AUTONOMOUS VEHICLES, COMPETENCE AND LIABILITY IN THE EU - ANSWERING THE CALL OF THE EUROPEAN PARLIAMENT

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Technology is taking immense steps in a short period of time and legislators are trying to keep up. Fully autonomous vehicles where human drivers are obsolete are not far away from becoming a reality. The EU aims at facilitating robotic advancements into legislation with the Proposition on Civil Law Rules on Robotics (205/2013(INL)). Consumer protection, market access and liability issues are of main importance concerning driverless vehicles.

The main goal of this master's thesis is to examine autonomous vehicles, competence and liability issues in the European Union context. In other words this thesis examines whether it is possible to regulate on autonomous vehicles on an EU level and if so, what the legislator must take into consideration when doing so or whether current legislation sufficient enough to grant protection for victims of traffic accidents involving autonomous vehicles. The scope of the study is set on future insurance policies, product liability and current national legislation with reference to international policies and regulation.

Different legislations on civil liability create a mixed and uncertain background for autonomous vehicles. A uniform and clear EU policy on autonomous vehicles would benefit consumers and market access of said products. The problems can be dissolved with creating an EU wide legal background for autonomous vehicles with product liability, insurance policies and a legal liability theorem. The private sector – the manufacturers and insurance industry – must have an active part in creating legislation and soft law policies.

The thesis has achieved its goal if it creates discussion on the importance of harnessing new technology, especially autonomous vehicles.

Keywords: EU law, autonomous vehicles, consumer protection, civil liability, non-contractual liability, product liability, market access.

TURUN YLIOPISTO
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Turun yliopiston laatujärjestelmän mukaisesti tämän julkaisun alkuperäisyys on tarkastettu Turnitin Originality Check –järjestelmällä.

Teknologia kehittyy hurjaa vauhtia ja lainsäätäjillä riittää työsarkaa pysyäkseen sen mukana. Itseohjautuvat autot, jotka ajavat ilman ihmiskuskeja tai -kontrollia, eivät ole kaukana todellisuudesta. Euroopan Unionin tavoitteena on fasilitoida robottiteknologia lainsäädäntöön: Euroopan Parlamentti on päätöslauselmaehdotuksessaan esittänyt suosituksista komissiolle robotiikkaa koskevista yksityisoikeudellisista säännöistä (2015/2103(INL)). Kuluttajansuoja, tavaroiden esteetön pääsy markkinoille ja vastuu kysymykset ovat tärkeitä koskien itseohjautuvia autoja.

Tämän pro gradu –tutkielman päämääränä on tutkia itseohjautuvia autoja, kompetenssia sekä vastuu kysymyksiä Euroopan Unionin kontekstissa. Toisin sanoen, tämä tutkielma tutkii mikäli on mahdollista säätää itseohjautuvista autoista EU tasolla, mitä lainsäätäjän tulee ottaa niitä säätäessään huomioon sekä onko nykyinen EU tasoinen lainsäädäntö riittävä suojaamaan uhrien oikeuksia rajat ylittävissä auto-onnettomuuksissa. Tutkielma keskittyy vakuutuksiin, tuotevastuuseen sekä nykyisiin kansallisiin ja kansainvälisiin säädöksiin.

Jäsenvaltioiden erilaiset oikeusjärjestelmät koskien siviilioikeutta muodostavat sekavan ja epävarman taustan nykyisellään itseohjautuville autoille, varsinkin rajat ylittävissä onnettomuuksissa. Yhtenäinen ja selkeä EU poliittinen ratkaisu helpottaisi itseohjautuvien autojen käyttöönottoa sekä hyödyttäisi kuluttajia. Ongelmat voidaan ratkaista EU oikeudellisella vastuuopilla ja lainsäädännöllä, joka kohdistettaisiin itseohjautuviin autoihin. Yksityinellä sektorila – nimenomaan autojen valmistajilla ja vakuutusteollisuudella – on oltava rooli lainsäädännön kehittämisessä.

Tämä tutkielma on saavuttanut päämääränsä, mikäli se saa aikaan keskustelua uuden teknologian ja lainsäädännön välillä, erityisesti koskien itseohjautuvia autoja.

