce the amount from 250.000 applicants to less than 4.000 applicants by just AI-powered hiring, and in this way, they save about 70.000 hours of working time.[27]

The food and beverage companies utilise AI nowadays as well in their business operations. McDonald's automates its processes by self-service kiosks, which automatically can promote

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[24] Marr 2019, pp. 312.

[25] Marr 2019, pp. 312-313.

[26] Marr 2019, pp. 239-240.

[27] Marr 2019, pp. 130-132.

different products depending, for example, on the local ordering trends[28] and Domino's uses machine learning and computer vision in their system called "Pizza Checker". The AI-system photographs pizzas to analyse their quality by checking that it is really the pizza the customer ordered and that the crust is baked correctly. Then, it sends that photo to the customer to tell the pizza is ready or that it had to be remade because of quality issues. Eventually, this should lead to fewer pizzas to be rejected by the customers because their quality expectations are not met.[29]

Here we can see that AI used in many different things from ordering food to saving people from cancers. Uses for AI are limitless, and probably no one knows what applications will be coming in the future. But just like with almost any product, also products containing AI can be used for malicious purposes or they just malfunction and someone or something gets hurt. For example, in such a harmless thing like Domino's "Pizza Checker" the AI could make a mistake, and the customer gets the wrong pizza after all. Then he could demand a new pizza or refund, which has additional costs for the company, primarily if the pizza has already delivered. The situation is even worse if Infervision's cancer spotting system makes an error, and it does not detect cancer. If the diagnose is done based only on this, and then the patient dies for cancer, someone needs to take responsibility. Here stakes are higher, but the result is mainly the same as with Pizza Checker. Something went wrong, results were not what they supposed to be, and someone needs to take responsibility.

1.2 *Methods and research*

Alvesalo and Ervasti have divided the purpose of the research in four different categories: exploratory, explanatory, descriptive and predictive.[30] The research in my thesis is mainly the first two, exploratory and explanatory. The explanatory research is pictured that it answers the questions "how, what kind of" as well as it sees what is happening, finds new viewpoints and explains phenomena. The exploratory research, on the other hand, answers the question "why" as well as looks an explanation to the situation or the problem and identifies probable causal connections. These research categories show in my thesis in many ways. Firstly, my thesis tries

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[28] Marr 2019, p. 106.

[29] Marr 2019, p. 96.

[30] Alvesalo – Ervasti 2006, p. 19.

to provide answers to the questions "How someone can be liable?" and "Why someone is liable?". My thesis also tries to find new viewpoints to the question about liability and tries to find an explanation to the problems with the AI liability. In other words, this thesis is looking for an explanation of the liability of AI products in national legislations as well as international legislation.

The research in my thesis is more qualitative and legal dogmatic than quantitative research. As Alvesalo and Ervasti states, in qualitative research theory is often built by the basis of the usable materials. The materials are collected from the inspected phenomenon and by understanding that the researcher tries to build up a new theory. Although, also in qualitative research, the researcher goes through the bibliography and terms, which belong to that topic, and then he forms glasses, through which results are viewed.[31] In this thesis, I have first studied the AI, liability and liability of AI by going through different materials and case studies. Although my theory is not new in a way that there would not have been written anything about this, it is still a relatively new subject. As I mentioned in the previous subsection, there are not any clear answer to this theme, and I want on my part provide one possible theory and responds to this problem. However, this thesis is not entirely qualitative research, as there are some signs of quantitative analysis, too, as I will present some current theories regarding this subject. The primary method is still qualitative research.

As this thesis is from the field of international law there, of course, need be and there are international materials, aspects, doctrines and methods in this thesis. Firstly the materials. All the material in this thesis is international. I do not provide answers to anything by just one state legislation and bibliography. Still, I use a wide variation of legislations and bibliography, even though they are mainly from the western states, excluding international organisations. I have studied legislations, guidelines and literature from the European Union (**EU**), its member states and the United States of America (**US**). In addition, I have studied different reports, working papers and guidelines from international organisations like the United Nations (**UN**) and its sub organisations as well as from the OECD. Of course, the international law thesis would not be an international thesis, if there would not have any studies from the relevant international law authors. Therefore I have discussed the theories presented by Ian Brownlie as well as Timo Koivurova and the publication in The Oxford handbook of international environmental law.

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[31] Alvesalo – Ervasti 2006, p. 20.

What comes to the international law doctrines, the doctrines I have mainly used the sources doctrine, the state responsibility doctrine, the jurisdiction doctrine and the sovereignty doctrine. The source doctrine can be seen throughout the thesis, but the other doctrines are mainly in use in the main section 3, and they are also defined there. As I am looking at the liability of AI in the international context there, I utilise those doctrines and apply them in practice. I thought this would be the best practice, as then the reader remembers those doctrines better and also that I do not make this introduction section too long by also defining those principles. However, sources doctrine I am going go to go shortly through here because as Brownley said, the sources of international law and the law of treaties are regarded as essential as an objects of study because they provide the primary particles of the legal regime.[32] For this reason, it is good to study it already a bit here as it also an essential part of the research.

As a principle in international law, the general consent of states creates rules of general application. That is why there are not any "formal sources" in international law, and the definition of custom in international law is basically a statement of that principle. For this reason, it is essential in international law to have a variety of material sources, which shows the existence of the consensus of the states concerning particular rules or practices. These sources are the decisions of the International Court, resolutions of the General Assembly of the United Nations and "law-making" multilateral treaties. It is also good to mention that according to Brownley the "term" sources refer to two different things, which are the binding quality of international law as such and the literary sources of the law as sources of information.[33]

Consequently, I have used these sources in my thesis too, directly or indirectly. For example, when I define and explain those other international law doctrines, there can be seen decisions of the International Court and multilateral treaties shaping those doctrines. Multilateral treaties also play a big part when I examine the liability, legislation and guidelines on AI in an international context as well as when I analyse the current situation in the international AI liability legal regime. Besides those material sources, I also have other international references in the meaning of the literary sources of the law as sources of information. I have state legislation and international and national judicial decisions, which are the material sources of

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[32] Brownlie 2003, p. 3.

[33] Brownlie 2003, pp. 3-4.

the customary law.[34] And finally, as mentioned before, I have decisions and reports from the international (and national) organisations as my sources.

Then to my research and research question. As the question about liability is essential, my thesis intends to give some clarity to this issue and provide an answer to the question about who can be held liable when AI causes injury. In addition, I try to give some clarification about what is the effective regulation now and what there are proposed for regulation about the AI liability globally and finally note the differences in the regulation. In other words, my research questions can be summarised to one main question and two subquestions. The main question is " Who can be held responsible by law for the damages caused by the actions of Artificial Intelligence?"

The first subquestion is about the grounds for the liability of the party, so what are the legal grounds for holding the person liable for the actions of Artificial Intelligence? Furthermore, the second subquestion is about the effective legislation so is the current legislation enough to regulate Artificial Intelligence and can it keep up with the fast-evolving technology? These same questions are asked in national and then in an international context. Even though the setting is different and of course, the global context is broader, as it includes states responsibility and not just the individual person liability, the fundamental issue of the liable party stays the same. The main research question is well involved in almost every section and subsection in this thesis, and it well reflects the main issue handled in this thesis.

1.3   *Structure and limitations*

In this thesis, I have already given background as well as defined the AI and its applications. In the following main section, I observe the liability issues regarding AI from an individual perspective. I start by defining general liability according to the tort law, and then I represent fault liability and strict liability. Then on the second sub-sub section, I provide answers to my research question about who could be the liable party. I look at the possible liable parties, the manufacturer and the owner, and provide different situations where they could be liable and on what basis. I also present the possibility of holding the robot itself liable and on the other hand what possible rights and responsibilities that brings to robots and humans.

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[34] Brownlie 2003, p. 6.

After examining the subject about the liable party, I continue the subject by looking at the AI guidance and legislation in the US and the EU and provide several examples of them. Even though I have already made observations to legislation in the US, the EU and its member states in the earlier section, I will give a short listing about different regulations and guidelines in them to get a closer look what is happening in legislative wise. Furthermore, I will examine quite shortly the risk management in AI liability. Here I first study about supervising the AI, which could at least try to prevent some potential accidents made by AI. I will also look closer to liability insurances. Insurances are already used for risk management in the way that if I cause damages, I do not need to pay the damages by myself, but the insurance company takes the financial risk. This same system could and should also be used with AI, so, for example, the owner would not need to bear all the risk by himself or herself.

In the fourth main section, I will cover the international legal framework for liability and AI. I will start by defining more closely couple essential international law doctrines regarding liability: state responsibility and sovereignty as well as territorial sovereignty. Here I just go them through in theory and later on study them in practice. Earlier I have examined liability regimes and AI legislation more from a national view, so here I will have a more international look to those and review the international legislation and guidelines regarding liability and AI. After the theory, I will analyse how current international regulation and agreements could be amended to cover also AI and how national legislation could fulfil international legislation.

Before the conclusions, I still observe one case involving situations where AI has caused harm in one way or another and then analysing them. In this chapter, I also consider the liable parties in a real-world view and as an example, define a couple of possible real-life situations where someone is liable. In the conclusions chapter, I summarise my thesis and provide answers to my research questions. I will also give so thought about what further research there could be or would be needed to do to get a better understanding of this whole issue.

As the space in the thesis is quite limited, I cannot examine all the things I would like to, or there would be needed to study. So firstly regarding liability, I limit this thesis to be only about civil liability and not criminal liability, because it is quite easy to draw the line between these two, and it limits my subject remarkably. What comes to AI and its applications, I will be mainly observing the liability caused by robots/robotics software type robots, like chatbots. Stuff like 3D printing, artificial reality, and virtual reality and possible liability issues produced by them are excluded from this thesis. Furthermore, as this is a juridical thesis and I am mainly looking

at these issues from the law point of view, I will not be considering the possible ethical and moral issues that certainly will be in this kind of subject, especially regarding giving robots a status of and ePerson.

I chose the US for closer examination because according to the working paper by the Economic and Social Commission for Asia and the Pacific of the United Nations, tech giants such as Alibaba, Amazon, Baidu, Facebook, and Google account over 75% of total AI investments to date [date of the paper, so 2017][35] . From these five tech companies, three of them are from the US. In addition, according to the same working paper, in the years 2010-2014 the US led with the filed patents with AI-related patent applications and a few analysts have listed global companies in terms of investment in AI, and from these eight companies, seven are from the US.[36] Hence it can be stated that the US is a big player in the field of AI, so the importance of the US is significant, and therefore it makes sense to study the legislation in there.

As already explained, I am observing mainly legislations in the EU and the US, besides to international law. However, I will not be covering all the legislation and regulations governing AI in the US and the EU, but I instead give some examples of the regulations. Finally, the purpose of this thesis is not to give an absolute answer to who should be held liable in different situations. That is because the conditions vary every time, and there no one can give any definite answer, as is usually the thing with the law. The final liable party will be for courts to decide. What I hope this thesis would provide, is to give some material and examples for the thought process about what the legislation could be and how it could be applied to the AI. I also want on my part to help to figure out at least one answer to the question "Who is liable when the machine makes a mistake?" and of course I will provide my opinion now and then.

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[35] Akhtar – Wong – Wang – Ngernlim 2017, p. 3.

[36] Akhtar – Wong – Wang – Ngernlim 2017, p. 4.

2 NATIONAL LEGISLATIONS APPROACHES TO WHO IS LIABLE WHEN ARTIFICIAL INTELLIGENCE MAKES MISTAKE

2.1 *Tort law liability regarding individual natural and legal persons*

2.1.1 General liability provisions

To better understand liability issues with AI, it is a good thing to know a bit about liability and tort law in general. Like Barfield states "liability is about establishing who is to blame with system failures–or, more accurately, who society can extract legal redress from–when something goes wrong".[37] As one reason, or as the main reason, for "liability" we can use as an example the definition made by the European Group on Tort Law[38] in "*Principles of European Tort Law*" (**PETL**). Its article 1:101 gives an overview of the grounds for liability:

> "(1) A person to whom damage to another is legally attributable is liable to compensate that damage.
>
> (2) Damage may be attributed in particular to the person
>
> a) whose conduct constituting fault has caused it; or
>
> b) whose abnormally dangerous activity has caused it; or
>
> c) whose auxiliary has caused it within the scope of his actions."[39]

That means that a person has to compensate another person's harm only when at least one of those requirements for liability are met. That is, a person's obligation to give compensation is only established if the damage is legally attributable to him. So primarily everyone is responsible for their loss by themselves, except when liability is transferred to another person by law. So this "basic norm" according to the PETL article 1:101 points out firstly general conditions for liability, that another person suffered harm. Secondly, that tort law harm needs to be compensated by paying damages which are not only to compensate the victim but also for prevention and as a punishment for the tortfeasor.[40]

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[37] Barfield 2018, p. 194.

[38] As said on their website (http://www.egtl.org/), they are a group of scholars in the area of tort law established in 1992. They have drafted a collection of Principles of European Tort Law.

[39] Busnelli and others 2005, p. 19.

[40] Busnelli and others 2005, p. 19.

The same kind of explanation is also stated in the German Civil Code, "*Bürgerliches Gesetzbuch*" (**BGB**). The general liability rules are in its Section 823 "Liability in damages". In that section, liability rules are explained as follows:

> "(1) A person who, intentionally or negligently, unlawfully injures the life, body, health, freedom, property or another right of another person is liable to make compensation to the other party for the damage arising from this.
>
> (2) The same duty is held by a person who commits a breach of a statute that is intended to protect another person. If according to the contents of the statute, it may also be breached without fault, then liability to compensation only exists in the case of fault."

Cees van Dam explains in his book that the application of Section 823 (1) requires the infringement of a right, such as the rights to life, body, health, freedom, and property and in turn, the application of Section 823 (2) requires the violation of a statutory rule. He also adds that in Section 826[41] of BGB is another general rule of liability and that the application of that section requires intentional unethical conduct, "also known as intentional infliction of damage *contra bonos mores*".[42]

In both of these definitions of liability, we can see the same or similar things. There need to be some harm inflicted by one person to another, and that harm needs to be inflicted intentionally or negligently (whose fault it is). Also, people can hold the act itself so dangerous that liability exists even if harm is inflected without fault or intention, or the contract/statute has been breached. Here it is easy to see that for there to be a liability; there has to be harm done first. If there is no harm, then there cannot be any liability. If someone has inflicted damage, we then need to look for the next criteria for how that harm is caused, and from these, we have two primary forms of liability: fault liability (intention and negligent); and strict liability.

It is also good to mention that liability or the level of liability is not unchanging. According to John Buyers, liability is basically:

> "a sliding scale which is based factually on the degree of consequential legal responsibility society places on a person. Historically responsibility and hence liability levels are not static – the able minded and children and mentally incapable adults have different levels of liability – the latter

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[41] BGB section 826 (Intentional damage contrary to public policy): A person who, in a manner contrary to public policy, intentionally inflicts damage on another person is liable to the other person to make compensation for the damage.

[42] Van Dam 2013, p. 79.

having little or no responsibility for their actions and therefore a commensurate degree of low accountability and liability."[43]

However, I do not continue with this subject any further, because that falls out the scope of this thesis. It is just good to be aware that liability levels can differ between different people at different times. Next, I am briefly explaining fault liability (liability caused by an intentional or negligent act), and strict liability separately, even though some things might be the same in more than just one category. I will just briefly explain their main points to help better follow the liability issues with AI later on.

2.1.2   Fault liability – intention and negligence

Fault can be divided into two different sections; intention which is deliberate wrong-doing, and negligent behaviour, which is non-intentional, and it causes unintended damage to others. Various degrees of fault can also be used to separate fault liability more accurately: intent, grave or gross fault or negligence, medium and finally slight fault or negligence.[44] However, here I just refer to just intention and negligence and not to all those different degrees as they are not so relevant here.

According to Article 4:101 of PETL: "A person is liable on the basis of fault for intentional or negligent violation of the required standard of conduct".[45] Here fault can be objectively understood as a deviation from or violation of the required standard of conduct[46], which can be wilful (so intentional breach of the required standard) or failing to act with the required care and precaution as could be fair to assume (negligent violation of the required standard).[47]

In Germany, for the person to be liable because of the fault requires that he violated the codified rule, his behaviour has been unlawful and that he has acted negligently or intentionally.

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[43] Buyers 2015, p. 1.

[44] Busnelli and others 2005, p. 66.

[45] Busnelli and others 2005, p. 68.

[46] Required standard of conduct is explained in the art. 4:102 paragraph 1 of PETL. It is explained there that the reasonable person in the circumstances, and depends, in particular, on the nature and value of the protected interest involved, the dangerousness of the activity, the expertise to be expected of a person carrying it on, the foreseeability of the damage, the relationship of proximity or special reliance between those involved, as well as the availability and the costs of precautionary or alternative methods.

[47] Busnelli and others 2005, pp. 69-70.

However, as BGB does not provide grounds for intention, as a general rule for the intention in Germany, there are two different requirements for intention. First is a "knowledge requirement", which requires that there is at least an awareness that the occurrence of harm is possible, and the second one is a "voluntary requirement", which requires that the person at least accepts the damage if it occurs. Both need to be present regarding the violation of protected interests or the statutory rule, and unlawfulness of this violation or conduct.[48]

Negligence in Germany is codified in Section 276 BGB. Pursuant to this Section, a person's action is negligent if he fails to exercise reasonable care, which is the level of care required in society. As an example of this level of care is a situation, where a rotten tree falls and causes injury to a passer. The owner of the tree would breach his safety duty if he omitted to secure or remove the tree. The breach of this safety duty implies unlawfulness and is an example of the most crucial aspect of negligence, "the outer care". The other element is "the inner care", and it stands for the personal features of the person, especially for the person's knowledge of the possible risk and for his ability to prevent that risk to come true. If, however, even a careful person could not have recognised and avoided the risk, then the negligence requirement does not actualise.[49]

In the American common law system, negligence is based in the same way. The elements of negligence are duty, breach of that duty, causation, and damages. For duty, there must be a foreseeable plaintiff and a suitable standard of care. Commonly, a plaintiff is foreseeable if he is close by within the zone of physical danger as, of course, the defendant has no duty to persons who are physically far away. Same as in BGB, a breach occurs if the defendant fails to exercise reasonable care, in which the general standard is that of a reasonable person. However, the standard differs between people and, for example, transport companies have a high standard of care, where even the slightest negligence may qualify as a breach. On the other side of the chart are the children who have a lower standard of care.[50]

There are two types of causation, actual and proximate. Actual causation is a "but for" test: But for the defendant's conduct, the plaintiff would not have suffered the harm. As for proximate

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[48] Van Dam 2013, pp. 227-228.

[49] Van Dam 2013, pp. 227, 231-232.

[50] Schaerer – Kelley – Nicolescu 2009, p. 74.

causation, it is a foreseeability test: that the defendant's conduct, which harms the plaintiff, needs to be foreseeable. For an act to cause harm, both of these tests must be met. Under the doctrine called "eggshell skull", the defendant is responsible for the full extent of the damages, foreseeable and unforeseeable, if the plaintiff can prove that there are actual damages. However, the defendant has also some defences to defend himself against accusations of negligent conduct. He may claim that the plaintiff was negligent or that the plaintiff assumed the risk. By the traditional rule of contributory negligence, if the plaintiff was even a bit negligent in causing the accident, he may not get any recovery.[51]

As of a generally accepted rule, the negligent character of the defendant's conduct is established by balancing the expected risk and the precautions, meaning that when the danger increases, so must the precautions increase. According to Van Dam, the level of risk can be determined by:

> "(a) the seriousness of the expected damage and (b) the probability that an accident will happen. And the level of care can be broken down into: (c) the character and the benefit of the conduct and (d) the burden of precautionary measures."[52]

Van Dam states that this approach is from the considerations of the famous American judge Learned Hand in United States v. Carroll Towing Co. The case concerned vessels that were not fastened to their moorings, thus causing damage. Learned Hand stated:

> "Since there are occasions when every vessel will break away from her moorings, and since, if she does, she becomes a menace to those about her; the owner's duty, as in other similar situations, to provide against resulting injuries is a function of three variables: (1) the probability that she will break away; (2) the gravity of the resulting injuries, if she does; (3) the burden of adequate precautions."[53]

An intentional unlawful act results from an intentional act, which is based on the act itself, intent to do that act and a causal link between the action and the infringement. If being subject to an intentional act, then unlike in negligent acts, the plaintiff is not usually required to prove actual damages, and he may demand nominal and punitive damages from the tortfeasor. Intentional torts include, among other things, battery, trespass to personal property or land, theft, and nuisance. Naturally, the defendant has also some defences available. For example, he may argue that the plaintiff consented to the act. He may even claim defence of himself, others,

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[51] Schaerer – Kelley – Nicolescu 2009, p. 74.

[52] Van Dam 2013, p. 235.

[53] Van Dam 2013, p. 236.

or property.[54] A clear example of having consent can be found in sports like boxing where both parties know and have the permission of being punched in a way that would be battery outside of the ring. Naturally, when playing contact sports, both athletes understand what they signed for, and that suffering damages is part of the game. However, there is a cap of the damage too and, for example, if the other one gives up, then any punch or kick made after that would not be any more under the consent.

Negligence and things like a duty of care and the level of risk are important factors when speaking about the liability of AI. At least yet, when AI is not self-thinking and capable of making independent decisions itself, it is hard to hold AI liable because of intentionally doing things, unless of course, someone would have programmed it to harm. In typical scenarios, this is not the case, and it is not in the intention of AI or anyone involved in the making of that AI to do harm. Instead, accidents can always happen and here the level of risk the AI has, and the duty of care, play an essential part. Nevertheless, in a next subsection about the liable party when AI causes damages, I will focus on both negligence and intention when looking for specific liability questions regarding AI and discuss the possibility to make AI liable by itself.

2.1.3 Strict liability

Strict liability in its essence means liability even if a person did nothing wrong, did not intend to cause harm, or there is not any fault in a person's active or passive doing. So even if there has not been any breach of a contract or negligent or intentional behaviour for causing harm, the person could still be liable for the injury and damage inflicted on others in certain situations. Strict liability can also be called as a liability for risk because risk or danger are the main factors to form a liability, which has as its basis, the idea of compensation of risk and the profit.[55] Dangerous activity is one of those situations which is affected by strict liability, and some definition for this is given in PETL article 5:101 as follows:

> "(1) A person who carries on an abnormally dangerous activity is strictly liable for damage characteristic to the risk presented by the activity and resulting from it.
>
> (2) An activity is abnormally dangerous if

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[54] Schaerer – Kelley – Nicolescu 2009, p. 74.

[55] Busnelli and others 2005, p. 69.

a) it creates a foreseeable and highly significant risk of damage even when all due care is exercised in its management and

b) it is not matter of common usage.

(3) A risk of damage may be significant having regard to the seriousness or the likelihood of the damage.

(4) This Article does not apply to an activity which is specifically subjected to strict liability by any other provision of these Principles or any other national law or international convention."[56]

Strict liability, as described here, means in situations like this, there is a highly significant risk of harm, even though the defendant has taken all proper precautions. Still, strict liability is not always applicable, because there is a limit even for strict liability: "the damage has to be characteristic to the risk presented by the activity and resulting from it". Therefore only the damage mentioned above can be recovered under this Article, which reduces the scope to those cases where the cause of the harm evidences the reason for establishing strict liability.[57] As an example, explosives are held as dangerous things and whoever uses or stores them has strict liability towards them, so if they explode and do harm, the owner would be liable for the damages because of the strict liability. However, if said explosives were stored in a box and that box would fall and damage someone, this kind of damage would not fall under the scope of strict liability, because it is not characteristic of the risk presented. Of course, that then could fall under some other liability provision than strict liability.

The example from above is not the only example of strict liability, nor is it in any way exhaustive. Van Dam states that "strict liability can be considered as liability without negligence, but elements of negligence may still play a role in rules of strict liability". As for examples, he mentions that the strict liability of the employer for damage caused by his employee (vicarious liability) requires the employee's negligent conduct. On the other hand, strict liability for a defective product contains elements in the requirement of defect that are similar to the aspects of negligent conduct. Even rules for damage caused in 'pure' strict liability usually contains defences which have signs of negligence. One of the defences in liability for things in French law is the external cause that was unforeseeable and insurmountable.[58] In

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[56] Busnelli and others 2005, p. 105.

[57] Busnelli and others 2005, pp. 105-106.

[58] Van Dam 2013, p. 297.

American common law, the defendant may claim that the plaintiff presumed the risk or that the warning in the product was sufficient.[59]

Often strict liability rules are used when movable objects, which have higher than average risk, cause damage. These objects include, among other things, motor vehicles and animals and they are considered to be inherently or inevitably dangerous: they have a high chance for accidents. If accidents would happen, they are likely to cause severe damage, i.e. death and serious personal injury.[60] However, in the case of an animal, the animal itself does not have liability, but the owner of the animal has it. For instance, in some states in the US, strict liability is used in connection with pets, usually dogs which bite or attack. That is because animals do not have a conscience, and therefore animal keepers have to restrain them from avoiding harm.[61]

The keeper of the animal, who has the actual power over the animal, has strict liability also in Germany. That rule aims to protect against specific animal risks like death, personal injury, and property damage caused by the particular danger inherent in keeping an animal.[62] Other forms of strict liability include an abnormally dangerous activity and strict product liability, which applies to a commercial supplier and in that case the product may be defective based on defective manufacture, faulty design, and inadequate warning.[63] The same kind of legislation governing abnormally dangerous activities, dangerous animals and product liability are also in the US where they are under strict liability.[64]

The EU also has its own definition of strict liability in its legislation, which mainly targets the manufacturers. According to Van Dam, "*the Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products*" (**Product Liability Directive**) gives a good and well-known example of strict liability. By the Product Liability Directive Article 1 "the

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[59] Schaerer – Kelley – Nicolescu 2009, p. 74.

[60] Van Dam 2013. p. 298.

[61] Justia. Strict Liability.

[62] Van Dam 2013, pp. 405-406.

[63] Schaerer – Kelley – Nicolescu 2009, p. 74.

[64] Legal Information Institute. Strict Liability.

producer shall be liable for damage caused by a defect in his product" and by Article 6 "a product is defective when it does not provide the safety which a person is entitled to expect, taking all circumstances into account".

Van Dam adds that Article 6 of the Product Liability Directive is a mirror of the negligence test which, quite often in cases, actually refers to the safety the claimant was entitled to expect, even though it focuses on the defendant's negligent conduct. He continues that the connection between defect and negligence is found in Article 2 providing that to establish the defectiveness of a product, the court has to consider the presentation and the reasonably expected use of the product. These elements are also relevant when establishing negligence. The difference between the tests is that the defectiveness test uses the product instead of the producer as a reference. This is suitable, especially in cases of manufacturing defects, because the tests have a difference in the results, unlike in cases of design defects.[65]

Under the US law, there is "strict liability negligence", which applies to products that are defective or unreasonably dangerous when used in a standard, intended or reasonably foreseeable manner, and which cause injury.[66] In the case of robots, this would apply, as they could be seen as products. However, when talking about other AI applications, like software, one could wonder if the software is held as a product or more like a service. According to the case Ransome v. Wisconsin Electric Power Company, electricity "is a form of energy that can be made or produced by men, confined, controlled, transmitted and distributed to be used as an energy source for heat, power and light and is distributed in the stream of commerce. The distribution might well be a service, but the electricity itself, in the contemplation of the ordinary user, is a consumable product."[67] Therefore we could also define software as a product rather than a service.[68] Assuming that the software is a product, it becomes a responsibility on

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[65] Van Dam 2013. p. 301.

[66] Kingston 2016, p. 274.

[67] *Ransome v. Wisconsin Electric Power Co*. 1979.

[68] Also according to the "*Council Directive 85/374/EEC of 25 July 1985 on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products*" Article 2 "-- 'product' means all movables, with the exception of primary agricultural products and game, even though incorporated into another movable or into an immovable. -- 'Product' includes electricity."

the developers of AI systems to make sure that their systems are free from design defects, manufacturing defects and inadequate warning or instructions.[69]

2.2   *The liable party when Artificial Intelligence causes damages*

2.2.1   Liability of the manufacturer and developer

The frame for the manufacturer's general liability gives the Product Liability Directive and especially its Articles 1 and 6. Under Article 1, the producer shall be liable for damage caused by a defect in the product. Under Article 6, a product is defective when it does not provide the safety which a person is entitled to expect. Since robots and almost all AI applications can be seen as some kind of product, this gives a sound basis also for the manufacturer's liability over AI. It means that if the AI application has a defect, in the end, the manufacturer has the liability, which is almost always a strict liability, so the manufacturer can be liable even if he does not even know about the defect.

Therefore, if a robot is defective in manufacture or design, or it does not have an adequate warning label, a plaintiff injured by that robot may hold the robot's manufacturer strictly liable for damages. The criteria for the strict liability of the manufacturer are that the robot manufacturer is a commercial supplier and that the robot is defective at the time of sale. If these criteria are met, the robot manufacturer is liable even if the robot owner would have been negligent. This possibility of strict liability gives robot manufacturers an incentive to avoid defects in the manufacture and design of their robots and to place adequate warning labels on their robots.[70] If manufacturers would not have strict liability, it could be that they would not care too much about the result and the product could end up with minor defects just because the manufacturer wanted to save money and maybe the robots have some production error in it.

The issue of manufacturers saving money from safety measures would be possible if there would not be any sanctions for the lack of safety measures or the manufacturer would not be responsible for defects. These safety measures add extra costs to the product and do not give any other benefit to the product. So in case, the manufacturer would only think about money,

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[69] Kingston 2018, p. 274.

[70] Kelley – Schaerer – Gomez – Nicolescu 2012, p. 1864.

there would not be hardly any safety measures. In my opinion, even this reason is enough to make manufacturers strictly liable for defects. Another reason is that usually, manufacturers are in a better economic situation than individual people and thus they are better prepared for the losses and have more money reimburse damages or new products. Sometimes, monetary wise, it is better for the manufacturer to pay the bill.

It is also worth noting that at first, it may sound easy to put manufacturer liable for the damages because if there is a defect in the robot lawnmower and that is why it hit someone and caused damage, the manufacturer is strictly liable because of that defect. However, the analyse about who is liable might get more complicated when looking at the liable person when a self-driving car causes an accident. A self-driving car does not consist of only the vehicle itself, as there is also an operating software, navigation sensors and external map data, and these all must work together for the car to work.[71]

There may then also be arguments about if the developer, programmer or someone else is liable too for the fault to some extent. In this situation, the contributory negligence could come in question.[72] That could be the case if two or more of these components cause the damage. An excellent example of this is a surgical robot. If an adverse outcome happens, so something goes wrong in the surgery, questions could arise about whether the robot had defective hardware or programming, if it was improperly maintained, or if it was insufficiently monitored. These kinds of claims base on both product liability and medical malpractice law, and they focus on alleged design defects and user negligence.[73]

What comes to design defects in the US, many of the state courts take a risk-utility approach. That means that they consider whether the benefits of using a product as designed outweigh the risks of harm associated with the design. Often in these cases, a key consideration is whether a reasonable alternative design would have avoided the damage. Then again, some state courts consider customer expectations, which is a more subjective approach. However, in this approach, inaccurate judgments are possible because, by background and experience, jurors can only speculate as to what a customer might expect. This kind of guessing does not result in

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[71] Buyers 2015, p. 2.

[72] Gluyas – Day 2018, p. 2.

[73] Silverman – Wilson – Goggans 2018, p. 11.

valid decision making in cases, which involves exceptionally complicated products. That is because consumer expectations about, for example, available safety features may be higher or lower than what technology allows or they may not consider how a maximum safety in a product can be achieved in various situations.[74] Furthermore, the manufacturers of self-driving cars cannot avoid liability just because these cars are usually safer than non-automated vehicles. Even if a human-driven car with various systems that ease driving is safer on the than a vehicle without these systems, the manufacturer of the car would still be liable if a reasonable alternative design for the combined systems could have prevented the injury.[75]

Even though it could feel like the manufacturers would be liable in almost any issue there is with the autonomous machines, they still have some defences available in traditional product liability suits, at least in the US. Applicable arguments in cases involving robots or other AI products include whether someone changed or modified the product after the sale or if it was misused in an unforeseeable or unreasonable manner (for example programmed or commanded to complete tasks for which it was not designed). Courts can also consider whether there was contributory negligence, so if the user or the victim deliberately engaged in risky behaviour under principles of comparative fault. In addition, as already mentioned earlier, there need to be adequate labelling in the product. So the manufacturer may also protect itself from liability by providing appropriate instructions for using the product, and by warning users of possible dangers or risks that the manufacturer cannot eliminate without an expensive and complete change to the product's design.[76]

According to the U.S. Chamber Institute for Legal Reform's report, a critical overriding issue concerning robotics and generally AI in the future will be whether a designer's or manufacturer's conduct can continue to be evaluated under the product liability principles when a product is a self-learning product and changing after its sale. The question here is that should AI applications be treated as "persons" rather than as "products"?[77] Manufacturing defects, which are abnormalities in the design of a product, are subject to strict liability. While AI products

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[74] Silverman – Wilson – Goggans 2018, p. 13.

[75] Hubbard 2014, p. 1858.

[76] Silverman – Wilson – Goggans 2018, p. 13.

[77] The question and problems about "ePersons", so giving legal entity to robots and other AI products, is discussed in the sub-subsection 2.2.3.

may be alike when they are made, they could have developed their own behaviour before the user gets the product. Whether a product has a manufacturing defect is evaluated based on its condition at the time of sale. That would preclude a manufacturing defect claim when an AI product was manufactured to design specifications but then later changed. The situation may be more complicated if the AI product's design is defective. AI products are designed to self-modify during use, which could preclude a design defect claim. As products become more autonomous all the time, traditional product liability law may fall to negligence principles, which might focus on whether the product's action was reasonably foreseeable and could have been avoided through exercising due care.[78]

All in all, I would conclude that having manufacturers strictly liable for AI products is well justified. If the owner of the AI product gets injured because of his defective AI product, it would no be fair to suffer the damages alone. Furthermore, it would not be fair either to acquit the manufacturer from liability just because the AI application would not be considered as a product by law and thus would free manufacturer from liability in multiple cases. However, the legislation needs to be amended to actually cover AI products, so it would be clear if the manufacturer is responsible or not. It is not fair for a manufacturer to be liable for acts of a self-modifying product, especially a long time after it has been manufactured. In my opinion, the only good answer to this is amending the legislation to consider these situations. As for now, no one can be 100 per cent sure, if the manufacturer is or should be liable for acts of self-modifying robot, which could be very different from the robot, which was manufactured. In case of that kind of robots, I would keep the approach of seeing them more like persons than products better, thus shifting the liability from the manufacturer to the robot itself.

2.2.2   Liability of the owner and the user
2.2.2.1   Robots as animals

In addition to the manufacturer's liability, the owner of the robot could be held liable. Liability could arise because of the owner's strict liability for the robot, the machine itself doing something to cause liability or just because of the owner's negligence, that is lack of supervision over the robot, can make the owner liable for the damage. Some machines could also need constant monitoring, and if the owner neglects this duty, the victim could also hold the owner

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[78] Silverman – Wilson – Goggans 2018, pp.13-14.

liable for negligence even though the manufacturer would also be liable. This could be the case if the criteria for the strict liability are not met, which means that for the victim to get compensation for the damages, he may hold the owner liable among other things for negligent supervision, in which the victim's recovery could be affected by his actions.[79]

One possible scenario to sort out liability issues is to treat robots as animals, so to handle the robot's liability as they would be animals, which would mean that the owner would be the liable party instead of the robot. By comparing robots as animals, I mean animals whom someone owns, like "normal" domesticated animals like dogs or cats or more dangerous animals like police dogs or snakes. This approach has also been proposed as one idea by the U.S. Chamber Institute for Legal Reform in their report, which mentions that courts and legislatures could also look at liability principles developed to address injuries from pets. As the authors state, here the person sued does not fully control the actions of the animal that led to injury, but he or she could be liable for the consequences in some situations.[80]

So who has the liability and what kind of liability for damage done by the animal? The animal itself would be quite hard to hold liable and demand to pay damages, but its owner can. Some background to animals' liability gives the Animals Act 1971 of the Parliament of the United Kingdom. Under subsection 1, section 2:

> "Where any damage is caused by an animal which belongs to a dangerous species, any person who is a keeper of the animal is liable for the damage, except as otherwise provided by this Act."

Then under subsection 2 are the provisions for when the owner of the not dangerous animal is liable for the damage done by that animal. Those provisions are that

> "a.) the damage is of a kind which the animal, unless restrained, was likely to cause or which, if caused by the animal, was likely to be severe"; and
>
> b.) the likelihood of the damage or of its being severe was due to characteristics of the animal which are not normally found in animals of the same species or are not normally so found except at particular times or in particular circumstances; and
>
> c.) those characteristics were known to that keeper or were at any time known to a person who at that time had charge of the animal as that keeper's servant or, where that keeper is the head of a household, were known to another keeper of the animal who is a member of that household and under the age of sixteen."

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[79] Schaerer – Kelley – Nicolescu 2009, p. 75.

[80] Silverman – Wilson – Goggans 2018, p. 2.

Furthermore, under section 5 are exceptions to the liability provided in sections 2 to 4. Those exceptions include that the person [owner of the animal] is not liable under sections 2 to 4 of this Act for any damage which is entirely the fault of the person suffering it or if the suffered person has voluntarily accepted the risk thereof. In addition, he will not be liable for any damage caused by an animal kept on any premises or structure to a person trespassing there, if the animal was not kept there for protection or if it was kept there for protection, the purpose for it must not have been unreasonable.

As can be seen from those sections, the animal's owner is responsible for any damage caused by his animal. However, the liability is shifted entirely or partly to the victim if the damage was his fault. These same provisions could be used when examining the robot's owner liability. Kelley, Schaerer, Gomez, and Nicolescu argue in their article that the law should hold robot owners to the same standard of negligence as the owners of domesticated animals. According to them, a robot is programmed to follow a particular behaviour. So, even though the robot can make some decisions by itself, it still acts in the way it is programmed. This makes robots much more predictable in the same way as domesticated animals and not as unpredictable like wild animals, whose owners are strictly liable. Hence, this kind of programming makes robots behaviour more like a well-trained dog, which usually does as he is trained. [81]

To the same results came Schaerer with Kelley and Nicolescu a couple of years earlier. They proposed that the robot could be treated like a domesticated animal if it is fully functional, but its owner acts negligently.[82] They explain that robots are more equivalent to animals, which act on their own, than to everyday products, which are not as autonomous and do not move by themselves. Authors also claim that robots are closer to domesticated animals than to wild animals. Therefore they should be subject to negligence liability like domesticated animals rather than to strict liability. Their reason is that domesticated animals are more predictable than dangerous wild animals. That is why owners of such animals do not have as demanding negligence standards by law. Likewise, the owners of robots should have the same standard of negligence by law.[83]

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[81] Kelley – Schaerer – Gomez – Nicolescu 2012, p. 1864.