Avainsanat: EU-oikeus, itseohjautuvat autot, kuluttajansuoja, siviilioikeudellinen vastuu, sopimuksen ulkoinen vastuu, tuotevastuu.

ABBREVIATIONS

AI	Artificial Intelligence
AV(s)	Autonomous vehicle(s)
Article/Articles	Art/Arts
CJEU	Court of Justice of the European Union
Commission	European Commission
DCFR	Draft Common Frame of Reference
ECJ	European Court of Justice
ECC	European Civil Code
ENISA	European Union Agency for Network and Information Security
EU	The European Union
EP	European Parliament
EDR/AP	Event Data Recorder for Automated Driving
FIA	Fédération Internationale d'Automobile
Finland	Republic of Finland
Germany	Federal Republic of Germany
HCLATA	Hague Convention on the Law Applicable to Traffic Accidents
HMI	Human-machine interface
ICAO	International Civil Aviation Organization
ITC	Inland Transport Committee
MEP	Member of the European Parliament
MS	Member State
NHTSA	National Highway Traffic Safety Administration
OSM	Overriding Safety Mechanism
PLD	Product Liability Directive
Proposition	Proposition on Civil Law Rules on Robotics (205/2013(INL))
PPP	Public Private Partnership in Robotics
REFIT	The Commission's Regulatory Fitness and Performance programme

SE	Societas Europaea, European Company
TEU	Treaty on European Union
TFEU	Treaty on the Functioning of the European Union
UAS	Unmanned Aircraft System
UK	The United Kingdom
UN	United Nations
UNECE	United Nations Economic Committee for Europe and Executive Committee
US	The United States

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I3: CARE (EU road accidents database) or national databases, 4. Available at https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/observatory/historical_evol.pdf.

I4: Kumpulainen, A.; Raivio, T. 'Ajoneuvot 2015-strategia: Ajoneuvoalan sääntely-ympäristö, Taustamuistio B' (2015), 4. Gaia Consulting Oy. Translated from Finnish to English by Vilma Kiilunen.

I5: Insurance Europe, 'European Motor Insurance Markets' (2015), 18.

I6: Council of Bureaux, 'The 5 EU Motor Insurance Directives (EU MID) were established in order to further enhance the protection system of road traffic victims within the European Economic Area (EEA)'. Under the title: 'The Protection of Visitors scheme' (2017). Available at http://www.cobx.org/Content/Default.asp?PageID=61>.

1. INTRODUCTION

1.1. INTRODUCTION TO THE SUBJECT

Technology is evolving rapidly and legislation is attempting to catch up to its fast moving pace. Such is the case for robotics. News are filled with advancements of medical robots taking care of the elderly, postal robots taking over the postmen's jobs, drones filming YouTube -videos of extreme sports and delivering Amazon packages straight to the customer's homes. Autonomous vehicles (hereinafter AVs) in transportation are a rapidly developing field of robotics. Autonomous cars[1] are not far from being reality. It is hard to imagine the first autopilot – a similar technology - tested on a plane was in the early 18th century.[2] Google's self-driving cars have been driving around since 2009 mapping our streets.[3] Harnessing new technology always proves difficulties for the legislator. What one country may think is appropriate in their nation is perhaps not legal in another country. This is a problem especially in the EU and the internal market when autonomous cars will be available for consumers. Realistically, autonomous cars will be used in commercial transportation before consumer manufacturing. Estimations have been that the consumer has access to driverless cars as early as the 2020's.[4]

Autonomous vehicles have said to improve safety on numerous accounts. Estimates say human error causes 90 % of traffic accidents.[5] Human error is caused by tiredness, alcohol and abrupt illnesses etc. Self-driving systems will enable decision making within milliseconds thus reducing the amount of accidents with more decisive decision making. Some researchers and engineers have estimated that greenhouse emissions will decrease and social inclusion will increase. On the other hand, new problems emerge: the security and privacy issues concerning the technical aspects of the cars system.

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[1] Autonomous cars are vehicles that are controlled fully by a system and there is no need for pedals or a driving wheel: no human control is needed. Autonomous vehicles, robotic cars and driver-less cars will be used as synonyms. Note: Google's driverless cars and most other driver-less cars in development will include a safe system, i.e. the chance for physical human interference.