[82] Schaerer – Kelley – Nicolescu 2009, p. 72.

[83] Schaerer – Kelley – Nicolescu 2009, p. 75.

However, all kinds of robots probably should not be treated as the same, and their owners should not have the same level of liability even though they would not be held as a wild and unpredictable like wild animals. For example, the owner of a dangerous attack dog could be held strictly liable for the dog, if the owner does not warn trespassers of the dangerous dog in the premises and in the same way owner of dangerous security robot could have stricter liability standards.[84] From different animals, dogs are maybe closest to robots as robots and dogs both can be divided into different breeds and group. Also (dangerous) dogs have more laws[85] governing them than there are for other dangerous animals, so the comparison is more meaningful in point of view of the law. There are, for example, medical robots, service robots, military/guarding robots and industrial robots and like some dog breeds, some robot groups are more dangerous by their nature than others. [86]

As a person probably would not typically hold small poodle dangerous per se, in the same way, little vacuuming robot is not held hazardous machine. Then on the other side of the "dangerous chart" are, for example, fighting dogs that are kept dangerous. This is illustrated well in the Dangerous Dogs Act 1991, which specifies hazardous dogs and what to do with them. Under subsection 1 section 1 of the act, dangerous dogs are dogs that are bred for fighting like pit bull terrier, Japanese tosa and any dog of any type designated for this section by order of the Secretary of State, being a type appearing to him to be bred for fighting or to have the characteristics of a type bred for that purpose. In the same manner, robots made for fighting purposes, like those aforementioned guarding robots, are more dangerous ones. Hence, their owners should be held strictly liable for their damage, like the owner of a dangerous dog is. Laws could also govern dangerous robots in the same way as dogs, or more accurately, dangerous dogs are.

Owner of a dangerous robot having strict liability also goes along with more general strict liability rules. As mentioned earlier, strict liability rules apply especially with movable objects, like motor vehicles and dangerous animals. That is because they have higher than average risk to cause damage, as they have a high chance for accidents and possible accidents would likely

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[84] Kelley – Schaerer – Gomez – Nicolescu 2012, p. 1865.

[85] See for example Dangerous Dogs Act 1991 of the United Kingdom and Finnish Public Order Act Section 14 "Control of Dogs".

[86] Kelley – Schaerer – Gomez – Nicolescu 2012, p. 1865.

cause grave harm, like death and serious personal injury.[87] And because the animal or the motor vehicle itself cannot be held liable, the liable party is the owner of the animal or vehicle. What then comes to dangerous robots or any dangerous AI application, they could be compared to either dangerous animal or motor vehicles. That is at least in the sense that dangerous robots have a higher chance for accidents and those accidents could be severe, especially when talking about armed robots. A dangerous robot can also be defined in legal terms so that dangerousness hinges on if advanced technology provides for machines capable of acting as a reasonable person in the law of torts, which is guarding against foreseeable harm. When the robot has been found not to achieve such a capability, it should be deemed dangerous.[88]

Pets, like robots, are capable of making independent decisions and interact with people. In general, pet owners have to prevent the animal from injuring others. Under the US common law, most jurisdictions have a so-called "one bite" rule, which provides that when the owner knows that his pet is harmful, he is strictly liable for attacks. Some states have even enacted statutes that impose strict liability for dog bites in particular situations or if the animal qualifies as a "dangerous dog" based on its breed. However, if the victim provokes the dog into biting himself, an owner may have a defence to liability. Also, owners of guard dogs, who post warning signs, may be able to reduce or avoid liability through the application of principles of assumption of risk or comparative fault. A robots-as-pets approach might appropriately balance owner responsibility, robot unpredictability, the level of risk of the particular robot based on its function, and the conduct of the person who was injured.[89] In a way, these statutes sound quite much like the Dangerous Dog Act 1991.

However, there could be situations where the owner is not liable. In the US, the person who could be liable because of the damage done by the animal does not necessarily need to be the actual owner of the animal. In a case from Georgia, a person got bitten by a pit bull and got severe injuries. Instead of suing the dog's actual owner, who was the third roommate of the defendant, he asserted liability to another person who was the owner of the house, because of

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[87] Van Dam 2013. p. 298.

[88] Pagallo 2013, p. 33.

[89] Silverman – Wilson – Goggans 2018, pp. 15–16.

Georgia's animal statute and premises liability law.[90] If this ruling were extended to robots in like the other rules governing animals, then in situations where the robot and its owner are visiting some other person's house, the owner of the house would be liable for the damages done by the robot instead of the owner of the robot. Personally, I am not sure this would be a good way to handle the liability, but it is one possibility.

2.2.2.2   Robots as employees and agents

It can also be added that the employer is liable for the injuries committed by the employee within the scope of the employee's employment, even if the employer used reasonable care in hiring, training, and supervising the employee. This doctrine is primarily based on the view that fairness requires the employer to be held liable for torts committed by the employees. When looking this from the point of view of the AI, artificial persons like corporations can only act through human employees and, thus, can only be liable vicariously. These policy reasons are based on the unique nature of human employees, like the ability of humans to act as responsible agents for an artificial person and to do business. For this reason, the application of those policies to a robot can are questionable so long until the robot's capacities approach the capacities of humans, especially the ability to engage in complicated intellectual interaction as a self-conscious member of a community. However, if the robot would have those characteristics, then the legal system would have to decide could that kind of robot even be owned. If the answer to this question is "no," then a robot with self-ownership should also be liable in tort in the same way that an employee is accountable for his torts regardless of whether the employer is vicariously liable under respondent superior.[91] This aspect I am looking more in the next sub-section.

Finally, the owner's responsibility and liability could also emerge in a situation where a robot acts as an agent. Agency is a relationship, which is created by contract or by operation of law. In agency the principal party grants authority to another party, called the agent, to act on behalf of and under control of the principal to deal with a third party. Mainly, the actions of the agent bind the principal so for example, if IoT speaker orders lots of music from online, by the

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[90] Karp – Ocrant – Bonanno 2011, p. 4.

[91] Hubbard 2014, pp. 1863-1864.

principles of agency law, a court may find that such decision bounds the owner. The AI application could act, based on its programming, with either the owner authorising it or, because the robot's action would give the impression to a reasonable person that it was allowed to act, with indisputable authority.[92] This approach is well justified also on the basis of the US Computer Information Act 15 U.S.C. § 7001(h), according to which that a contract "may not be denied legal effect, validity or enforceability solely because its formation, creation or delivery involved the action of one or more electronic agent so long as the action of any such electronic agent is legally attributable to the person to be bound."

An excellent example of a robot-agent binding decision can be found from the USA as the U.S. Court of Appeals has found that the actions of robots can bound businesses. According to the U.S. Chamber Institute for Legal Reform, in the case from the year 2004, a website design company called Verio had created an automated software application to identify new websites and collect the contact information of those who register the sites. The "search robot" would submit multiple queries to the "WHOIS" -system[93] and Verio would then use this information to send marketing requests, among other things by email and direct mail to those people. The problem was that when receiving the results of a WHOIS query, users also received terms of use stating: "*that under no circumstances will you use this data to … support the transmission of mass unsolicited, commercial advertising or solicitation via email*." One of the reasons Verio countered the accusation was that it did not enter a legally enforceable contract when its search robot collected information from the database. However, the U.S. Court of Appeals was not persuaded by Verio, and it maintained a preliminary injunction against them. Although the court did not explicitly apply principles of agency law, it found that Verio was bound by the restrictions triggered by its search robots.[94]

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[92] Silverman – Wilson – Goggans 2018, p. 14.

[93] ICANN / About WHOIS: "WHOIS" is a system that asks the question, *who is* responsible for a domain name or an IP address? Every year, millions of individuals, businesses, organizations and governments register domain names. Each one must provide identifying and contact information which may include: name, address, email, phone number, and administrative and technical contacts. This information is often referred to as "WHOIS data".

[94] Silverman – Wilson – Goggans 2018, pp. 14-15.

In my opinion, the analogy between animals and robots is quite good. As robots are usually programmed in a certain way, and they have an owner to command them, or at least supervise them, therefore equating robots to trained dogs or another domesticated animal makes sense. Then it also makes sense to hold the owner of the robot liable in the same way as the owner of the animal. Of course, there could be a problem with the programming, or some robots could be programmed in malicious purposes. Still, in this case, the consumer-owner would not be liable anymore if he did not know and he should not even have known about those malicious purposes, after which the liability goes to the programmer or manufacturer. The owner should be held liable for negligence if he does not do as said on the instructions, or he does not keep on eye his robot, and because of that, it causes damage.

Owners should also bear the risk of owning dangerous robots and hold them strictly liable if they cause harm. Be it an armed security robot or self-made robotic lawnmower equipped with a flamethrower or additional blades. They are both potentially dangerous (even though typical robotic lawnmower is not so deadly) so they should be treated as dangerous animals. Besides, in the worst case, they could and should be ordered to be destroyed, like is the situation in some countries with dangerous dogs[95]. Still, comparing robots to animals is not fruitful in every possible case, especially regarding strict liability and the potential reduction of the burden of proof, although it is suitable, but so is those other possible comparisons. My point here is that the effective legislation is not enough for new technology, and as is seen in later sections, legislators are already working on this issue.

As an example, Ugo Pagallo states that the burden of proof can reduce strict liability. This means that, for instance, after an animal provoked harm, owners or avoid responsibility by proving that the plaintiff voluntarily assumed the risk of the injury or show that an unexpected event occurred. Analogously, in the case of strict liability for the behaviour of children, some legal systems give immunity when parents prove they could not prevent that harmful behaviour. The same principle applies to producers of dangerous products when if they can show that they carefully followed the precise regulation. However, these legal rules often fall short in coping with the advancement of technology. Maybe individual robots may behave as a reasonable

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[95] Kelley – Schaerer – Gomez – Nicolescu 2012, p. 1866. See also Dangerous Dogs Act 1991 Section 4 by which the court may order the dangerous dog being destructed if it would constitute danger to public safety.

person in the field of tort law, guarding against foreseeable harm. However, should we see robots as children, so preventing the actions of robots, or should we see them as animals, so prove that an unexpected event has occurred? Would such responsibility differ according to the different typology of robots with which we are confronted?[96]

2.2.3   Liability of the robot itself

Even though it is not the situation yet, but possibly in the future there may come situations in which AI products act in a way that is beyond the control of designers, manufacturers, or owners. For example, employers are usually liable for the damage done by the employees, except when damage was done intentionally or if an employee would commit an assault. Also, a pet owner may not be liable when a puppy that had always been gentle bites a child who enters its yard. As already established earlier in subsection 2.1, a person can be liable based on an intentional or negligent violation of the required standard of conduct, meaning that the liability is based on control, foreseeability, and fault (or then in some cases strict liability for example for dangerous activities).

Once again, according to the authors of the U.S. Chamber Institute for Legal reform's report, one possible answer to situations in which the designer, manufacturer, or owner of an AI product may not be liable under existing principles is to understand the purpose of tort law. It is not just to compensate a person who has experienced an injury, but to do so because of the other party's wrongful action caused that harm. That means that one answer to the question about the liable party may also be to recognize AI entities themselves as responsible for their own actions. Some people even suggest that there could be a bit limited form of a "personhood" for AI technology that we will interact within the same manner as people.[97]

Giving some sort of legal status to AI entities would make them able to enter into legally binding contracts, which would make them competent to, for example, order goods and services. This would mean that recognizing robots as legal entities could protect the owner of the robot in situations in which the technology caused an accident while acting autonomously so the owner would not be responsible for the action. For this, according to some people, the technology

[96] Pagallo 2013, pp. 33-34.

[97] Silverman – Wilson – Goggans 2018, p. 16.

itself would need to have some kind of insurance on its own to cover possible claims. Legal status or limited personhood might also provide some other rights to AI entities. These rights could be inter alia to be able to own the intellectual property that it creates, such as software code, music, articles, or books in the same way humans own the intellectual rights of their creations. This idea would not even be too farfetched, as corporations have those same rights already and they are still ultimately owned by individuals. Furthermore, the owners then benefit financially from the corporation's intellectual property rights. In this point of view, it seems possible that AI entities with property and other legal rights would also be subject to ownership, and that their owners would then also be the ultimate financial beneficiaries.[98]

The subject of robots having legal rights is not just some discussion in the books and reports, but there has also been discussion about it in the legislation level. In "*The European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics*" (the **Civil Law Rules on Robotics**) the European Parliament has considered the issue of robots' liability. In resolution's paragraph 49, they state:

> "that the civil liability for damage caused by robots is a crucial issue which also needs to be analysed and addressed at Union level in order to ensure the same degree of efficiency, transparency and consistency in the implementation of legal certainty throughout the European Union for the benefit of citizens, consumers and businesses".

In the Civil Law Rules on Robotics, there is a discussion on different approaches to this issue and about mandatory insurances,[99] which I am going to discuss more on the next section. In the resolution, the Parliament has also thought about future legislature in long-term perspective; creating a special legal status for robots, so giving them electronic personality and recognizing them as electronic persons. This would make robots liable for any damage that would have been caused by the autonomous behaviour of the robot. According to law professor Gerhard Wagner, the idea of ePersons is "the most innovative, interesting and stimulating idea within the Parliament's resolution".[100] And I agree with Wagner. The idea is not only interesting, but it would help in many situations, where the liable party is not found easily and it would help the victim to get compensation for the damages, as there would not be any doubts about the liable

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[98] Silverman – Wilson – Goggans 2018, p. 17.

[99] Wagner 2018, p. 2.

[100] Wagner 2018, p. 2.

party. The idea is also very innovative, as it would be one big step towards making robots more like humans and maybe in the near future we would have robots living alongside humans at least in some way.

Still, the question here is that is it realistic at all that autonomous machines would be intelligent enough to make their own decisions or would they just do as programmed, so if the idea giving ePersonality to robots would be even relevant. But as Wagner says, that question is more of a technological nature and not for lawyers to discuss (and thus not in the scope of this thesis). The real legal problem is whether autonomous machines should be given entity status, on the assumption that and at the point in time when they have acquired the required capabilities. Furthermore, Wagner also states that legal systems also take it for granted that humans are persons, "legal subjects". So whether some human being is really able to think for himself, set its goals autonomously, and develop emotional ties towards others, is irrelevant. He continues that "[t]his strategy of defining legal subjectivity not with a view towards certain intellectual and emotional capabilities, but simply based on belonging to the human race, suggests that the expansion of entity status to non-human actors is not a question of capabilities. It is rather a decision for the legal system to make."[101] However, in case AI would be completely autonomous (like superintelligence), then the AI product must be aware of its actions. And if it is aware of its activities, it must be liable for its activities.[102]

There also might be problems with making autonomous machines legal entities who may be held liable for damages. One problem would be that in that case, all the people behind robots, such as owner and manufacturer, would be protected from liability. Whether this is good or bad is maybe open to debate and depends on the party. On the other hand, the owner could rest well, knowing that if his robot harms someone, he would not be liable. On the other side, this could mean that all the incentives to take care would be lost. If the manufacturer were not held liable for any manufacturing mistakes there would be in the robot when it was done, then they would not need to pay so much attention and money for making good quality robots. Wagner compares this situation to the limited liability of shareholders and calls manufacturers and owners as "quasi-shareholders" of the robot as they would be protected from the robot liability in the same

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[101] Wagner 2018, pp. 18-19.

[102] Čerka – Grigienė – Sirbikytė 2015, p. 383.

way as shareholders are protected from the liability of the company.[103] In my opinion, this could be a risk when giving legal status to robots, although I think it would not need to be like this. For example, robots could be kind of held as children so that they would be liable, but their owners could also be responsible for the damage robots do.

Lastly, one more thing to think about giving robots a legal status is what other rights can be given to them. According to the British government study, in the future, robots could demand the same citizen's rights as humans. This would mean that countries would need to provide social benefits, like healthcare and housing. Even though this is not something to look for right now, and it is still just a prediction in a paper, robots could have some responsibilities and rights. The study says that in the next 20 to 50 years, robots could be granted rights, so they could for example vote and pay taxes, and on the other hand, societies would have to take care of their new digital citizens.[104] So if robots would be made as ePersons and they would be made liable for their decisions, maybe then there would be a need to give other rights and responsibilities to them too.

Ultimately, I see the idea of giving the robots ePersonality as a very good idea, although for now there are some potential issues in it. The pros of the ePersonality are, for example, the clear definition of the liable party, easing the burden of the manufacturer and the owner in cases, where they could not have prevented the act of the autonomous product in any way and it could help the technology to evolve even more. However, there is also a negative side especially in giving rights to robots. Before they could be given legal rights like voting, we would need to make sure that the robots cannot be programmed or hacked to vote for a certain way, but they would need to make the voting decision on their own. There may also be some ethical issues, but I will not take stand for them here. All in all, I see this idea really good one and it would definitely provide a good answer to the issue of the liable party. Also just from the pure legislative perspective, I would say this would be a really huge thing and development. The idea about ePersonality would just need to be implemented worldwide for it to be useful.

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[103] Wagner 2018, pp. 20-21.

[104] BBC / Robots could demand legal rights.

3   ARTIFICIAL INTELLIGENCE REGULATION AND RISK MANAGEMENT

3.1   *Artificial Intelligence regulation in the United States and the European Union*

3.1.1   The United States legislation and guidance on Artificial Intelligence

For over two centuries, the US has addressed the concerns about the challenges of technological innovation, like the safety of the products and allocating the costs of victims' injuries, with a complicated system of federal, state, and local governmental entities. They are all quite autonomous and uses both judicial and legislative/regulatory mechanisms to address injuries.[105] The same problem is also with the legislation governing AI and other new technology because the overlapping and potentially conflicting federal, state, and local regulation for example for AV's and drone operation can pose severe impediments to deploying these new technologies. Such a legal patchwork creates an unreasonable risk that a manufacturer or user may unintentionally violate the law and thus become subject to liability. Federal agencies could prevent this problem by clearly asserting their intent to pre-empt state law, among other things, in regulations and agency guidance.[106]

One example of the guidance the US has about AI is the National Highway Transportation and Safety Administration's (**NHTSA**) voluntary guidance titled "Automated Driving Systems: A Vision for Safety 2.0.", which was published in 2017. It intends to ease the process for manufacturing, testing, and deploying AVs while discouraging states from implementing their own AV regulations, which could be potentially conflicting. NHTSA's Safety 2.0 focuses on automation levels three to five[107] and covers all vehicles under the agency's jurisdiction. The guidance describes 12 "priority safety elements" for consideration in the design, development, testing, and deployment of AV technologies. The guidance encourages companies engaged in testing and deploying of AVs to submit to NHSTA "Voluntary Safety Self- Assessment" letters demonstrating how they have addressed the safety elements, which, however, are not really

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[105] Hubbard 2014, p. 1811.