[2] Frank Douma and Sarah Aue Palodichuk, 'Criminal Liability Issues Created by Autonomous Vehicles' (2012) 52 Santa Clara Law Review 1157, 1158.

[3] Google inc. 2017, 'Journey – Waymo' (2017) <https://waymo.com/journey/> accessed 2 May 2017.

[4] Dorothy J. Glancy, 'Autonomous and Automated and Connected Cars-Oh My! First Generation Autonomous Cars in the Legal Ecosystem' (2015) 16 Minnesota Journal of Law Science & Technology 619, 621.

[5] Dorothy J. Glancy, 'Autonomous and Automated and Connected Cars-Oh My! First Generation Autonomous Cars in the Legal Ecosystem' (2015) 16 Minnesota Journal of Law Science & Technology 619, 621.

The issue this thesis is concerned about is when an autonomous vehicle, i.e. a driverless car, causes damage to property or a bystander within the EU area. Who should be held liable when it is clear that a car cannot be held liable for such damages (or is it)? What are the consequences especially when you cross the border of your country? Is it even legal to drive said car into another state? How should the burden of proof be allocated? Current EU level legislation has adopted a directive on liability of defective consumer products[6], in which the producer of a defective product may be held liable for occurred damage. The directive is significant to autonomous cars in which it may act as a safeguard before legislation is passed in the EU among other regulations. The European Parliament has made initiative in 2016 to call for civil law rules on robotics.[7] The initial report was made by rapporteur Mady Delvaux on the Committee of Legal Affairs.[8] The report includes specifically the notion that liability issues with autonomous vehicles should be addressed in the EU with new private liability rules. Legal development on robotics has to be sifting in order to keep up with the growing demand of said products and to keep the roads safe.

1.2. THE FOCUS AND SCOPE OF THE THESIS

The issue in question revolves around the ideology of legislation being prepared in advance, as to solving problems before they exist. It is not new news that legislation has a tendency to drag behind. Technology has taken immense steps forward and lawmakers are finding it difficult to create sufficient, clear and exact regulations. Take for instance commercial and privately owned drones (unmanned aircrafts). Drones were available for purchase in Europe in the early 21st century[9] and the EU responded with a policy recommendation in 2014[10], which is almost 15 years later. The European Parliament has taken concern at a rather early stage concerning robotics, though, the U.S. has reacted

[6] 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.

[7] European Commission, 'Travelling Safely in Europe by Road Rail and Water' (2014) 4, 21 <http://www.transport-research.info/sites/default/files/brochure/20141128_025833_55878_PB09EN_WEB.pdf> accessed 18 May 2017; U.S. Department of Transportation, 'Traffic Safety Facts: Critical Reasons for Crashes Investigated in the National Motor Vehicle Crash Causation Survey' (2015) 1 <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812115>.

[8] European Parliament Committee on Legal Affairs, 'Report with Recommendations to the Commission on Civil Law Rules on Robotics (2015/2013(INL)) 27.1.2017'.

[9]

[10] European Commission, 'COM(2014) 207 Final: Communication From the Commission to the European Parliament and the Council - A New Era for Aviation - Opening the Aviation Market to the Civil Use of Remotely Piloted Aircraft Systems in a Safe and Sustainable Manner' (2014) <https://www.easa.europa.eu/system/files/dfu/Communication_Commission_Drones.pdf> accessed 17 May 2017.

relatively early to the creation and development of autonomous vehicles as well as China and Japan.

Transportation on land involves heavy machinery and there are always risks when human lives are involved. The aim of the EU is to make sure the driver-less vehicles will be safe and secure for passengers, pedestrians and others, and that liability issues concerning accidents are resolved. The second aspect of the thesis is whether the EU has overall competence to regulate over autonomous vehicles. The focus in this thesis will be based on identifying the problems concerning autonomous cars. The biggest problem however is the fact that there are no harmonious regulations within the EU on liability concerning robots. Thus, the scope will be on autonomous vehicles and their liability since there is no specific legislation to cover it at the EU level. The research questions this thesis will focus on are the following:

1) What are the risks and possibilities of driver-less cars?
2) Does the EU have competence to regulate on autonomous vehicles?
3) What future legislation needs to take into account with fully autonomous vehicles concerning civil liability in cross-border traffic accidents or is current legislation sufficient enough?

A basic presumption behind this thesis is that the robotic cars are in fact not long from reality. Another basic presumption is that if not otherwise mentioned, the seller/supplier is the manufacturer, i.e. the product is directly sold from the manufacturer. The writer acknowledges the supply chain of vehicles is more complex and leasing models of financing contracts apply for cars.

This thesis is focused on road transportation, excluding air, rail and maritime transportation. The thesis will not examine or focus on the rights of workers (professional drivers) or incidents occurring during work time. The thesis will not cover criminal liability. Another main topic revolving around autonomous vehicles is the issues on data protection which are not covered by this thesis. The thesis discusses light–duty vehicles whilst heavy-duty vehicles (coaches, buses, trucks are excluded from the study.

EU has never been an isolate market square nor will it be in the future. The thesis draws attention to the technology aspects of the autonomous vehicle (hereinafter AV), with subject to special standardization of the field. Also, the legislation concerning traffic accidents is found to be messy in the way that the EU and its Member States (hereinafter MSs) are not the only ones governing legislation over transportation. The thesis is mainly focused on EU law, yet EU law is closely connected to other international law instruments

such as the UN and other Charters. This becomes especially evident in the third chapter of the thesis.

The thesis is divided into discussing four parts. Chapter 2 will examine the benefits and risks of AVs. Chapter 3 discusses the EU's competence on AVs and civil liability. Chapter 4 will focus on current legislation and application on AVs, and the creation of a completely new liability scheme for AVs. Theory is incorporated along the text in order for the reader to stay focused in each part of the thesis rather than jumping from section to section which might hinder the reading experience. Finally, conclusions will be given.

1.3. METHODOLOGY AND SOURCES

The method used in this research is jurisprudence: what regulation covers autonomous vehicles at present and how the current legislation should be modified or new legislation created. Current EU legislation on transportation and liability poses the basic framework for the thesis. Reference is also made to the member states' national legislation in regard to the chosen subject. International law is taken into consideration. Some member states, such as Germany, have adopted new regulation concerning autonomous vehicles.[11]

This research is based on current legal scholars' articles and publications concerning robotics and transportation. The auto-industry has produced research on autonomous cars since they are the forerunners of AVs. The EU has also funded numerous projects on robotics and their studies will form a basis for this thesis. Also the Unions case law has huge importance on a substantial material view. The subject is time sensitive in sense that the Commission and the Parliament want to move fast on civil liability on robotics.

Existing autonomous vehicles on the streets are limited to a handful in the EU, most notably Google cars and some postal service robots. Some case law is available in the EU as well as in the United States. The material is limited due to the novelty of said cars. Nevertheless, the existing scarce case law will indicate on how the national courts are adapting and capable of handling the new technology with the means, i.e. legislation, they have. The study is not a comparative study yet comparison is made to the member states, the United States and other countries' legislation where necessary. The objective is to give a guideline for new legislation tackling the liability issues in the EU and highlighting other states' political and legal decisions on the matter.

[11] European Commission, 'COM(2014) 207 Final: Communication From the Commission to the European Parliament and the Council - A New Era for Aviation - Opening the Aviation Market to the Civil Use of Remotely Piloted Aircraft Systems in a Safe and Sustainable Manner' (2014) <https://www.easa.europa.eu/system/files/dfu/Communication_Commission_Drones.pdf> accessed 17 May 2017.

2. BACKROUND

2.1. TAKING OVER THE STREETS

What is an autonomous car? The simple question requires an adequate answer. Let's take Google as an example: Google is one of the first pioneers in the attempt of creating fully automated vehicles.[12] Google's self-driving cars have successfully been in the roads for millions of kilometres since 2015. In 2016 it launches a self-driving car project called Waymo, or in other words, rebranded the project.[13] The former Google Plan was of course Google Maps, where the cars would map out streets and photograph the surroundings.[14] Google describes its technology as a "fully self-driving technology" with the "car designed to do all the work of driving and the person in the vehicle is never expected to take control of the vehicle at any time".[15] Google's aim is on mass marketing the fully automated cars in the future years to come which will lead to the evident need of legislator action, action that the United States has sought to take. The state of Michigan in 2016 placed a bill that allows testing on its streets for cars that have no steering wheels, pedals or human control.[16]