[106] Silverman – Wilson – Goggans 2018, p. 70.

[107] This is the same levelling scale as talked earlier in chapter 1.1.2 and for comparison, in year 2019 Teslas were on level 2 in that same scale from 1-5.

required.[108] Furthermore, even though NHTSA has not adopted standards in terms of specific automation levels, it has adopted policies and regulations concerning particular technology. These policies are, for example, concerning electronic stability control, and it also has plans to address possible regulations on automatic braking technologies.[109]

What comes to legislation, at the same time as NHTSA has released new guidance and updating old guidance, the US Congress has also taken up the issue of AVs. Apparently, the proposed legislation, which, if it becomes a law, may help to accelerate AV deployment. In addition to the Congress proposed legislation, the U.S. House of Representatives has passed "*the Safely Ensuring Lives Future Deployment and Research In Vehicle Evolution Act*" (short title SELF DRIVE Act)[110], in September 2017 and also the Senate has its AV legislation pending called "*the American Vision for Safer Transportation through Advancement of Revolutionary Technologies Act*" (short title AV START Act). Although the Senate and House bills have some differences between each other, the good thing is that they both provide the federal government with a framework for developing AV rules. The bills would also obligate NHTSA to regulate the design, construction, and performance of the vehicles, to encourage their testing and deployment as well as authorize them to update Federal Motor Vehicle Safety Standards. They would try to prevent state laws in the areas regulated by NHTSA, while preserving the states' traditional authority to regulate, for example, registration, licensing, insurance, and traffic laws.[111]

Maybe one of the essential elements of those bills is the preventing rule because launching AVs to markets would be much more complicated if states pass their own laws and regulations. For example, more than 40 US states have considered their own legislation for a couple of years, and 21 US states have already passed their own laws on AVs. The regulation situation with the AV's can be compared to the legislation about drones. More than half of the states have rules about the use of drones and those laws govern areas like pre-emption of local and municipal

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[108] Silverman – Wilson – Goggans 2018, p. 59.

[109] Hubbard 2014, p. 1845.

[110] According to the Act's Section 2: "The purpose of this Act is to memorialize the Federal role in ensuring the safety of highly automated vehicles as it relates to design, construction, and performance, by encouraging the testing and deployment of such vehicles."

[111] Silverman – Wilson – Goggans 2018, pp. 59-60.

laws, privacy rights, commercial and governmental methods of drones and criminal penalties for misuse.[112] Regarding the legislation on AV's on states' level, Nevada was the first state to adopt a plan to regulate autonomous cars, and its plan provides a useful example of a regulatory approach to experimental vehicles. In 2011, the Nevada Legislature adopted a bill defining AV and directing the Department of Motor Vehicles to establish regulations addressing, among other things, licensing operators of AV's, operation of these vehicles on highways in the state, requirements and safety standards for the vehicles and insurance for operators of the vehicles.[113]

Other guidance regarding AI, specifically IoT, is the Federal Trade Commission's updated guidance complying with the Children's Online Privacy Protection Act (**COPPA**). COPPA identifies IoT devices that collect personal data, like voice or GPS data, as covered under COPPA and has newly approved methods for obtaining parental consent regarding knowledge-based authentication questions and using face recognition. Legislators have also introduced a Spy Car Act, which addresses concerns about data collecting cars, which may not be sufficiently secured, and a DIGIT Act, which would create a working group of federal agencies to provide recommendations to Congress on how to encourage the growth of IoT. However, after their introduction in 2017, either one has not advanced further.[114]

However, it is, according to Hubbard, quite challenging to know when robots, like giant general-purpose robots equipped with the functional equivalents of human arms and hands, will be available for consumer markets and what risks would come with them. Hence, a specific regulatory plan could be difficult to prepare at this time and attempts to do so too early might impose arbitrary limits on innovation. On the other hand, well-made safety standards could reduce injuries and advance innovation by reducing uncertainties about requirements. For these reasons, the National Institution of Safety and Standards has a project to develop the safety standards and performance measures to enable humans and robots to work together in the same space; and establish performance measures for sensors used to monitor the work area and ensure the safety of robots, vehicles, and people.[115]

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[112] Silverman – Wilson – Goggans 2018, pp. 60 and 62.

[113] Hubbard 2014, pp. 1845-1846.

[114] Silverman – Wilson – Goggans 2018, pp. 66 and 68.

[115] Hubbard 2014, pp. 1849-1850.

3.1.2   The European Union legislation and guidance on Artificial Intelligence

One quite remarkable piece of legislation in the EU about AI and robotics is the European Parliament Resolution of 16 February 2017 on Civil Law Rules on Robotics, which I have been talking already earlier. In the general principles of those rules, the European Parliament states, for example, part T: "whereas Asimov's Laws must be regarded as being directed at the designers, producers and operators of robots, including robots assigned with built-in autonomy and self-learning, since those laws cannot be converted into machine code"; and part Y: "whereas it is appropriate, in view of the stage reached in the development of robotics and AI, to start with civil liability issues".

In the next part about liability the European Parliament state, inter alia, part AA.: " whereas a robot's autonomy can be defined as the ability to take decisions and implement them in the outside world, independently of external control or influence; whereas this autonomy is of a purely technological nature and its degree depends on how sophisticated a robot's interaction with its environment has been designed to be"; part AC.: "whereas, ultimately, the autonomy of robots raises the question of their nature in the light of the existing legal categories or whether a new category should be created, with its own specific features and implications"; and part AE. "whereas according to the current legal framework for product liability — where the producer of a product is liable for a malfunction- and rules governing liability for harmful actions -where the user of a product is liable for a behaviour that leads to harm- apply to damages caused by robots or AI".

Altogether there are ten different sections in the liability part, which in my mind reflects quite well that the EU is really taking the liability of AI seriously. Even just those couple referenced parts picture well that the EU is considering the problem with the liability of AI if the current legal framework is sufficient enough and who would be liable if AI makes a mistake. In the other parts of that liability section, the European Parliament mentions things like what to do when AI can make autonomous decisions, in what circumstances manufacturers and owners can be held strictly liable for acts or omissions of a robot and how the injured person can prove the actual damage. Later on in the Resolution, it discusses general principles concerning the development of robotics and AI for civil use, and here they discuss things like intellectual property rights, safety, different robots, liability and international aspects. The paragraphs 49-59 of the Resolution are about liability. Though they are only just discussions/considerations,

they give a good picture of the way where the European Parliament seems to want the legislation about AI liability to go.

Some of those Resolution paragraphs about liability have already been partly discussed in section 2 of this thesis. However, I will still cite Wagner here to make a summary of the most important or interesting paragraphs regarding liability. So in substance, the European Parliament suggests a choice between the "risk management" and "strict liability" approaches. According to the Parliament, a strict liability rule requires proof of only three disparate elements, which are damage, a harmful functioning of the robot, and a causal link between those two. However, it remains open whether "harmful functioning" of a robot is equivalent to its malfunctioning, i.e. requires a deviation from the behavioural design of its manufacturer.[116]

In my opinion, equivalenting harmful functioning to malfunctioning could be good and bad. In case it is equivalent, then if out of sudden a robot lawnmower starts to cut legs instead of crass to which it was programmed to, there seems to be malfunction. However, the change in programming could also be, because the owner programmed it again. In these kinds of situations, it should be made clear to what extend the strict liability for manufacturer applies. What I mean is that the comparison should be made case-by-case to see if the harmful functioning was indeed because of malfunctioning or defect and not because of the malicious intent of the owner.

The risk management approach, which would be an alternative to strict liability, would be focusing on the individual who was able to minimize risks and deal with negative impacts instead of concentrating to the person who acted negligently. However, according to Wagner, it seems that the risk management approach is in urgent need of a principle of attribution and further elaboration upon the principle that has been chosen. Besides of these two approaches, the Parliament also pictures, as a long-term perspective, the creation of a special legal status for robots, i.e. their recognition as ePersons, and these ePersons would be liable for any damage caused by the autonomous behaviour of the robot. At the end of the Resolution, the Parliament also mentions insurance issues and considers that there might be a need for mandatory liability insurance like there is now for cars. This compulsory insurance mechanism could be

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[116] Wagner 2018, p. 2.

supplemented by a fund that would pick up losses not covered by liability insurance, as is the case already in the area of motor traffic.[117]

Of course, this resolution is no the only document from the EU regarding AI. On May 2018 the Commission published a report on *the Application of the Council Directive on the approximation of the laws, regulations, and administrative provisions of the Member States concerning liability for defective products (85/374/EEC)* (**Fifth Report**), which is basically about the evaluation of the Product Liability Directive. In the Fifth Report, the Commission states that "2018 is not 1985. The EU and its rules on product safety have evolved, as have the economy and technologies. Many products available today have characteristics that were considered science fiction in the 1980s."

By the statement mentioned above, the Commission seems to mean that the Product Liability Directive is a useful tool, but not quite up to date and it needs some update to correspond the technology now and in the future. This idea can be seen a bit further down, where they state that the Product Liability Directive is still an adequate tool. Still, there is a need for clarifying the legal understanding of certain concepts and some products, which may pose a challenge to the performance of the Directive, need to be looked closer. The Commission also states in the Fifth Report that their "goal is to ensure that: (i) the EU continues to have a product liability regime that fosters innovation; (ii) products placed on the EU market are safe; and (iii) people who suffer injury because of defective products can claim compensation when accidents occur."

Basically, all the EU's AI-related stuff are still guidance's, reports or equivalents, even though many of the publications are quite recent. For example, the Parliament has published a briefing about "EU guidelines on ethics in AI: Context and implementation" in September 2019. According to it, the core principle of the EU guidelines is that the EU must develop a "human-centric" approach to AI that is respectful of European values and principles. The main idea of this approach to AI is to ensure that human values are central in AI development, deployment, using and monitoring, by providing respect for fundamental rights, including the rights in the Treaties of the European Union and Charter of Fundamental Rights of the European Union. These all are united by reference to a typical foundation rooted in respect for human dignity, in which the human being enjoys a unique and unchallengeable moral status. The guidelines also

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[117] Wagner 2018, p. 2.

discuss the essential EU requirements for achieving trustworthy AI, which are human agency and oversight; robustness and safety; privacy and data governance; transparency; diversity, non-discrimination and fairness; societal and environmental well-being; and accountability.[118] Furthermore, the guidelines consider the "need for coordination of actions at EU and national levels" as a few EU Member States (France, Germany, Finland[119] and the United Kingdom) has started work on establishing their own national frameworks on ethics and AI in parallel to the EU initiatives.[120]

The latest publications from the European Parliament are "White Paper on Artificial Intelligence - A European approach to excellence and trust" and "Report on the safety and liability implications of Artificial Intelligence, the Internet of Things" both of which were published on February 2020. The main points, of which the White Paper consists of, are: (1) the policy framework setting out measures to align efforts at European, national and regional level and in partnership between the private and the public sector, the framework aims to mobilise resources to achieve an "ecosystem of excellence"; and (2) The key elements of a future regulatory framework for AI in Europe that will create a unique "ecosystem of trust" and to do so, it must ensure compliance with EU rules, including the regulations protecting fundamental rights and consumers' rights, in particular for AI systems operated in the EU that pose a high risk.[121]

The more interesting report of these two, at least regarding this thesis, is the second report about safety and liability implications. According to that report, the Commission has recognised the importance and potential of the new technologies, and it is committed to make Europe a world leader in AI, IoT and robotics, but to achieve this goal, a clear and predictable legal framework addressing the technological challenges is required.[122] Furthermore, there seem to be two levels

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[118] European Parliamentary Research Service 2019, p. 3.

[119] The Ministry of Economic Affairs and Employment of Finland has given a report about "Work in the age of artificial intelligence: Four perspectives on the economy, employment, skills and ethics", which discuss about the effects of artificial intelligence on general economic and employment trends; the transformation of work and the labour market; reforms on education and skills maintenance; and ethics. The report can be found from Permanent URL in Institutional Repository for the Government http://urn.fi/URN:ISBN:978-952-327-313-9

[120] European Parliamentary Research Service 2019, pp. 6-7.

[121] European Commission 2020, pp. 2-3.

[122] European Commission 2020, p. 1.

in general product safety and liability at the union and national level. At Union level, product safety and product liability provisions are two complementary mechanisms to pursue the same policy goal of a single functioning market for goods. At the national level, non-harmonised civil liability frameworks complement these Union rules by ensuring compensation for damages from various causes and by addressing liable persons.[123]

In the Report, the Commission has also provided thoughts on what its plan is regarding the Product Liability Directive. The Commission state that even though the definition of product in the Product Liability Directive's is comprehensive, its scope could still be clarified more for two reasons. First, to reflect better the complexity of new technologies and second, to make sure that reimbursement is always available for harm caused by defective AI products. That would better aid economic actors to evaluate if they could be considered as producers according to the Product Liability Directive. The Commission is also looking out if and to what extent it may be needed to ease the consequences of complexity by alleviating/reversing the burden of proof required by national liability rules for damage caused by the operation of AI applications, through an appropriate EU initiative. What comes to Union legislation, the Product Liability Directive says that if a product that does not meet mandatory safety rules, it would be considered defective, whether the producer has a fault or not.[124]

Also, the Commission mentions that in close coordination with corresponding changes in the Union safety framework, the notion of "putting into circulation" in the Product Liability Directive could be revisited to consider that products may change and be altered. This could also help to clarify who is liable for any changes that are made to the product. What comes to the operation of AI applications with a specific risk profile, the Commission is seeking views on whether and to what extent strict liability may be needed to achieve adequate compensation for possible victims. The Commission is also seeking views about if mandatory insurance may be required for activities under strict liability, following the example of the Motor Insurance Directive, to ensure compensation even if the liable person in not solvent and to help to reduce the costs of damage. Regarding the activity of other AI applications, the Commission is considering if the burden of proof on causation and fault needs to be altered. In this respect, the Report from the New Technologies formation of the Expert Group on Liability and New

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[123] European Commission 2020, p. 12.

[124] European Commission 2020, p. 14.

Technologies has noted an issue on the situation when the potentially liable party has not logged the data relevant for estimating liability or does not want to share that data with the victim.[125]

As can be seen from the above, the EU is really taking part in the discussion about AI liability and how to regulate it. It can also be seen that the EU is actively thinking about the problem of AI liability, and it has noted that the current regulation needs to be amended to answer the questions about AI. The "Report on the safety and liability implications of Artificial Intelligence, the Internet of Things and robotics" is an excellent example about how serious the Commission takes the issue and it is also an outstanding report regarding the actions needed for regulating the AI. From my personal view, I hope that those actions mentioned in that report will take place sooner than later. As already said multiple times, especially the idea of ePersonality would be really good, if it is implemented well. For my, maybe a bit partial, opinion, the guidance and discussion in the EU on AI liability is way better and more advanced than in the US, although the effective legislation on AI in overall is better in the US. However, this should not be a competition against anyone, but everyone should make co-operation, as the issues regarding AI can be and are global and therefore global legislation in this are is needed.

3.2 *Managing the liability risk*

3.2.1 Supervising Artificial Intelligence

Referring to the earlier chapter about owner's liability and equating robots to animals, governing dangerous robots more by law like dangerous animals and particularly dangerous dogs would be a good idea. For example, the Dangerous Dogs Act 1991 took on a two-way approach to deal with dangerous dogs. Firstly it introduced an offence of either owning or being in charge of any dog which was dangerously out of control within either a public place or a non-public place in which it was not permitted to be. Secondly, it introduced type-specific legislation by which particular types of fighting dog breeds were banned like told earlier in chapter 3.2.2.[126]

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[125] European Commission 2020, p. 15-16.

[126] Bleasdale-Hill – Dickinson 2016, p. 66.

Maybe one of the oldest or maybe most known laws about robotics was given by science fiction author and biochemist Isaac Asimov. He wrote three laws of robotics, which a robot must follow before deciding. What this means is that these laws produce a reasoning process, which the robot must go through before it can make any decision. If the decision would break any of those laws, in the order first, second, and the third law, this process does not allow the robot to make that decision. These three laws are, in order:

> Law 1: A robot may not harm a human being, or allow, by inaction, a human being to come to harm.
>
> Law 2: A robot must obey orders given by a human being, unless these orders are in conflict with L1.
>
> Law 3: A robot must protect its own existence, unless doing so is in conflict with L1 or L2.[127]

Even though they are just fiction and developed for science fiction literature, they could be a good starting point for legislation governing robots and maybe other AI. However, it is accepted among roboticists that general implementation of these laws is not practically viable. Still, Asimov's laws have been used in limited extend as part of AI research into autonomous decision making.[128] The Asimov's laws were just an example of legislation, which could be applicable for robotics and more generally to AI. Of course, in maybe even not so distant future, if and when robots are considered equal to humans, and they walk among us, they would be under the same laws as humans are. But until then, there could and need to be legislation applicable to the current situation.

So besides, or in addition to, the Asimov's laws, there need to be laws to govern the AI-systems itself or the makers of AI-systems. Like university professor Amitai Etzioni and CEO of the Allen Institute for Artificial Intelligence Oren Etzioni have stated, "Operational AI systems (for example, self-driving cars) need to obey both the land and our values".[129] Even though they did not mean any special legislation to deal with the issue, but a particular type of supervision, the legislation would be a good starting point. Maybe not straight to govern AI itself, but at least the humans behind the AI. Supervising AI in its essence is not even a unique idea, as in our society people are being almost constantly supervised by someone, like at work by the employer

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[127] Kaminka – Spokoini-Stern – Amir – Agmon – Bachelet 2017, p. 343.

[128] Kaminka – Spokoini-Stern – Amir – Agmon – Bachelet 2017, p. 344.

[129] Etzioni – Etzioni 2016, p. 29.

or children by their parents. However, this is something that needs to be stated and work with, so it would not be forgotten and taken for granted.

In addition to legislation, there could be some kind of supervision/oversight system watching over AI systems, as Etzioni & Etzioni have proposed. They argue that all societies have had oversight systems, like workers, have supervisors and teacher have principals. In these systems, first-line operators are under the oversight of the second line operators, and they must respond to corrective signals from the overseers.[130] So, for example, workers need to do what their supervisors tell them to do. In the same way, then AI systems need to have some kind of oversight and, according to the same authors, this oversight should be provided at least partly by supervising AI systems.

Firstly that is because operational AI systems are learning systems, so they keep collecting data. This continuous data mining and the experience are being used to improve their performance, which could lead them to lapse from the guidelines they were programmed to and no human can monitor these changes, especially in real-time to determine if those changes are within the law. Secondly, AI systems are also becoming too complicated for people to understand or different entities, like governments or corporates, want to keep the algorithms as a secret so that no one can understand them. Lastly, according to Etzioni & Etzioni, these AI guided systems increasing autonomy, meaning that they sometimes decide on their own, maybe even defying their original guidelines. One example of this is an emergency braking that stops the car without the human driver doing anything when it senses dangers, which sometimes can happen because of false alarm. Therefore for all of these three reasons, there is a need for AI supervisor or guardian.[131]

Of course, supervisors also need supervisors. Simplified, generally in workplaces employees are responsible for their managers, who are responsible for the chief executive officer, who is responsible for the board of directors who then are responsible for the shareholders. So everyone answers to someone and everyone have their supervisor. In the same way, AI oversight needs to have a supervisor. Also, someone needs to decide which oversight system will supervise which operational system. Etzioni & Etzioni argue that different parties have

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[130] Etzioni – Etzioni 2016, p. 29.