For the distinction between autonomous, semi-autonomous and driver assisted attention can be drawn to the US National Highway Traffic Safety Administration (NHTSA) and their use of SAE International's[17] (SAE) definition on levels of automation which are the following:

> *SAE Level 0*: the human driver handles everything;
> *SAE Level 1*: an automated system on the vehicle can sometimes assist the human driver conduct some parts of the driving task;
> *SAE Level 2*: an automated system on the vehicle can actually conduct some parts of the driving task, while the human continues to monitor the driving environment and performs the rest of the driving task;

[12] Currently there are over 40 autonomous vehicle manufacturers and innovation companies, such as Volvo, Uber, Tesla, Volkswagen, etc., according to CBinsights. The manufacturer list is available at: https://www.cbinsights.com/research/autonomous-driverless-vehicles-corporations-list/ (visited 15th August 2017).
[13] Christiaan Hetzner, 'German Industry Welcomes Self-Driving Vehicles Law' (*15 May 2017*, 2017) <http://europe.autonews.com/article/20170515/ANE/170519866/german-industry-welcomes-self-driving-vehicles-law> accessed 18 May 2017; Thomas Escritt, 'Germany Adopts Self-Driving Vehicles Law | Reuters' (2017) <http://www.reuters.com/article/us-germany-autos-self-driving-idUSKBN1881HY> accessed 18 May 2017. 2017.
[14] Google Mapping and photographing included a human behind the wheel, as for the new project Waymo tries to exclude the need for a human driver.
[15] Ibid.
[16] Section 4.7.1. tries to give a recommendation for a definition on an AV.
[17] Formerly known as the "Society of Automotive Engineers".

> *SAE Level 3*: an automated system can both actually conduct some parts of the driving task and monitor the driving environment in some instances, but the human driver must be ready to take back control when the automated system requests
> *SAE Level 4*: an automated system can conduct the driving task and monitor the driving environment, and the human need not take back control, but the automated system can operate only in certain environments and under certain conditions; and
> *SAE Level 5*: the automated system can perform all driving tasks, under all conditions that a human driver could perform them.

The SAE levels of automation are a guiding point as to how the technology advances in the near future. Full automation is defined in level 5, levels 1-4 represent semi-automation and level 0 is a completely human assisted driving mode. Currently the average Joe is driving SAE level 0-3 cars. New cars have assisted parking systems and/or electronic speed control that help the driver on some of the tasks as default. The level 5 ("the automated system can perform all driving tasks, under all conditions that a human driver could perform them") is what this thesis undertakes and is considered an 'autonomous vehicle'. The Digital Transformation Monitor, a European Commission's coordinated project that monitors technological trends, published a report on autonomous cars.[18] The report suggests that said vehicles will be a huge opportunity for the EU and it also makes reference to the international SAE levels.[19] .

The result of Mady Delvaux's initiative is the European Parliament's resolution on Civil Law Rules on Robotics of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)). The resolution urges in paragraph C the need for a common definition of artificial intelligent (AI) robots. The report calls for a definition that is "flexible" yet does not hinder innovation.[20] The European Parliament's report does not make reference to the SAE levels, yet most of the journals on autonomous vehicles make note of the SEA "definition".[21] This underlines the need for a clear and exact definition for autonomous transportation.

[18] Google inc.
[19] Ibid, p 2.
[20] (2015/2103(INL)), p 2.
[21] Egenio Stoppani, a policy officer in the European Commission on connected and automated mobility, used the SAE levels of autonomity in his power point presentation on automated and connected vehicles, available at <https://eng.kuleuven.be/over_ons/evenementen/arenbergsymposium-2016/20161123eugeniostoppani-eu-regulatory-and-policy.pdf>.