[131] Etzioni – Etzioni 2016, p. 30.

their own oversight systems, so they are also deciding what system oversights what operational one. For example, manufacturers of the driverless cars want to, of course, ensure that their products stay in line, so they have their own systems.

On the other hand, courts and law enforcement authorities will have their own AI oversight system, for example, to determine who or what will be liable for accidents, and whether or not there was the intention. The last question remains then that who guards the guardians. The best answer is that humans should have the last word about the roles and actions of both the AI operational and AI oversight systems. Neither of those systems should be completely autonomous. Ultimately, however, smart a technology may become it is just a tool to serve human purposes. As already establishes earlier, those who make or use these technologies should be held responsible for their programming and utilization. Hence these same people should be the ultimate authority over the operation and oversight of AI.[132]

3.2.2   Managing the risks with insurances

One thing there still need to be looked out for is the insurance policy. As Van Dam has stated, liability insurance has made the rules of strict liability possible. The driver, the manufacturer, or the owner of the animal can continue his activities without having to worry that liability for damages will ruin his financial situation. The fact that the insurer generally pays compensation means that the group of insured carries the burden, and they can often re-distribute these costs to the customers. In this sense, large companies and insurers not only have 'deep pockets' but are also loss spreaders.[133]

Therefore it is essential to look at this aspect concerning AI because innovation has often made existing insurance products to be insufficient. Also, frequently insurance companies have been in an awkward position of needing to elaborate on new solutions without having complete information[134] or because if the robot causes harm, the victim's compensation would be assured.[135] In addition, also clear liability rules are essential for insurance companies, as they

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[132] Etzioni – Etzioni 2016, p. 31.

[133] Van Dam 2015, p. 299.

[134] Bertolini – Salvini – Pagliai – Morachioli – Acerbi – Trieste – Cavallo – Turchetti – Dario 2016, p. 1.

[135] Wagner 2018, p. 22.

help companies to calculate their risks and to claim reimbursement from the party ultimately liable for the damage[136]. I will first examine the insurance from the view of the insurance products and insured parties; in other words, the manufacturer and the owner of the AI product. Insurances are quite crucial in almost everything we do to protect us from risks, be it done by a car crash or leaking dishwasher.

Insurances are also quite necessary to companies and manufactories, as insurances enable them to manage risks better, especially what comes to developing new technology. Therefore if this gap, offering decent insurances for robots and other AI products, is not filled, it may result in a technology-harmful effect by delaying the emergence of new robotic applications onto the market. In the end, that could hamper the formation of a robust robotic industry. The problem about managing the risk, therefore, has to be understood as more broadly encompassing ethical as well as social implications of cutting-edge technologies. [137]

In its essence, insurance is a contract, which purpose is to protect the insured party from the detrimental economic consequences of a possible risk. The risk can be of any type, depending on a negligent behaviour of the insured, or of third parties, causing harm to the same party entering the contract (first-party insurance) or to others (third party insurance). Insurance is one of the possible legal tools that parties can resort to manage the risks they face with their activities. Generally, insurances are not compulsory, so the parties are left free to decide whether to enter an insurance contract to manage their risk. However, in some cases, the risk associated with a particular activity is too high, or that hazardous moral behaviour and adverse selection may negatively affect the pooling and spreading of the damages that arise. Therefore in these activities, there is duress by law to have insurance (typically third party insurance).[138]

One reason why having sufficient insurances with robots is essential is that inter alia Japans' Ministry of Economy Trade and Industry has found out that "current technique is insufficient in identifying and evaluating the risk of unexpected potential accidents that results from the expansion of the area to utilize robots". For example, industrial robots can be divided into two groups: robots operating in isolation from human beings, usually constrained inside protective

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[136] European Commission 2020, p. 13.

[137] Bertolini – Salvini – Pagliai – Morachioli – Acerbi – Trieste – Cavallo – Turchetti – Dario 2016, p. 2.

[138] Bertolini – Salvini – Pagliai – Morachioli – Acerbi – Trieste – Cavallo – Turchetti – Dario 2016, p. 2.

cages; and "collaborative" robots, which are designed to interact physically with workers. As the first type is generally isolated from humans, there probably are fewer accidents with that kind of robots. However, as safety standards for the robots interacting with humans are still under development, it is hard yet to say if those collaborative robots will increase or further reduce the safety of the workers working with them. Another question is about the autonomous vehicles (**AV**), no matter how safe they will be, there will still be accidents with them, because of causes and malfunctions that probably cannot be foreseen.[139]

As already discussed earlier, the question is that if an accident occurs, will it be the manufacturer's fault, or the owner's fault. However, the owner of the car would need to have some indivisible element of risk, as, for example, there could be damage or theft of the vehicle when it is parked in a driveway. What comes to medical robots, according to Bertolini and the others, the most recurrent issues concerning surgical robots and insurance are about the coverage of specific surgical interventions by the national health insurance service and the reduced health insurance costs resulting from robotic-assisted surgery. Also, most of the commercial robots currently in the market are not covered by any specific insurance product, like for instance is the case of surgical robots. According to Bertolini and others, existing medical insurances to some small operations may apply, but it is not sure whether the specificity of the robotic device is considered when determining the premium.[140]

How can the risk then be calculated? Calculation of risk is essential for the insurances, as it is the basis of the premium. That calculation of risk is based on the definition of its frequency and severity. However, according to Bertolini and others, the difficulty in assessing risks associated with the robots "is due to (i) the technical complexity of robotic devices, (ii) the lack of sufficient data with respect to the potential risks and the accidents they may cause, (iii) the uncertainties with respect to liabilities that producers and users may face. [I]n some cases, it is not even clear which party may be held liable, hence, ultimately, who should have the interest to acquire insurance coverage." Altogether, this could mean for the robots and AI that all robotic devices possibly would not be insured, the existing insurance contracts will be used even if they

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[139] Bertolini – Salvini – Pagliai – Morachioli – Acerbi – Trieste – Cavallo – Turchetti – Dario 2016, pp. 3-4.

[140] Bertolini – Salvini – Pagliai – Morachioli – Acerbi – Trieste – Cavallo – Turchetti – Dario 2016, p. 5.

would not be adequate, or the insurance premiums would be higher. That, in turn, could delay spreading of the robots and hamper the industry for the production of robots.[141]

All those problems cannot be solved by just introducing new legal duties for users and producers to purchase first or third-party insurance products. The result in that practice could be that the problem could worsen and further delay the adoption and spreading of robotic devices. Insurances are one of the essential tools to enable technology transfer from research to the market and the creation of a new industry. In addition, the risk management function of insurances help transform uncertainty into an advance cost that may be internalized by the party, and in case of the producer, the cost could be distributed through price mechanisms among all possible users of the robotic device. In the end, any effort in the direction of technology and legal assessment would help to provide the necessary conditions for the development of specific insurance products for robotic devices and that would help the robotic industry and other technologically advanced industries. [142]

The other part why insurances are essential is the risk externalization and the compensation of the victim. One way to compensate the victim, according to Wagner, is that the robot could be required to have minimum assets to qualify as a legal entity in the same way as limited companies are usually required to have minimum assets. This kind of minimum asset requirement would oblige parties to provide the funds necessary to satisfy potential damages claims, and then the funds would be transferred under the robot's possession. Then in case of accidents, the damage claims would be paid off from those funds. The other and maybe better way to ensure compensation for victims would be mandatory insurances. The burden for providing the compulsory liability insurance would again be on the natural and legal persons, so the owner and the manufacturer. They would just need to supply the insurance contract and pay the premiums.[143]

The prime advantage of insurance over other forms of hedging risk is that there is no minimum amount of assets needed. Hence, the insurance buyer does not need to wait until he has enough assets and that there is no tied-up capital as savings for the victims, so the assets remain liquid.

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[141] Bertolini – Salvini – Pagliai – Morachioli – Acerbi – Trieste – Cavallo – Turchetti – Dario 2016, pp. 6 and 8.

[142] Bertolini – Salvini – Pagliai – Morachioli – Acerbi – Trieste – Cavallo – Turchetti – Dario 2016, p. 8.

[143] Wagner 2018, pp. 21-22.

In this point of view, the mandatory insurance could be a better solution for ePersons than having minimum asset requirement. The usual suspects for financing the insurance are already familiar: the manufacturers of the robots and their users. If the manufacturers have to front the costs of insurance, they will pass these costs on to the owners/users of the robot. In one form or another, the costs would end up to the users, so it does not make a difference if the users contribute directly to the asset cushion or become liable for the insurance premiums. In the end, the producers and users of robots will have to pay for the harm caused by the robots and the ePerson is only a conduit to channel the costs of cover to the manufacturers and users.[144]

So both of those legal tools, the minimum asset requirements and mandatory insurance, are well-suited to avoid risk externalization as they assure the victim's compensation at least to the minimum amount. Beyond this amount, the risk externalization would persist. However, if autonomous systems generate significant savings in accident costs that they are promised to, then no liability subsidies, like insurances, would be needed. Wagner also states that as a general matter, it is submitted that the issue of limited liability should be addressed and discussed head-on rather than hidden in the issue of recognition of autonomous systems as ePersons. The liability of users, at least as long as it is fault-based, is typically unlimited.[145]

As the legislation needs to be amended to cover AI, in the same way, insurances and their terms need to be amended to cover AI and different damages made by AI. Insurances are an important part of our society and therefore they should not be forgotten, nevertheless what is the people's opinion on the insurance industry. Insurances are also very good at externalising the risk, and risk is an important part of liability. Therefore I see it essential to talk also about insurances when talking about AI liability. It does not matter who the liable party is if he does not have enough assets to pay the damages and compensation to the victim. Besides, paying compensation for something my AI product did should not drive me to personal bankruptcy. The ideas I presented here especially from Bertolini and others regarding insurances are quite good in my opinion and should be considered by the insurance companies and maybe even by legislators.

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[144] Wagner 2018, p. 22.

[145] Wagner 2018, pp. 22-23.

4 INTERNATIONAL ARTIFICIAL INTELLIGENCE LIABILITY AND THE STATES RESPONSIBILITY AND SOVEREIGNTY

4.1 *International legislation on transboundary liability and Artificial Intelligence*

4.1.1 States responsibility and sovereignty and territorial sovereignty

What comes to liability in international law, there are two essential doctrines relating to it, and they need a closer inspection before I can go further to the liability and AI liability. The first doctrine is a state responsibility. As it usually is with typical social relations, when one person violater another person's legal interests, it creates responsibility determined by some particular legal system and international relations act in the same way.[146] According to Ian Brownlie, one of the international law's general principle is the responsibility, and the law of responsibility is concerned with especially the payment of compensation for loss caused. Furthermore, the character of state responsibility does not base on delict same way as in domestic law, but "international responsibility" relates both to breaches of the treaty and other violations of a legal duty. As Judge Huber has said, according to Brownlie: "All rights of an international character involve international responsibility."[147]

In principle, an act or omission, which results in a breach of a legal obligation, rises liability in international law, whether the requirement arises by treaty, custom, or otherwise. However, many rules order the conduct required without being very clear about the degree of necessary advertence from the state organs involved, and this is a common fault even in torts of English law. Also, the problems in intergovernmental relations can usually be compared to those arising from the activities of employees and companies in English law and sometimes it is more the relationship than fault which is held to justify liability. Therefore objective tests are usually used to determine responsibility in international law. However, it is possible that governments, as groups of morally responsible natural persons, are capable to prove intention or negligence. Technically, objective responsibility is based on the voluntary act -doctrine: when the agency and casual connection are established, it makes a breach of duty. Furthermore, according to

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[146] Brownlie 2003, p. 419.

[147] Brownlie 2003, pp. 420-421.

Brownlie, it is believed that the practice of states and the jurisprudence of arbitral tribunals and the International Court follow the theory of objective responsibility.[148]

The classical approach to state responsibility can be found in the decision in the case *Trail Smelter Arbitration* (*the United States v. Canada*). According to The Oxford handbook of international environmental law, in that case, the tribunal relied on "the principle of general international law" prohibiting a "State …to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein when the case is of serious consequences and the injury is established by clear and convincing evidence". The same primary assumption can be found from grounds of the International Court of Justice decision in the *Corfu Channel* case. In this case, the court referred to "every State's obligation not to allow knowingly its territory to be used to cause harm to the citizens or property of other States."[149] Also, the court stated that "it cannot be concluded that just because of the control exercised by a State over its territory and waters that that State necessarily knew, or should have ought to have known, of any unlawful act perpetrated therein, nor yet that it necessarily or should have known, the authors. This fact, by itself and apart from other circumstances, neither involves *prima facie* responsibility nor shifts the burden of proof."[150]

Moreover, besides being a theory and rules from courts decisions, the International Law Commission (**ILC**) has codified the universal system for state responsibility in the Articles on Responsibility of States for Internationally Wrongful Acts (**ILC Responsibility Articles**) in 2001. The law of state responsibility is based on two different sets of rules: "primary rules", which establish the obligations of states, and "secondary rules", which are concerned with the breach of primary standards and the consequences of breaching those rules. Furthermore, according to The Oxford handbook of international environmental law, the term "state responsibility" is often being used to point out to secondary rules, following the decision of the ILC to limit its articles on state responsibility to those rules.[151]

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[148] Brownlie 2003, pp. 422-423.

[149] Bodansky – Brunnée – Hey (eds) 2008, p. 1013.

[150] Brownlie 2003, p. 428.

[151] Bodansky – Brunnée – Hey (eds) 2008, p. 1011.

The ILC Responsibility Articles are divided into three different parts. In part 1 of the articles, there is the fundamental basis for triggering state responsibility, the commission of an internationally wrongful act by a state. For example, by the ILC Responsibility Articles Article 1 "*Every internationally wrongful act of a State entails the international responsibility of that State*" and by Article 2 "*There is an internationally wrongful act of a State when conduct consisting of an action or omission: (a) is attributable to the State under international law; and (b) constitutes a breach of an international obligation of the State*." Then part 2 of the ILC Responsibility Articles is about the "content of the international responsibility of a State", which is the issue of remedies, like Article 31 about reparation. Finally, part 3 gives grounds for the "implementation of the international responsibility of a state". This part is about the invocation of the responsibility of a state and countermeasures.[152]

Timo Koivurova also adds that the general rules of state responsibility codify customary international law in many respects as many rules reflect the existing universal international law. However, those rules give just rough guidelines as to which standards are applicable if a state breaks international law. According to Koivurova, the rules operate like the customary law that applies to all treaties. That means that they apply if states have not agreed otherwise with each other. The ILC Responsibility Articles do not describe the requirements, "primary rules", from states in each case in detail. Instead, they focus on "secondary rules", which are the consequences of a state's violation of one or more of the primary rules, so a state does not do what is expected of it. The ILC point of view here is that although the fundamental rules differ in different fields of international law, for example, the standard of care that is expected of a state if a primary rule is violated, the same secondary rules apply.[153]

States sovereignty and territorial sovereignty are also essential doctrines here. First of all, even though it may sound obvious, states are sovereign in their land areas, and almost all land areas belong to states, except Antarctica, where sovereignty claims are frozen, but not renounced. Ownership of a territory, which means that the state is sovereign in a region, also contains sovereign rights to specific adjoining maritime spaces and airspace. Koivurova states that a state is sovereign up to the outer edge of its territorial waters, which is 12 nautical miles and

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[152] Bodansky – Brunnée – Hey (eds) 2008, p. 1017. See also the "Responsibility of States for Internationally wrongful Acts".

[153] Koivurova 2014, p. 177.

that is similarly the outer edge of a state's airspace.[154] Brownlie adds that the concept of territory also includes islands, islets, rocks and reefs as well as the seabed and subsoil of the territorial sea.[155]

According to Koivurova, territorial sovereignty, in reality, is often just an illusion. Nowadays the world's airspace is open to many airlines because of the intergovernmental treaties and foreign ships have been legally guaranteed "innocent passage" on the territorial sea. Furthermore, multinational companies operate across many countries and in a fully global market in terms of goods and services. Of course, sovereignty also brings some responsibilities. One of these responsibilities is that a state must prevent and minimize the probability of environmental harm from any operations it permits in its jurisdiction and control. In addition, as a coastal state can allow oil drilling in its continental shelf, even as far as 400 kilometres from the coast, it is also liable to organise an appropriate environmental impact assessment before deciding to grant the permission.[156]

Then there is the state sovereignty, which characterises the fundamental constitutional doctrine of the law of nations that governs a community comprising primarily of states having a uniform legal personality. The primary outcomes regarding the sovereignty and equality of the states are jurisdiction over a territory and the citizens living there; non-interference in the area of other states jurisdiction; and the dependence of obligations arising from customary law and treaties on the consent of the obligor. State sovereignty can also be seen as a discretionary power within the state territory (as defined earlier). Therefore only states can, among other things, delimit the territorial sea or deicide for the self-defence, though only within limits allowed by law.[157]

The essential part of the state sovereignty, which is vital regarding the liability, is the jurisdiction and jurisdictional competence. As part of the independence, jurisdiction refers to judicial, legislative and administrative power of the state. According to Brownley, the starting point of this law is that the jurisdiction is territorial. However, this approach a bit outdated, and the law is currently being developed by two different principles. First is the territorial theory,

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[154] Koivurova 2014, p. 91.

[155] Brownlie 2003, p. 105.

[156] Koivurova 2014, p. 91.

[157] Brownlie 2003, pp. 287-288.

which is the best foundation to the law, but does not provide answers for modern jurisdictional conflicts. By the second principle, the substantial and genuine connection between the subject-matter of jurisdiction, and the territorial base and reasonable interests of the jurisdiction sought to be exercised, should be observed. For the meaning of these principles, we can look them from the criminal jurisdiction of the state. However, they are applicable for civil liability too, as the problems created by civil and criminal jurisdiction over aliens do not have a significant difference between them.[158]

The big discussion regarding the jurisdiction is that in which municipal court can exercise authority in respect of criminal acts under the forum. The principle, which has received universal recognition, is the territorial theory, but it is just a single application of the essential territoriality of sovereignty. By this principle, the courts of the state where the crime is committed can exercise jurisdiction. This principle's advantages are the convenience of the forum and presumed interests of the state where the crime is committed. This principle has also sometimes been given an extensive application. One example of this principle is often applied "objective territorial principle", by which the jurisdiction is founded when any crucial constituent element of a crime is consummated on state territory.[159]

The objective principle got also support from the Permanent Court of International Justice in the case *Lotus*, where the basis of the majority view on the Court was the principle of objective territorial jurisdiction.[160] Another quite important and generally recognized policy is the nationality principle as a basis for jurisdiction over extra-territorial acts. The use of nationality principle can also be extended by reliance on the residence and other connections as evidence of allegiance owed by alien and also by ignoring changes of nationality. However, many states place limitations on the nationality principle, for example, because of possible double jeopardy caused by dual nationalities.[161]

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[158] Brownlie 2003, pp. 297-298.

[159] Brownlie 2003, p. 299.

[160] Brownlie 2003, p. 300.

[161] Brownlie 2003, pp. 301-302.