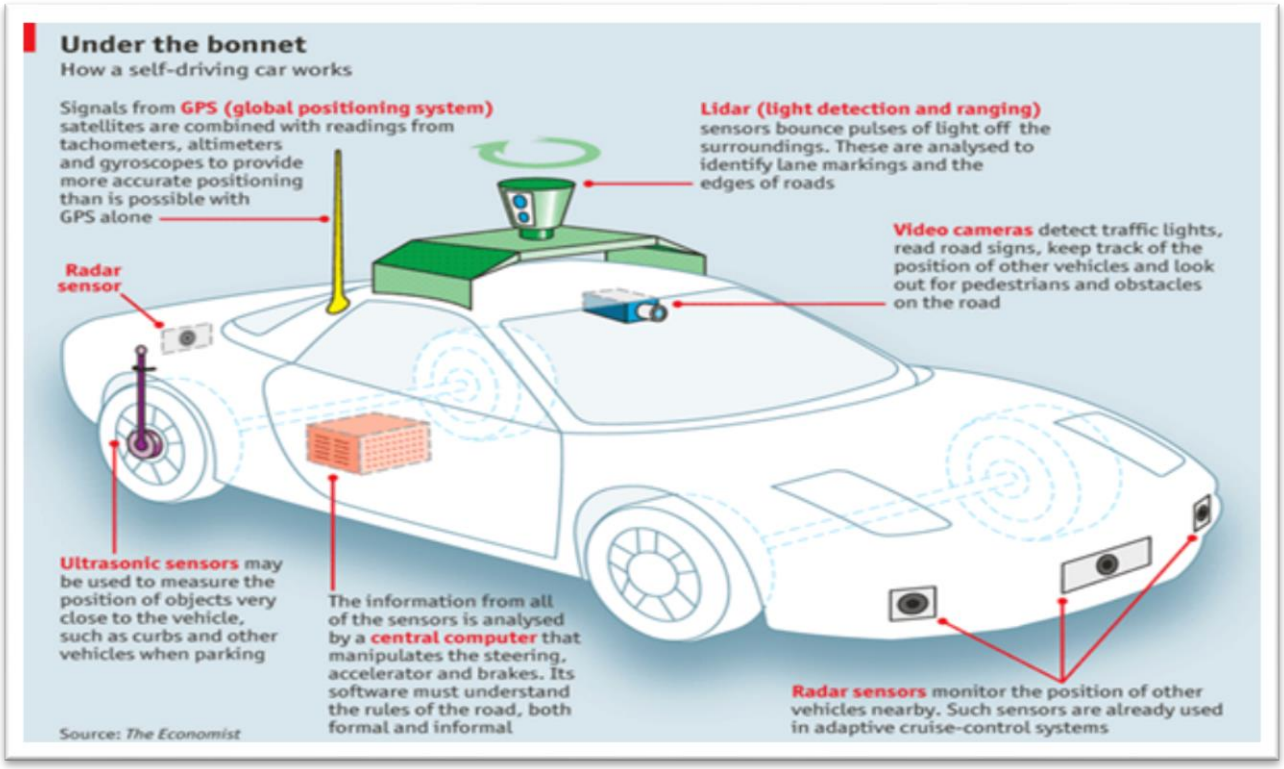

Image 1. The Economist (2015). The Economist explains: How Does an Autonomous Vehicle Work? May 12th 2015. Available at http://www.economist.com/blogs/economist-explains/2013/04/economist-explains-how-self-driving-car-works-driverless.

The AVs will highly be dependent on sensors, video cameras and GPS systems. A central computer will analyze and assess the information given by the sensors and others, and make deliberate decisions based on it (see picture above).

In order to fully understand the need for legislative action, one must consider the technical and engineering aspects of an autonomous vehicle as defined in the SAE level 5. How does the car drive and make decisions without human interaction or control? According to Glancy, an autonomous vehicle comprises of five technological elements: 1) human-machine interface, 2) operating and data sensors, 3) external environment sensors, 4) automated controls over car operations and functions, and 5) artificial intelligence.[22] Glancy points out the first autonomous vehicles may include a off-on switch that allows the human driver to take control or let the car drive on its own, i.e. human-machine interface (HMIs). The most crucial importance is on the sensor mechanisms that inform the vehicle of the surrounding area and moving parts, such as other cars, humans and buildings. The operating and data sensors formulate the information received for the AI to compress and analyze. Finally, the AI which then makes the decisions based on its

[22] Digital Transformation Monitor, 'Autonomous Cars: A Big Opportunity for European Industry' (2017) <https://ec.europa.eu/growth/tools-databases/dem/monitor/sites/default/files/DTM_Autonomous cars v1.pdf> accessed 16 August 2017.

programming and data received. In contrary to human decision-making, the AI is able to analyze and comprise a solution for each situation in milliseconds. The advantage should result in faster and more secure decision making, which us humans sometimes lack due to stress, tiredness, miscalculation and so on.