4.1.2 General liability regulation in international law and conventions

According to Koivurova, legal liability in the international community is primarily defined based on the compensation principles of general international law, and legal liability can be applied easiest on factual circumstances. One example is strict liability in fundamentally hazardous functions, like managing nuclear power plant. It does not matter how carefully a nuclear power plant is maintained, as there is always a risk of catastrophic harm. States have negotiated strict-liability agreements to cover operations such as these; the originator of any damage is generally liable irrespective of how carefully the plant is operated.[162] Therefore, the strict liability provisions in international law and national law seems not to differ so much from each other.

However, in international law, strict liability on essentially hazardous activities is regulated by exclusive agreements, strict liability agreements. Usually, these agreements are related, for example, to nuclear power plants, although strict liability agreements have been developed only in recent years, like the conventions established by the OECD and the International Atomic Energy Agency in the early 1960s. Koivurova says that both of those nuclear treaty systems have the same basic principles:

> "1 The liability is channelled to the operator of a nuclear power plant: the treaty systems apply the principle of 'polluter pays'.
>
> 2 The liability is strict (so there is no need to prove that an operator is at fault), but if the damage is due to force majeure (such as war or natural catastrophe), there is no liability to compensate.
>
> 3 The liability is limited; it was considered that otherwise nuclear plant operators would find it impossible to obtain insurance because of the inherent risk of disaster (the operator, however, must take out insurance up to the limit of the risk).
>
> 4 In both treaty systems, states, and ultimately their taxpayers, bear the liability if the limit is exceeded."[163]

Furthermore, regarding strict liability, one historically significant aspect to it is the regulation of civil liability for maritime oil transportation. The oil transport agreements are based on the principle that the owner of the ship has strict liability, except if the owner can prove that the damage was not caused by the ship. So, in this case, the burden of proof deviates from the

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[162] Koivurova 2014, pp. 173-174.

[163] Koivurova 2014, p. 178.

normal state and is thus reversed. However, like with nuclear plant damage, the owner's liability is limited. Koivurova says that the reason in this was that unless the liability was limited, only a few states would have ratified the Convention.

However, that also means that often the victims are not adequately compensated. As the owner probably in most cases do not have enough assets to pay the possible damages, the ship's owner must insure the vessel to secure compensation. If the insurance would not be sufficient, the Fund for Compensation for Oil Pollution Damage takes effect. The Fund's purpose is to supplement the oil liability Convention by collecting contributions both from oil companies, who operate within the convention parties and from the recipients of oil into a fund from which compensation can be paid. In these cases, states have prioritized the liability of individual actors and industries for compensating environmental damage. Just in one agreement states have assumed the primary liability for compensation and that is the Convention on International Liability for Damage Caused by Space Objects.[164]

State responsibility rules are an essential starting point for international liability. This is well reflected on the critic the ILC got from its first draft of "*International liability for injurious consequences arising out of acts not prohibited by international law*". Apparently, ILC's approach on the first draft resulted in the separation of the liability topic from that of state responsibility. This approach was seen to be "fundamentally misconceived". The critics' key complaint was that in the law of state responsibility, the relevant activity being unlawful is not the issue but whether the home state fulfils its due diligence duty in avoiding to cause transboundary harm.[165]

After the criticism of several drafts, the ILC decided to further divide the liability topic into two parts, the prevention of transboundary harm from hazardous activities and liability for injurious consequences. The liability part is focused on the legal regime for the allocation of loss from transboundary harm arising out of dangerous events. However, it has been reoriented to focus more on civil liability, instead of state liability. The first part about prevention adopted the primary obligation of states concerning harm prevention from the draft convention, which outlines fundamental rules of conduct aimed at preventing or minimizing the risk of significant

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[164] Koivurova 2014, p. 179.

[165] Bodansky – Brunnée – Hey (eds) 2008, p. 1022.

transboundary harm (Articles 1 and 3). That means that the essential ground underlying the draft convention is the need for management of risk and cooperation and consultation between states. In the articles, the harm is defined to mean losses to persons, property, and the environment. There is a commentary about the draft convention, which explains that the risk of causing significant harm refers to a combined effect of the possibility of occurrence of an accident and the scale of how injurious it is. The draft convention also confirms a few essential procedural duties between states, which have to contribute to the avoidance of significant transboundary harm: cooperation (Article 4); notification and information (Article 8); consultation on preventive measures (Article 9); and exchange of information (Article 12).[166]

Then there is also the question about the standard of care or diligence. Koivurova explains that it really cannot be said precisely when a state has done what is required in terms of diligence when figuring out if the state's measures, for example, in examining the possibility of transboundary impacts in advance are enough. The required standard of care gets higher as the probability of severe transboundary consequences or the more severe the potential damage gets higher. For example, in the cases where the environmental damage is caused to the environment beyond the state, the principle of no-harm in customary law requires similar diligence. However, usually, the real problem in these cases is that states are not prepared to act for the benefit of the international community as a whole when environmental damage harms them all. For this reason, states are willing to exercise their legal rights only in the situations when there is recognisable damage to their own territory and even then, only rarely.[167]

One necessary liability protocol is the Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and Their Disposal (**Basel Liability Protocol**)[168], which is still not in force, even though it had been drafted already in 1999. Basel Liability Protocol's objective is stated under its Article 1, by which its purpose "is to provide a comprehensive regime for liability and adequate and prompt compensation for damage resulting from the transboundary movement and disposal of hazardous wastes." Interesting article in the Basel Liability Protocol is its Article 6. It enforces a duty to notify

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[166] Bodansky – Brunnée – Hey (eds) 2008, p. 1023.

[167] Koivurova 2014, pp. 177-178.

[168] Even though this is mainly legislation regime for international environmental law, it is a good example for the "general" international civil liability and therefore it is suitable in this thesis too.

other interested states of the proposed transboundary movement of hazardous wastes, as the process of exporting hazardous wastes is very complicated, so there could be many liable parties. The protocol, however, identifies the actual exporter as the responsible party, who is held strictly liable. Although under Article 12 and Annex B, the strictly liable party is liable only up to a specific limit, unlike party liable by fault liability[169], whose liability does not have any financial limit.[170]

Furthermore, other relevant or interesting articles in the Basel Liability Protocol are, among other things, Article 2, which defines the damage. Under the Article 2, the damage is defined as loss of life or personal injury; loss of or damage to property; loss of income directly deriving from an economic interest in the use of the impaired environment; and costs of specific measures taken to prevent, minimize, or mitigate damage or to effect environmental clean-up. Quite closely related article to article 2 is Article 15 (1) about the financial mechanism, which states that in situations "[w]here compensation under the Protocol does not cover the costs of damage, additional and supplementary measures aimed at ensuring adequate and prompt compensation may be taken using existing mechanisms." According to the Oxford handbook of international environmental law, it is understood that such a mechanism is provided by the Technical Co-operation Trust Fund, established under the Basel Convention and supplied by voluntary contributions.[171]

After all these liability protocols and ways to hold someone liable, it is also good to know and remember that there can also be limits to the strict liability in international law. One of such limitation is in the Convention on damage caused by foreign aircraft to third partes on the surface, signed at Rome, on 7 October 1952 (**Rome Convention**). According to Pagollo, this convention provides for a limited compensation scheme for incidents as well as limits to such strict liability regime, by reversing the burden of proof.[172] According to Article 6.1 of the Rome Convention:

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[169] The Basel Liability Protocol Article 5 provides for the possibility of liability based on fault in cases of damage caused by non-compliance with the requirements of the Basel Convention or through wrongful intentional, reckless or negligent conduct.

[170] Bodansky – Brunnée – Hey (eds) 2008, p. 1030 and the Basel Liability Protocol.

[171] Bodansky – Brunnée – Hey (eds) 2008, p. 1031 and the Basel Liability Protocol.

[172] Pagallo 2013, p. 133.

"Any person who would otherwise be liable under the provisions of this Convention shall not be liable for damage if he proves that the damage was caused solely through the negligence or other wrongful act or omission of the person who suffers the damage or of the latter's servants or agents. If the person liable proves that the damage was contributed to by the negligence or other wrongful act or omission of the person who suffers the damage, or of his servants or agents, the compensation shall be reduced to the extent to which such negligence or wrongful act or omission contributed to the damage."

This means that like under specific national regulations if the liable person can prove that the victim caused the damages, then the liable person be released from the liability, instead of being strictly liable for everything. It is terrific to have that kind of clauses, as it would not be fair if the victim causes all the damages, but someone would need to pay the costs just because of the strict liability. Sometimes even internationally victim just has to suffer from his or her own actions or omissions.

4.1.3   International legislation on Artificial Intelligence

International organisations have also considered the problem with AI liability. For example, in 2016 OECD has mentioned the liability issues in "OECD Science, Technology and Innovation Outlook 2016". In that report, OECD stated that AI could make errors that result in potentially serious damage (e.g. wrong patient diagnosis) and AI choices may also be subject to misinterpretation, criticism or refusal (e.g. loan refusal). They continue that the nature of AI is imperfect; it raises questions about the principles of legal responsibility and how liability should be shared among AI itself, programmers, owners and other possible parties. Laws and legal frameworks will be needed to be devised and implemented before many of the benefits of AI can be gained in markets like transportation and health.[173]

OECD has on its part been active regarding AI, as OECD has taken part in AI discussion also with "The OECD Principles on Artificial Intelligence", which, at least according to the OECD webpage, "promote AI that is innovative and trustworthy and that respects human rights and democratic values". OECD member states adopted the principles in May 2019, when they approved the OECD Council Recommendation on Artificial Intelligence (**Recommendation**). These principles set standards for AI that are practical and flexible enough to stand the test of time, even in such a fast-evolving technological field as AI. They complement existing OECD standards inter alia in privacy, digital security risk management and responsible business

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[173] OECD 2016, p. 88.

conduct areas. The Recommendation also offers five suggestions for governments: facilitate public and private investment in research & development to spur innovation in trustworthy AI; foster accessible AI ecosystems with digital infrastructure and technologies and mechanisms to share data and knowledge; ensure a policy environment that will open the way to deployment of trustworthy AI systems; empower people with the skills for AI and support workers for a fair transition and; co-operate across borders and sectors to progress on responsible stewardship of trustworthy AI[174]

The Recommendation consists of only two sections. The first section is called "Principles for responsible stewardship of trustworthy AI" which is divided into five different principles. It is also underlined that those five principles are only complementary and should be considered as a whole. These five principles are 1.1 Inclusive growth, sustainable development and well-being; 1.2 Human-centred values and fairness; 1.3. Transparency and explainability; 1.4 Robustness, security and safety; and 1.5 Accountability. From these principles, the most interesting ones for this thesis are the principles 1.4. and 1.5. The principle of robustness, security and safety go as follows:

> "a) AI systems should be robust, secure and safe throughout their entire lifecycle so that, in conditions of normal use, foreseeable use or misuse, or other adverse conditions, they function appropriately and do not pose unreasonable safety risk.
>
> b) To this end, AI actors should ensure traceability, including in relation to datasets, processes and decisions made during the AI system lifecycle, to enable analysis of the AI system's outcomes and responses to inquiry, appropriate to the context and consistent with the state of art.
>
> c) AI actors should, based on their roles, the context, and their ability to act, apply a systematic risk management approach to each phase of the AI system lifecycle on a continuous basis to address risks related to AI systems, including privacy, digital security, safety and bias."

The principle 1.5 about accountability states that "AI actors should be accountable for the proper functioning of AI systems and the respect of the above principles, based on their roles, the context, and consistent with the state of art."[175]

The second section is about national policies and international co-operation for trustworthy AI, which also consists of five different principles concerning research, digital ecosystem, policy

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[174] OECD / What are the OECD Principles. It should also be noted that the OECD Recommendations are not legally binding, but they are still highly influential. They have set the international standard in a wide range of areas and helped governments design national legislation, like the OECD Privacy Guidelines have done.

[175] OECD 2019.

environment, labour market and last international co-operation. The first four principles are about national policies and the last one, as can be concluded from its name, is about international principles. Under the principle 2.5 International co-operation for trustworthy AI

> "a) Governments, including developing countries and with stakeholders, should actively co-operate to advance these principles and to progress on responsible stewardship of trustworthy AI.
>
> b) Governments should work together in the OECD and other global and regional fora to foster the sharing of AI knowledge, as appropriate. They should encourage international, cross-sectoral and open multi-stakeholder initiatives to garner long-term expertise on AI.
>
> c) Governments should promote the development of multi-stakeholder, consensus-driven global technical standards for interoperable and trustworthy AI.
>
> d) Governments should also encourage the development, and their own use, of internationally comparable metrics to measure AI research, development and deployment, and gather the evidence base to assess progress in the implementation of these principles."[176]

What then these principles have on the AI liability? The principle 1.4 sounds quite much what is expected from the manufacturer about the product. The product, in this case, AI application, needs to be safe for regular use or foreseeable use/misuse and it should not have unreasonably safety risk, which is almost exactly what I talked about on chapter 2.2.1 on manufacturer's liability. The principle also talks about risk management, which likewise is already at minimum discussed in national legislation. This principle is then supplemented by principle 1.5 about accountability, which quite clearly states that if the application does not function as it should, then the AI actor, like the manufacturer or by the context also the owner, has accountability over it. In the second section, there is not so much about liability, but it has something to give for the international legislation and agreements on AI. The principle 2.5 basically encourages different states to act together and with OECD to create common technical standards for AI and to advance these principles, which I understand to mean all principles in the Recommendation, so AI policies, safe use of AI and risk management.

In addition to all this, the UN's specialized agency for information and communication technologies, the International Telecommunication Union (**ITU**) leads the organisation of the annual "AI for Good Global Summit", aimed at building a common understanding of the capabilities of emerging AI technologies, with the help of other UN organisations. In the summit of 2019, ITU and its 37 UN partners updated the 2019 version of the Compendium "UN

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[176] OECD 2019.

Activities on Artificial Intelligence", which outlines the uses of AI. It also offers insights into the challenges associated with AI by addressing ethical and human right implications and invites all the parties regarding AI to consider how best to work together to ensure AI serves as a positive force for humanity.[177] The uses of AI by UN organisations are for example, by The Food and Agriculture Organization to detect fall army worm damage using a mobile application,[178] by UN Environment Programme to monitor water-related ecosystems with the help from Google Earth Engine and the European Commission's (**Commission**) Joint Research Center[179] and by UN World Tourism Organization to select top startups that use AI as a way to predict and analyze tourist behaviour.[180]

One interesting activity on AI in the UN Activities on Artificial Intelligence is the AV project of the UN Economic Commission For Europe. Their Sustainable Transport Division provides the secretariat services to the World Forum for Harmonization of Vehicle Regulations (**WP.29**), the World Forum that integrates into its regulatory framework the technological innovations of vehicles to make them safer and more environmentally comprehensive. WP.29 has been working since 2014 on technical regulations for automated and autonomous vehicles, and it has found that there are some prominent AI applications, like the vehicle self-driving capability, for the automotive sector. WP.29, which is the regulatory body managing the three Multilateral Frameworks related to the construction of vehicles, their subsystems and parts as well as the periodic technical inspection of road vehicles, is monitoring the technological developments regarding AV's. However, unlike in some national legislative framework, WP.29 did not take any action framing the use of AI in vehicles. That was because WP.29 thinks that any regulatory measure would be premature at this point, and they would just limit the innovation and technological development for the AV's. Still, the WP.29 adopted the Framework Document for Automated Vehicles drafted by the China, EU, Japan and the US. The Framework Document contains the Safety Vision for automated Driving as well as Key Safety Aspects relevant to these products.[181]

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[177] United Nations 2019, p. vi.

[178] United Nations 2019, p. 3.

[179] United Nations 2019, p. 32.

[180] United Nations 2019, p. 68.

[181] United Nations 2019, p. 29.

4.2 *Analysing national and international Artificial Intelligence liability*

4.2.1 International liability laws regulating Artificial Intelligence liability

As one could see from the previous section, there are already discussion, guidance, agreements and regulation regarding liability and, in some extend, also AI, but as is the case with many states national law, there is not much legislation and agreements regarding AI liability. In this section, I am going to go through some legislation and agreements regarding already existing international legislation and agreements, for example, on electronic communications, and see how they could be amended to cover also AI.

In the current legislation, there are some great conventions and other regulation, which could be extended for AI, by taking into account also "normal" liability rules and international doctrines. There is, for example, a UN convention called "United Nations Convention on the Use of Electronic Communications in International Contracts", which Article 12 is a general principle for AI liability. Article 12 states that a person, who can be a natural person or a legal entity, on whose behalf a computer was programmed should ultimately be liable for any message generated by the machine.[182] So even though that convention is not about AI liability per se, there are some excellent principles for it.

As a whole, Article 12 goes as follows:

> "A contract formed by the interaction of an automated message system and a natural person, or by the interaction of automated message systems, shall not be denied validity or enforceability on the sole ground that no natural person reviewed or intervened in each of the individual actions carried out by the automated message systems or the resulting contract."

The meaning of the article is opened up in the Electronic Communications Convention Explanatory note section 213, according to which:

> "Article 12 is an enabling provision and should not be misinterpreted as allowing for an automated message system or a computer to be made the subject of rights and obligations. Electronic communications that are generated automatically by message systems or computers without direct human intervention should be regarded as 'originating' from the legal entity on behalf of which the message system or computer is operated. Questions relevant to agency that might arise in that context are to be settled under rules outside the Convention."[183]

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[182] Čerka – Grigienė – Sirbikytė 2015, p. 378.

[183] Čerka – Grigienė – Sirbikytė 2015, p. 383.

As can be seen from this note, electronic systems cannot be held liable, meaning that computers are not seen as legal persons by international law, and so only natural and legal persons can be held responsible or at least they should ultimately be the responsible party. This is because of the general rule that the user of the tool is responsible, as the tool does not have its own will.[184] This matter is not usually a problem in situations where the owner has acted intentionally or otherwise very carelessly or if the AI product would have had a defect on it in manufacturing. The problem might be, however, in events where the AI itself has caused harm, particularly when talking about fully autonomous robots.

Ugo Pagallo explains that the Unicitral document enclosed in the proposal of the UN Convention on the Use of Electronic Communications in International Contracts states that "general principles of agency law (for example, principles involving limitation of liability as a result of the faulty behaviour of the agent) could not be used in connection with the operation of such systems. The Working Group reiterated its earlier understanding that, as a general principle, the person (whether a natural person or a legal entity) on whose behalf a computer was programmed should ultimately be responsible for any message generated by the machine… As a general rule, the employer of a tool is responsible for the results obtained by the use of that tool since the tool has no independent volition of its own."[185]

Hence, according to the proposal, it could be reasoned that a robot, as a machine, should be seen as a tool. Therefore, the user or the manufacturer would be the responsible party when a robot makes a mistake. This idea goes partly with the approach discussed in the earlier section that robots could be compared to animals, and the owner should ultimately be responsible. Nevertheless, Pagollo lists three reasons why the "robots-as-tools" approach may not be okay after all. The first reason is that very likely humans would delegate complicated cognitive tasks like acquiring knowledge for decision-making to smart robots. Secondly, it does not necessarily mean that when the principal delegates task to a robot that the legal effects of the behaviour of the robot should inevitably fall upon the principal. Although, the robot's counterparty C should be allowed to expect, in good faith, that the machine really means what it declares, when negotiating with the robot, so that principal cannot evade liability by claiming he did not intend to conclude such a contract. The third reason is that the robots-as-tools approach seems

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[184] Čerka – Grigienė – Sirbikytė 2015, p. 384.

[185] Pagallo 2013, p. 98.

unsatisfactory when responsibility and risk must be distributed between, for example, operators and users as principals of the robot. Operators and users of robots should be held responsible for the different errors of the machine and the circumstances of the case.[186]

The approach in the proposal of the UN Convention on the Use of Electronic Communications in International Contracts is almost the same as in the US Computer Information Act, which really is not so surprising. Even though it cannot be said for sure, it looks like the UN Conventions copied the US Act here. It should not matter who are the parties of the contract or who act on behalf of the parties, the contract should still be binding. Therefore also contracts made by the robot-agent should be valid. In my opinion, Pagallo's reasons against keeping robot as a tool make sense, as especially self-learning AI robots cannot really be considered just as a tool, but something more. Still, even agreements made by a human agent are binding, so it should not be different here.

What comes to state responsibility in this matter, also states should be responsible for the decisions AI has made for them. As was stated in the Trail Smelter case, a state should not allow to use or permit the use of its territory in a way which causes injury to property or persons. This same should apply when damages were caused because of the robot acting behalf of a state, notwithstanding if the robot is kept as a tool or not. This issue should also go under Article 2 of the ILC Responsible Articles. From this article, it can be seen that if the act or omission is attributable to the state under international law, it is an internationally wrongful act (and it breached an international obligation of the State.

I see this in a way that if an internationally wrongful act is done on behalf of the State, the State should be responsible and it does not matter who does it, as long as it is attributable to the state under international law. The states would get out from charges too easily if the act of the robot would not be binding to the state, so in the worst-case scenario, states would blame everything to the robot and save themselves from liability. For this reason, in my opinion, the UN Convention on the Use of Electronic Communications in International Contracts should be amended to cover also robots and other AI products and also make it apply, even though robots would not be seen as tools.

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[186] Pagallo 2013, p. 99.

However, the liable party is protected from the liability under Article 6.1 of the Roman Convention, if he can prove that damage was caused solely through the negligence or other wrongful act or omission of the person who suffers the damage or of the latter's agents or if the liable person can prove that the damage was contributed to by the negligence or other wrongful act of the person who suffers the damage, or of his agents, the compensation shall be reduced to the extent to which such negligence or wrongful act or omission contributed to the damage. This same clause could and should apply also when a robot is involved, either as an agent of the liable party or the party who suffered damages. Furthermore, in the event we decide to stick to a strict liability model of vicarious responsibility in the case of robot-traders, Article 11 of the earlier mentioned Rome Convention suggests how we should interpret the idea that human's strict liability can be limited to the value of a robot's peculium, according to Pagallo. The Rome Convention states that the amount of financial compensation to be paid is determined based on the weight of the aircraft causing the damage. In the case of robots, the amount of the peculium could be established based on the "work contract activities" of the machine, so as to distinguish between, inter alia, the duties of a robot nanny and those of a robot waiter.[187]

Lastly a couple of things about international agreements. Just as previous international agreements have regulated technological advancements over the past decades for example, in fields such as chemical, biological and nuclear weapons, a similar UN-sponsored agreement is urgently needed to define the conditions of legitimacy for the employment of robot soldiers.[188] And robot soldiers are not the only robots, which would need to be regulated by international agreements, but also other types of robots should be regulated via international agreements in the same way as other technological advancements, as Pagallo mentioned. Another good example of an agreement about technology is the United Nations Convention on the Use of Electronic Communications in International Contracts, which was discussed at the start of this section. Ai products could be regulated in the same way with an agreement or that UN convention could be amended to include all kinds of AI products.

As the biggest issue in the AI regulation now is that it nearly does not even exist and for example, the conventions, agreements and article do not quite cover the AI products, the solution here would be to make new agreements and articles or amened existing ones. The

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[187] Pagallo 2013, p. 134.

[188] Pagallo 2013, p. 190.

examples presented here are good ways to regulate, but if some agreement applies only to normal aeroplanes, it does not matter how good and applicable it is, but if it delimits or does not cover AI at all, then those articles are not usable. Some problems are also coming from the fact that always the owner or developer just cannot be made responsible, especially if the robot is a self-learning smart robot and even a reasonable owner would not have been able to know or prevent the acts of the robot. For these occasions, granting an ePersonality to robots should also be recognised in international law and this subject I am going to consider next.

4.2.2   What national legislation can give for international legislation on AI

As stated above, I am going to present some of my thoughts on what parts of the national legislation guidance and regulation could also be implemented to international law for better international control on AI. My main idea here is that I am going to go through a couple of issues, which I have already established and found possible solutions to them from the measures, which I have studied earlier. In the same way as the UN Convention on the Use of Electronic Communications in International Contracts is almost the same as in Electronic signatures in Global and National Commerce Act, 15 U.S.C., some other regulation and ideas could be implemented from national laws to international law to supplement the regulation of AI liability in international law.

First is the owner's and manufacturer's liability in an international perspective, especially when the damage caused by AI is transboundary. The problem could arise here regarding state responsibility and jurisdiction, as discussed earlier. One possible solution to this from national, or more precise union level, is giving ePersonality to robots, which also should be recognised by international law. As mentioned earlier, providing ePersonality to robots could make robots liable for themselves, so protecting the manufacturer (and possibly the owner) in case of self-learning and a fully autonomous robot would cause damages. Giving ePersonality could also mean that robots need to be also given rights, like voting rights and even citizenship.

Citizenship, however, could be useful from the international law perspective. If the robot would get citizenship of some state, then the responsibility, as well as jurisdiction, for the damages what that robot causes, would belong to that state. With a robot having citizenship, all the incidents could be handled in the same way as the tortfeasor would be a human. Then it would not even matter if the owner and the manufacturer would both have different citizenships, as only the robot's nationality would count.

Under Article 2 of the ILC Responsibility Articles:

> "There is an internationally wrongful act of a State when conduct consisting of an action or omission: (a) is attributable to the State under international law; and (b) constitutes a breach of an international obligation of the State."

If the liable party cannot be found, it could be hard to find the action or omission attributable to a particular state. And the responsible party cannot be found if there is no clarity of the liable party, especially if all the potentially liable parties (so basically the owner and the manufacturer of the AI) are from different states. Giving robots ePersonality and citizenship will also help with this issue, as then the liable party is evident as well as the nationality, thus giving establishing the responsible state.

Of course, this problem could be solved in some other way too, but for example, making the owner responsible party, it would need first that the national legislations implement that. I do not see that very plausible approach, that under international treaties the owner would be liable and thus the owner state or the state where the owner has residence would be liable for another state, but in national law, it would not be so. Therefore it may be most natural in international regulation to follow the same principles as the majority of states have. Either way, the law here should be harmonized, so the treatment of AI would be universal as the new technology is also universal, and it could be in many places at the same time.

International law could also imitate national law by implementing the same kind of regulation as there is now or is being prepared in the US and the EU. One excellent example would be the Civil Law Rules on Robotics from the European Parliament. Even though it is more just a discussion and consideration than actual regulation, there are many good parts, which could be implemented in international law, for example, by an international agreement. As learned already, there is also a discussion about granting robots an ePersonality, which makes that resolution even better for international law to implement. Things like when the producer of a product is liable for a malfunction, rules governing liability for harmful actions and when the user of a product is liable for a behaviour that leads to harm are things that could also be given some thoughts in international conventions.

All in all, there are plenty of good legislations or at least thoughts about how to regulate AI in national and EU legislation, so in my opinion, it would not be pointless to see if they could be implemented to international law. Things like state jurisdiction and responsibility could be solved by granting robots ePersonality and citizenship and then the state, which citizenship they

have, would have responsibility and jurisdiction, at least in most of the cases. Of course, there will always be cases, where the liable party is hard to find, but if with some measures we could solve most of the cases, in my view that measure should at least be thought about. Everything cannot be solved with just agreements between a few states and, for example, ePersonality that kind of thing, which should be given more consideration in international law, and national laws.

5 CASE-LAW ANALYSIS AND OTHER LIABILITY EXAMPLES

5.1 *Nilsson v. General Motors LLC*

5.1.1 Case summary

The second AI-case concerns self-driving car and it is the first known lawsuit against a manufacturer, according to the U.S. Chamber Institute for Legal Reform[189]. In January 2018 a lawsuit was filed against a manufacturer over an accident involving an AV. In this lawsuit, a motorcyclist claimed that he suffered neck and shoulder injuries after a 2016 Chevrolet Bolt knocked him to the ground while travelling on a San Francisco street. General Motors (**GM**) and its Cruise subsidiary have had a permit to test AV's on California roads since June 2015. According to the quite short complaint by the motorcyclist, a driver was in the front seat, but he was "driving" the car in self-driving mode with his hands off the steering wheel. The operator instructed the Chevy Bolt to move from the middle line to the left lane. The complaint claims that the motorcyclist, who was travelling directly behind the self-driving car, attempted to move ahead and pass the car because it changed lane to the left. As he did pass the vehicle, the plaintiff claims that the Chevy Bolt abruptly swerved back into its original lane, striking him and knocking him to the ground.[190]

Nevertheless, there is more than one side to this story, as is often the case in car accidents. In a report GM filed with California's Department of Motor Vehicles, the automaker explained that the Chevy Bolt was driving in the middle lane until the car saw space and attempted to turn into the left lane. Because the minivan ahead of the Chevy Bolt in the middle lane slowed down, the Bolt deserted its attempt to merge into the left lane. At the same as the Chevy Bolt was coming back in the middle lane, the plaintiff was approaching the car, "lane-splitting" between the middle and right lanes in slow, heavy traffic. The GM's report also said that as the motorcycle moved into the middle lane, it "glanced the side of the Cruise AV, wobbled, and fell over". In addition, the San Francisco Police Department police report proves that the motorcyclist was at fault when he attempted to overtake and pass another vehicle on the right before it was safe to

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[189] Silverman – Wilson – Goggans 2018, p. 57.

[190] Nilsson v. General Motors LLC 1/2018, pp. 2-3 and Silverman – Wilson – Goggans 2018, pp. 57-58.

do so. Though, the motorcyclist's attorney says that the police report also supports the motorcyclist's version of the events.[191]

Maybe the most interesting part here is that the lawsuit names only GM as a defendant and it does not claim that the Chevy Bolt's operator would have contributed to the accident. However, the only claim is negligence, making the lawsuit more or less like a traditional auto accident claim than a product liability claim that would allege that a vehicle was defectively designed.[192] According to the complaint, GM owed the motorcyclist a duty of care to, "hav[e] its Self-Driving Vehicle operate in a manner in which it obeys the traffic laws and regulations," and GM "breached that duty in that its Self-Driving Vehicle drove in such a negligent manner that it veered into an adjacent lane of traffic without regard for a passing motorist, striking Mr Nilsson and knocking him to the ground."[193]

In addition, according to the Torts of the Future, if the case would have proceeded to trial, the plaintiff could have argued that the Chevy Bolt failed to perform as a reasonable person would in similar circumstances. Basically, the lawsuit treats the AV much like a person, rather than as a product. Authors of the Torts of the Future also state that the lawsuit suggests, in addition to suing for damages, that as cars become even more autonomous, attorneys may continue to bring traditional negligence claims to courts instead of needing to have complicated product liability lawsuits that likely necessitate expert testimony on auto design and autonomous technology. However, it seems to be inevitable that car manufacturers, who include AI and autonomous technology into their vehicles, are more likely than before to be named as defendants in cases involving motor vehicle accident.[194] Unfortunately (for regulation-wise) this case did not go to trial, but the parties settled the dispute between them. However, according to their "joint stipulation for dismissal with prejudice", GM "does not admit any liability as to the claims and causes of action asserted against Defendant".[195]

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[191] Silverman – Wilson – Goggans 2018, p. 58.

[192] Silverman – Wilson – Goggans 2018, p. 58.

[193] Nilsson v. General Motors LLC 1/2018, p. 4.

[194] Silverman – Wilson – Goggans 2018, pp. 58–59.

[195] Nilsson v. General Motors LLC 6/2018, p. 1.

5.1.2 Case analysis

So what does this case have to offer in terms of the AI liability? Well firstly, if this would have been a typical car accident, so driver colliding with the other driver, there would not have been any questing about the liable party. The driver controls the car and makes the decisions about speed or when to turn. Therefore, if in this case, there would not have been AI controlling the vehicle, the driver would have undoubtedly been the defendant. The story here does not tell why the motorcyclist chose GM as a plaintiff and not the driver or the AI-software developer. In the Uber's death case[196], mentioned earlier in chapter 2.2.2, the company did not have all the blame, as some responsibility was also distributed to the safety driver in the car, who did not monitor the driving environment and the operation of the vehicle, but she was more focused on her phone. The situations in Uber's and GM's cases are bit different though since the GM case was pure civil law case as car accidents usually are. In contrast, the Uber case involved death and thus a potential criminal liability, although it must be mentioned that at least the prosecutor did not charge Uber with a crime as there was no basis for it[197].

Secondly, here the case was not at least directly about a manufacturer's liability for defect product, but it was about the manufacturer's duty of care to have its product obey rules and drive negligent. It would have been nice to hear the court's opinion on that that if the manufacturer of AV has a duty of care towards other drivers or people altogether. In this case, the AV made its decision because of the car in front of it did something unexpected, and not because it would have had some sort of defect, like a short circuit. Here we come back to the same question already mentioned when talking about manufacture's liability that as products become more autonomous, traditional product liability law may fall to negligence principles. That then might focus on whether the product's action was reasonably foreseeable and could have been avoided through exercising due care.[198] So basically, if the motorcyclist could not have foreseen that the AV would change back to its original lane because the car in front of it was slowing down and the AV's decision to turn back could not have been avoided through exercising due care, then with this reasoning, the manufacturer could have been held liable.

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[196] The Verge / The world's first robot car death was the result of human error — and it can happen again.

[197] According to the letter written by the Yavapai County Attorney Sheila Polk, who was the prosecutor in charge of the case that time, Uber will not be charged with a crime, as there is no basis for criminal liability.

[198] Silverman – Wilson – Goggans 2018, pp. 13-14.

Nevertheless, this case shows that with the AV's, manufacturers need to be careful, because unlike with accidents involving regular vehicles, with AV's included they can be held liable or at least they can be sued.

Could any risk management policy, that is supervision and insurances, have helped in this case? At least insurances would not have prevented this, as it is not their task. As I do not know all the facts, it is hard to say what were the insurance terms in either party. However, I highly doubt that the conditions in any insurance during the accident would have covered the damage made by AV. In case the GM would have had insurance, which covers costs made by AV, there probably would not have been the need even to sue anyone. That is usually the case in car accidents that parties are not rushing to the court unless there is something unique to the case. Hence I would argue that sufficient insurance could have saved the parties for the trip to the court in the first place. What comes to the supervising AI, it probably would not have helped here either, as everything happened so quickly, and the supervisor cannot take control of the car and for example, do not let it change lane in the first place. However, if the GM would have some kind of supervisor system, then with the help of that they could analyse what happened and with that knowledge, try to prevent something like this happening again.

5.2   *Examples of liability issues caused by real-life robots*

5.2.1   Liability caused by a service robot

A robot, which carries out useful tasks for humans or equipment, however not industrial automation application, is called a service robot. One example of a service robot for household use is a robotic vacuum cleaner.[199] So how does the liability divide between different parties when the robot causing damage is a harmless service robot, for example, small vacuum cleaner? So primarily vacuum cleaners are quite safe products, so this robot is not considered as dangerous. This semi-autonomous cleaner goes around the house on its own and seeks dust and dirt from the floor while avoiding chairs, walls and other obstacles. The owner does not need to, move it, push it or anything. Just command it to clean with mobile app or equivalent, and it does the job. Now the owner, Mark, has his grandmother Susan, who has difficulties in moving and fragile bones, visiting him. Mark has commanded his vacuum cleaner robot to clean in the

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[199] Bertolini – Salvini – Pagliai – Morachioli – Acerbi – Trieste – Cavallo – Turchetti – Dario 2016, p. 4.

same room his grandmother is while he is indifferent room. The robot is on his business, but manage to run into Susan, who falls breaking her leg and thus rising liability claim to someone.

To start looking for the liable source, first what need to do is to see if the robot was defective. As mentioned earlier, the product manufacturer has strict liability in case of a defect in the product which has occurred during the production or if the product does not have an adequate warning label in it. In this case, the manufacturer/developer could be liable because of the defect so if the robot had some malfunction because of defect the robot vacuum cleaner had when purchased it or because there is some unique manufacture defect only in his vacuum cleaner. Another possibility to get manufacturer liable is that if the product did not have adequate warning label warning, for example, "do not let the robotic vacuum cleaner without supervision or otherwise it may cause harm". If one of these is the case, then Susan could hold the manufacturer liable, if she can provide these facts, causation and damages. She could also sue Mark, who could then hold the manufacturer liable and demand reimbursement from them.

In a situation where there is no defect or inadequate warning label in the robotic vacuum cleaner, then the owner could be held liable. We can presume it is an ordinary robotic vacuum cleaner without any dangerous add-ons, so the strict liability in hazardous robots does not need to be considered. However, if there is no defect to make the manufacturer liable, the owner could be liable for negligence, for example, for negligent supervision. So that Susan could sue Mark for negligent as an owner of the robot, she must prove that Mark owed her a duty of care as she was a victim within the foreseeable zone of danger, that by his negligent supervision his conduct fell below the standard of care one of a reasonably prudent person, that such behaviour is the reason what caused her injuries, because the accident was foreseeable, and that she suffered damages.[200]

The last scenario is that everyone is liable to Susan's accident, so the cost of damages goes to everyone. If Susan was negligent herself and caused the accident because of that or at least contributed to the accident because of her own negligence, Mark could raise that as a defence. Mark could have warned Susan of the vacuum cleaner and that she needs to watch her step. If curiosity got to Susan and she went to look closer to the robot, and because of that she stepped on it, of course then she cannot hold Mark fully responsible for the accident. If this would be

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[200] Schaerer – Kelley – Nicolescu 2009, p. 76.

the case, then liability, as well as the costs regarding the accident, would be divided between all parties involved, so manufacturer, owner and victim.

5.2.2   Liability caused by a security robot

Another example involves more dangerous and potentially lethal, security robot. Here the accident could be that Mark has a security robot on his piece of land guarding the property. Lauren then is jogging past Mark's property, and for some reason, the security bot chases Lauren and gives her electricity shock ending up hurting Lauren. Here the manufacturer's liability works the same way as with the robotic vacuum cleaner, so if there is a defect or the warning label is not sufficient enough, or there even is not any, then the manufacturer could be held strictly liable. If there is no defect in the robot, in its software or its sensors and there is no insufficient warning label in the robot, manufacturer's and developers' liability are ruled out quite effectively. In this case, the owner's responsibility is a bit different and more interesting.

A person has a strict liability in situations like this when there is a highly significant risk of harm even though the defendant has taken all proper precautions if the damage is foreseeable and characteristic to the risk presented by the activity and resulting from it. It is easy to argue that owning a security robot is a situation where a highly significant risk of harm is present. Also because strict liability rules apply with movable objects, like motor vehicles and dangerous animals, for their higher risk to cause severe damage, this gives the owner of the security robot strict liability for any damage caused by the robot.