Needless to say, harnessing new technology will enable market superiority over the car industry. Most car manufacturers have allocated significant amounts of capital and other resources in doing so. The Nagivant Research Leader board has listed "18 companies that are most likely to get self-driving cars on the road first" in the year 2017.

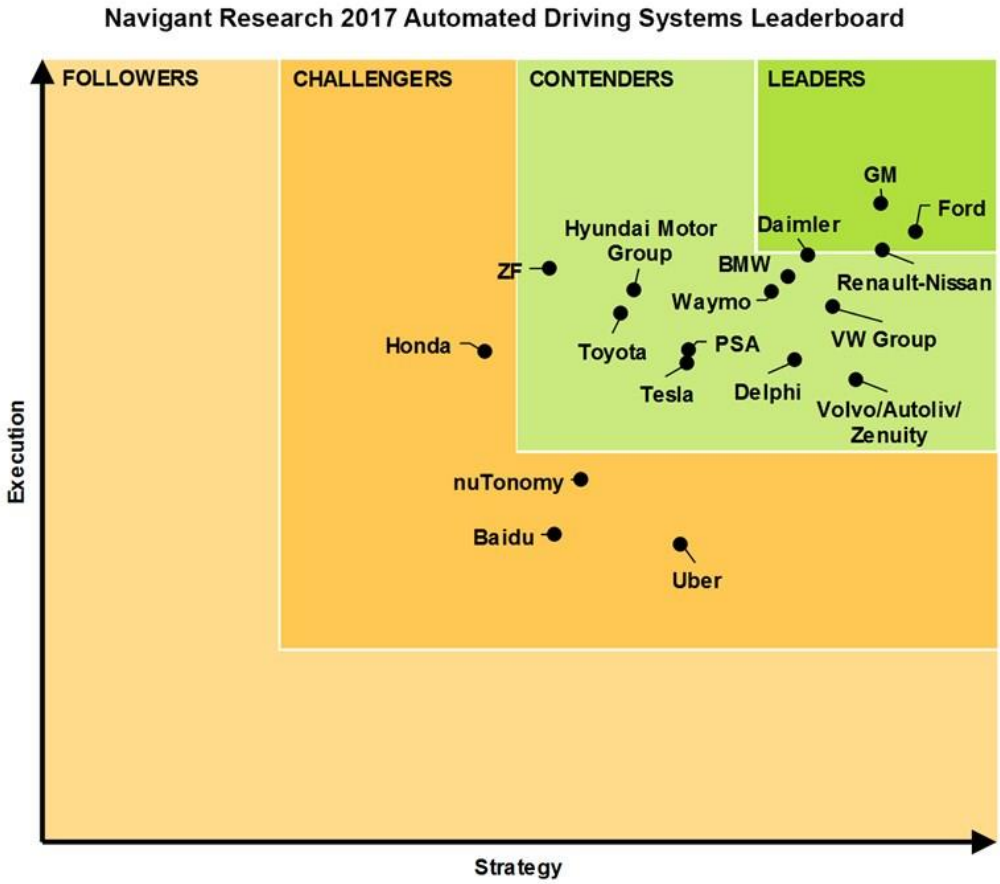

Image 2: Navigant Research Leaderboard Report: Automated Driving (2017). Available at https://www.navigantresearch.com/research/navigant-research-leaderboard-report-automated-driving.

We can see from the graph that top names are on the list concerning the strategy and execution of said strategy of inventing a self-driving system, the American Ford and General Motors being the forerunners at the time of the report. This is most likely at least in part because of the legislative policies enacted in the States. The auto industry will play a huge role in legislating over AVs as well as the insurance industry.