Even if Mark has done everything as one could expect from a reasonably prudent person, with just owning a dangerous robot, he can be held strictly liable for the damage done by the robot. With using the comparison of dangerous robots to dangerous dogs, just the type of the robot, security robot, could be that kind of "breed" of a robot that it can be held dangerous. That means that any harm done by the robot will make the owner strictly liable, so in this case, Mark would be liable for the damage done to Lauren, even if he would not have done anything wrong and as with dangerous dogs under the Dangerous Dogs Act 1991, his security robot could be set to be destroyed if it would constitute danger to public danger, for example, because of malfunction in its system. With a dangerous robot, Mark could have joint liability with the manufacturer in case of failure or another defect in the robot, as they both would have strict liability. Even if not equating dangerous robots to dangerous dogs, owner of the perilous robot could still be held

strictly liable as owning a movable object, as it has a high chance for accidents that could cause severe damage.

Lastly, as with the vacuum cleaner, the accident could be entirely or partly the victim's fault. Here the case could be that Lauren was trespassing on Mark's property, where were proper signs warning about security robot in the property. So, Mark could argue that Lauren assumed the risk when she did not care about warning signs and came to his property without permission. So for example, under Germany strict liability rules there is a defence for external cause, under which acts of the claimant may be invoked if they were entirely beyond the defendant's control. [201] However even if Mark could use that defence, he cannot escape liability entirely, and he could still end up liable for part of damages, as with the robotic vacuum cleaner although in this case, when equating dangerous robots to dangerous dogs, the court would not necessarily rule that the robot must be destroyed. And like with the vacuum cleaner, if the security robot here would have some defect, the manufacturer would also be liable, and hence with the victims' action, every party would be liable.

5.2.3 Can chatbot cause liability to its owners?

Lastly, I go quickly through liability issues arising from different kind of robot or more just computer software, chatbot. Chatbots or virtual assistants are getting more and more popular, and even Finnish Tax Administration has its chatbot.[202] However, when this chatbot makes a mistake or does not behave appropriately, who is liable? For example, if Tax Administration's chatbot gives incorrect information which party has the liability? Here we can assume that in case of a defect in the software, that is the chatbot malfunctions and starts giving wrong information, the developer has the liability as explained earlier. And if there are no malfunctions and no defect in the software, then the liability falls to the owner, the Tax Administration.

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[201] Van Dam 2015, p. 301.

[202] https://www.vero.fi/en/About-us/it_developer/e-service-development/#chatbot. It is said there that their chatbot helps taxpayers in situations where help is needed quickly, and it can find essential information about the taxpayer's problem as quickly and correctly as possible from a large amount of background data.

It just could be that the bot was taught wrong; the owner did not supervise the bot enough, or other negligent behaviour. And while information giving computer software cannot be held as a dangerous robot, so to give the owner strict liability by owning deadly robot, it could be worth to give strict liability also to owners of AI application providing essential information which has a massive effect to the person receiving that information. Although in this specific case involving state authority which has public liability, so chatbot and the information it gives is an act subject to public liability by which the owner, Tax Administration, has liability if nothing else rises liability before that.[203]

Another example, based on actual events, is the Microsoft's former chatbot called Tay, who was an artificially intelligent chatbot with the personality of a 19-year-old and which the company hoped that people would interact with on different social platforms like Twitter and Kik. Microsoft's idea was that by chatting with Tay, people would help her learn while having some fun and aiding her creators in their AI research. However, what started as a friendly and fun experiment, ended in 24 hours as twitter users taught it to say awful and racist things.[204] So in less than 24 hours, Tay went from human loving bot to full Nazi, because people did not teach it the way Microsoft thought or wanted to, but instead, they tweeted all kind of misogynist and racist stuff which ultimately led to the point where Tay itself turned to be misogynist racist.[205]

This happened already in 2016, and no claims were raised against anyone, but this whole thing still raises the question about who would be liable. If media were believed, the liable party here would be the Twitter users who taught Tay all that stuff, because many headlines in media were about how Twitter users taught Tay to be a racist.[206] So the question here is that should the

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[203] An example of public liability gives the Section 118 of the Constitution of Finland by which anyone who has suffered damage because of official's negligence has right to demand compensation for damages from the public entity or the official.

[204] MIT Technology Review / Why Microsoft Accidentally Unleashed a Neo-Nazi Sexbot.

[205] The Verge / Twitter taught Microsoft's AI chatbot to be a racist asshole in less than a day.

[206] In addition to Verge's news see e.g. Forbes: "How Twitter Corrupted Microsoft's Tay: A Crash Course In the Dangers Of AI In The Real World" https://www.forbes.com/sites/kalevleetaru/2016/03/24/how-twitter-corrupted-microsofts-tay-a-crash-course-in-the-dangers-of-ai-in-the-real-world/#955dede26d28 and Washington Post: "Trolls turned Tay, Microsoft's fun millennial AI bot, into a genocidal maniac" https://www.washingtonpost.com/news/the-intersect/wp/2016/03/24/the-internet-turned-tay-microsofts-fun-millennial-ai-bot-into-a-genocidal-maniac/.

liable party be Microsoft as the developer and owner of Tay or the Twitter users who taught Tay to be racist and run down some celebrities.

When following the rules mentioned above, they would need to look if there is defect or malfunction in the chatbot to hold developer strictly liable, although as the developer and owner, in this case, are the same entity. Therefore it does not matter so much whether the liability falls to the developer or the owner. Seemingly there probably were not any visible defects. However, it could be argued if the self-learning feature, which allowed Tay to learn all the racist and other vulgar stuff without restricting it, was a defect or not. As chatbot cannot be held as a dangerous for life and health, the strict liability of the owner is not a suitable way to keep the owner liable. What then comes to the Twitter users, they probably cannot be held liable now, but maybe in the future when self-learning AI comes more common, there should be some legislation to cover also maliciously teaching AI.

6   CONCLUSIONS

6.1   *Final conclusions*

One thing is for sure: like already seen in the introduction, AI is a really international thing, and it has spread rapidly all over the globe in the past few years. It also used almost everywhere, by individuals or state. As already mentioned earlier, there are lots of different AI products already in use, like self-driving cars, robot vacuum cleaners and personal assistants in smartphones. Also, for example, the Slovenian Ministry of Finance uses a machine-learning system to detect tax evasion and tax fraud, Belgium police are using a predictive algorithm to predict car robberies. In Poland, AI is used to profile unemployed people and decide on the type of assistance appropriate for them.[207] As also international organisations like the UN and OECD are talking about AI, it is a huge thing. Having said that, it should be remembered that with great power comes great responsibility.

Because AI has spread so wide and it is used everywhere, the question is not "*if* damages happen", but "*when* damages happen". For this reason, the liable party should be clear, be it car crash with AV, robot vacuum cleaner autonomously tripping someone, autonomous weapon system launching by itself or anything else. It is also vital information to know how to manage risks regarding AI and understand the importance of the insurance system. The answer to the question "How someone can be liable" is essential information also for insurance companies, when they are drafting new insurance policies regarding AI. Furthermore, international organisations are already writing and thinking about different measures for AI, be it guidelines, different actions from organisations or even thinking of amending old legislation to correspond better for today, like the EU is doing with the Product Liability Directive.

The first thing I noticed regarding AI was that there is not only one definition for it, as the OECD has its definition,[208] but also the Encyclopaedia Britannica[209]and the EU[210] have their definitions. In addition to these are many more definitions around the world. Even though the

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[207] European Parliamentary Research Service 2019, p. 2.

[208] OECD 2016, p. 86.

[209] Ertel 2017, p. 2.

[210] European Commission 2018, p. 1.

definitions do not fundamentally vary from each other, I would argue that having just one universal definition for AI would make everything easier, also regarding AI liability. However, I realize that this is easier said than done. Many different meanings may become a problem regarding insurances. The potential problem here is that if different insurance companies use different definitions in their policies, then it is hard to know which company policy covers accident with the specific AI. Also, it could be hard to understand, if the insurance covers the accident as you are not sure if the AI application hit the definition the insurance company uses. Even though AI applications like a self-driving car or robotic vacuum cleaner would have universal definitions, in my opinion, there should be a universal definition for the concept "Artificial Intelligence" too, even if to just avoid errors.

In main section 2, I discussed the individual liability by national law and provided answers to the questions "Who is liable when AI makes a mistake?" and "On what basis that party can be held liable?" and I found couple possible parties and many possible reasons. Although I must say here that when looking for the liable parties, there are not too many parties to look for, even though the amount of possible responsible parties in a car crash is a bit higher than in typical car crash, it is not too much. The harder question here is choosing the liable party and giving grounds to why that party is liable. I examined as liable parties the manufacturer (and developer), the owner and the robot itself. What I found here is that there is not any unambiguous answer. At this moment, the owner, the manufacturer, or they both can be liable, depending on the circumstances. In the (maybe even not so distant) future also the robot itself could be responsible alone or with the owner or manufacturer.

The manufacturer's liability depends, or a couple of different things. Firstly, the manufacturer could be held strictly liable if the robot has a defect or it does not have an adequate warning label. [211] Often the manufacturer's liability is strict, so the manufacturer can be liable even if he did nothing wrong. With bundled devices, so for example devices where there are different devices bundled as one like a self-driving car, the possible liable parties are many, and it could be hard to say who is liable for the defect. As mentioned earlier, in this case, the contributory negligence could kick in.[212] In its essence, contributory negligence is the plaintiff's failure to exercise reasonable care for their safety. Contributory negligence can be used often in cases,

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[211] Kelley – Schaerer – Gomez – Nicolescu 2012,p. 1864.

[212] Gluyas – Day 2018, p. 2.

where the victim has done or did not do something, which contributed to the emergence of the injury. In this case, it means that for example, the manufacturer, who put the car and its parts together, should have been more careful and scrutinize the parts for any defect.

It can also be seen from the case law that people could hold manufacturers of the self-driving cars liable rather than the owner of the car, as happened in the case Nilsson v. General Motors LLC, where the victim sued General Motors, the manufacturer of the vehicle and not the owner. This was because, according to the complaint, GM owed the motorcyclist a duty of care to, "hav[e] its Self-Driving Vehicle operate in a manner in which it obeys the traffic laws and regulations," and GM "breached that duty in that its Self-Driving Vehicle drove in such a negligent manner that it veered into an adjacent lane of traffic without regard for a passing motorist, striking Mr Nilsson and knocking him to the ground."[213] Even though this case was finally settled and we did not get any preliminary ruling from the court, it could be argued that if the majority of the people would think like the motorcyclist and when we add the strict liability of the manufacturer to the case, then at least in car accidents involving a self-driving car the liable party could generally be the manufacturer of the vehicle.

Owner's liability on robots was mainly compared to the owner's liability to the animal, employer's liability on the employees and liability in a situation where the robot acts as an agent. In my opinion, these all are plausible and good ways to hold the owner liable for the damages made by the robot. The comparison made by Schaerer, Kelley and Nicolescu that semi-autonomous machines are more equivalent to animals, which act on their own, than to everyday products, which are not as autonomous and do not act by themselves,[214] is quite suitable in my opinion. As an example, I own and use a regular vacuum cleaner and a robotic vacuum cleaner and both causes damages. With the regular vacuum cleaner, unless it explodes because of the manufacturing defect, I am of course liable for the damages as I was the one using it and causing damages. When no one uses the vacuum cleaner, it does not cause any damages, as it cannot function alone.

On the other hand, the robotic vacuum cleaner can work and move by itself, even when I am not around. As I am not using the robotic vacuum cleaner, it would not make any sense to have

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[213] Nilsson v. General Motors LLC 1/2018, p. 4.

[214] Schaerer – Kelley – Nicolescu 2009, p. 75.

me liable, as I was not even there. However, it would be quite harmful to the victim, if he would not get any compensation for the damages he suffered, as there would not be any liable party to pay damages. Without more regulation or guidance, the victim probably would not get any compensation. Who could say that I am liable when other person trips to my vacuum cleaner, which is lying on the living room floor?

Analogously robots can be compared to animals and maybe also a bit to children. Both of them are capable of causing harm, but neither one of them are held liable, but instead, their owner or parents are held responsible and sometimes, especially regarding dangerous animals, strictly liable. I find this analogy good and quite good starting point when trying to figure out the liable party, at least as long as robots are not ePersons and cannot be held liable for themselves. Furthermore, the liability in an agency relationship complements the owner's liability on its half. If someone lets the robot act behalf of him, as was in the WHOIS -case, the other party should trust that the contract made with the robot is valid, unless there were some specific reasons to think otherwise. So this in this way it makes sense to hold the principal liable for the actions of the robot agent in the same way as a human agent.

When coming back to strict liability, there is also possible to ease it, as seen in Ugo Pagallo's example. Same rules also apply for dangerous products now, but they might not be enough for fast advancing technology. So to quote Pagallo, "[w]ould such responsibility vary according to the different typology of robots with which we are confronted?"[215] This is one of the reasons why the problem in finding the liable party is real and new rules regarding AI is needed.

The final part of the individual liability is the robot's being liable for themselves in the same way as people are liable for their own actions. Having an ePersonality for the robots would be quite a big thing, and it would "save" the owner and manufacturer from the liability in many situations. The interesting part here, in my opinion, is that this is not just consideration of legal scholars, but the European Parliament has thought it. If someday this could be true, I think it would be a massive step for legislation. This would also mean that the manufacturers and owners could have less fear of being subject to liability.

However, at least in case of the manufacturer's liability, it would not take it away completely, as manufacturers still need to take responsibility for the defects. Besides at least at first, robots

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[215] Pagallo 2013, p. 34.

cannot pay any damages by themselves, so either the manufacturer or the owner would be responsible for them. I also agree with Wagner that the mandatory insurances would be the best way to "fund" the robots in case of accidents. I also agree with him that it does not matter if the insurance is paid by the manufacturers or the owners/users because in the end the owner/user will end up as a payer in one way or another. That being said, I think for the future giving ePersonality to robots will be an excellent thing, at least in point of view of the law.

International liability, on the other hand, is a bit different thing even though the fundamental rules are the same there too. The general liability on international law is mainly based on various treaties and for the compensation principle. For example, for strict liability in hazardous activities is found in many cases on special agreements between states. For those agreements to cover harms caused by the AI, then the accidents caused by AI should be included in those agreements in the same way national legislation needs to include car accidents caused by AI. Furthermore, as by the state responsibility doctrine state is responsible for the damaged caused by that state or some individual in that state.

However, what would be the case in the situation when the company stated in state A manufactures a robot or software for the company in state B and that robot or software then causes damages in the state C. Which state then has to bear the responsibility? It could be both A and B, but is it fair to make state A responsible here because the user of the robot should be accountable or should the manufacturer be strictly liable as in national law, even though there would not be any special agreement for this? For AI liability, maybe international law could look at some principles from the national laws or inter alia EU legislation and apply these principles to international law.

The other possible problem there could be is robots ePersonality. As "normal" humans have nationalities as a fundamental right, should robots have citizenship too and if they have a nationality, is the state, whose nationality robots have, responsible for the damages the robots have inflected? I would argue that at least in the future if robots are considered equal to humans, and they would even have voting rights, as suggested by the BBC,[216] then they should be regarded as humans in this case too and if using the nationality perspective from the state jurisdiction doctrine. Therefore the state whose nationality the robot has would also have the

[216] BBC / Robots could demand legal rights.

jurisdiction over it. The problem still could be that if AI launches a missile to another country without any human influence, who has the responsibility and who has the jurisdiction. This is a question where I do not have an answer, and it is something, that should and need to be inspected more closely as in the future, there is a possibility for that.

As a summary, it could be said that there is no simple or just one answer to the question for who is liable. If there would need to have a straight answer to who is liable, it could be something like: "The liable party depends on the circumstances of the event and the concerned AI application." Therefore the better question could be. "For what reason the party X is liable in this specific case?". As it is often with the new technology, the technology evolves faster than the law. The same problem is in this case, and even if it could seem to be evident that some specific party is liable, in reality, that party probably is not liable by law. It could be that the law is behind and does not recognise the liable situation or even the technology or it could be that party which at first seems to be liable cannot be held liable.

This is the case, for example, with the self-driving car. We are used to that if someone crashes into my car, I hold the driver liable for the damages. However, with the self-driving car, it probably is not so, especially if the driver could not even do anything to prevent the crash. Here then I would demand damages from someone else, most likely from the manufacturer. So the question about AI liability is not so straightforward as it first could see, because either the liable party is someone else than you think or the law just does not recognise the situation yet. Therefore it is essential to think about these questions and amend the law in a way that it recognises these situations and the victims get compensation in all the possible cases, be it national or international damage.

6.2   *Further research*

As thesis needs to be relatively short and the subject thus needs to be quite limited, I did not have time or space to study all the interesting and relevant topics that I think would need to be reviewed more. For this reason, I wanted to name a couple of these topics that I would have wanted to study. First, what I would have wanted to examine is the AI's criminal liability. I focused only on civil liability, and I knowingly ignored criminal liability, but it is an essential part of liability too. I think the study regarding the criminal liability could and should be about that can a robot have criminal responsibility and, for example, can the owner of the robot go to prison because of the crime made by the AI, as usually people cannot be sent to prison on behalf

of someone else. In addition, as punishments have the deterrent and preventive effect, as their purpose is also to prevent crimes for happening because people do not want to have to pay fines, go to prison or get entry into the criminal record. How would then the deterrent and preventive effect work in the situation where the AI would have the criminal responsibility, as AI probably does not care if it gets into prison or like some software cannot even be put I the penitentiary? Furthermore, it probably is not so fair to put the owner of the AI to prison for the crime committed by AI, if the owner did not have anything at all to do with the crime.

Another question related to the criminal liability is the state's liability and jurisdiction in the international crimes, for example, if the AI launches a missile to another state or even to the same state by itself and even killing civilians. So in further research, I would like to study the state's responsibility and jurisdiction from this point of view, even though I already studied state jurisdiction in criminal liability previously a bit. The issue what I would want to find out regarding the state's criminal responsibility could the state face criminal responsibility if the AI launched missile all by itself without anyone affecting it. In addition, I would study what difference it would make regarding the liability and jurisdiction, if the AI, which launched the missile, would be made in another state. Would the manufacturing state then have responsibility?

I would also like to examine more about different US and EU cases in AI liability as well as the liability insurance system. I did not have enough space to study and analyse more cases, and I would like to see how the court's decisions have evolved in last ten or twenty years in the field of AI and especially AI liability. More research could also be in examining what kind of cases there have been in courts and what decisions there have been given in the US and EU. So, for example, how often the owner or manufacturer has been the defendant and how often the court has agreed that the defendant is liable or then found out that the defendant is not liable after all. It would be interesting also to see are the decisions similar in EU and the US or do they vary a lot between these two different jurisdictions.

Lastly, about the insurance system, I feel that there is a need to examine more at least that to what extent they would need to make cover harm made by AI. There is a need to balance between how much the insurance companies want the insurances to cover and on the other hand, how much the insurances need to cover. As a simple example, insurances will not be made to include every possible event, but it would be enough if they only cover malfunctions. Also, the terms need to be clear enough that people understand them. Still, the contents of the

insurance terms should specify accurately enough the AI applications, which would also mean that AI and AI applications would need to have unified definitions, so people can know for sure if the insurance covers the specific use or not.