2.2. SOCIAL AND ECONOMICAL COSTS OF ROAD ACCIDENTS

Social costs of traffic accidents. Social costs of traffic accidents revolve around the loss of human lives and personal injuries. Traffic accidents can cause permanent or temporary damage to human health.

Road traffic accidents cost tens of thousands of lives each year in the EU. In the year 2015 there were over 1 million reported road accidents, with more than 26.000 fatalities and 1.4 million injured in the EU according to the EU road accidents database.[23]

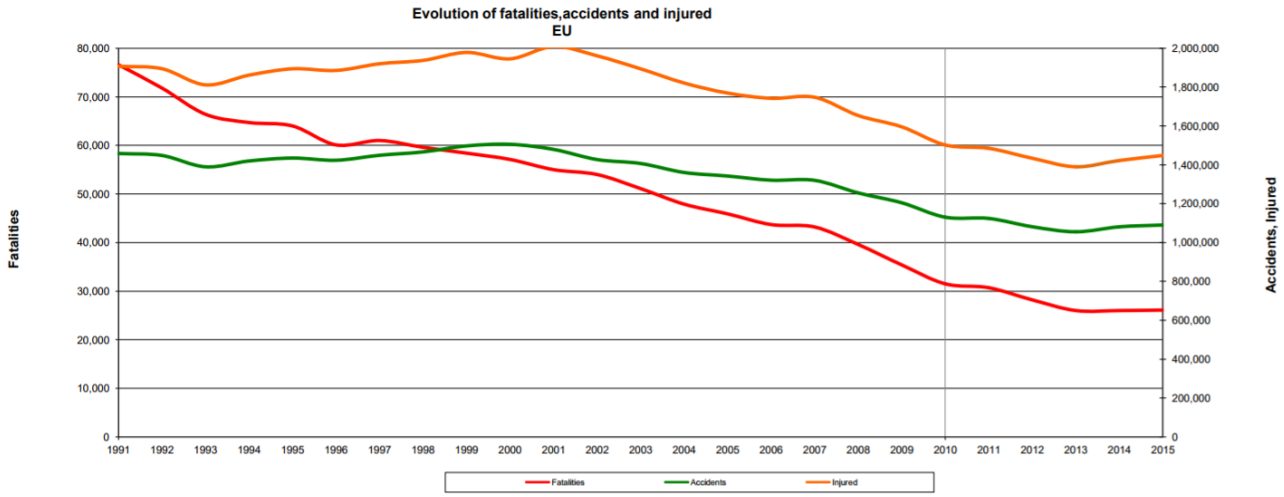

Image 3. CARE (EU road accidents database) or national databases, 4. Available at https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/observatory/historical_evol.pdf.

As can be seen from the graph, the number of fatalities, accidents and people injured has been on decline since the year 1991.[24] The EU has initiated several projects and missions in order to prevent traffic accidents and traffic itself in the Member States, such as the European Road Safety Charter launched in 2004. The mission of the Charter is to increase knowledge and improve road safety standards and national policies. The EU has also other policies and directives that aim for road safety.[25]

The social costs of traffic accidents are manifold: the costs of non-fatal accidents do not end with medical bills. They may result in job loss, which impacts the whole livelihood of families or there may be psychological consequences. The quality of life may not be the

[23] Dorothy J. Glancy 634–640.

[24] Not all accidents are reported to national officers. Since the EU databases are contingent on national inquiries, the statistics may be much higher. More on the statistical errors of road accidents on 'Social and Economic Consequences of Traffic Injury in Europe', ETSC (European Transport Safety Council) 2007, 9-14.

[25] European Commission, 'Road Safety Evolution in EU Road Safety Evolution in EU February 2016' (2016) <https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/observatory/historical_evol.pdf>.

same. Long-term sick-leave affects employers and companies which inquires more resources to hire replacements.[26] According to a study on involuntary manslaughter, a traffic accident that leads to the death of a person affects the injurer with long term psychological effects.[27] An accident may be unintended as they mostly are, yet the consequences can be horrific.

On a positive note, emissions can affect the quality of life: One of the main culprits of wolrd wide emissions are caused by cars. Car emission is air pollution resulting from carbon dioxide ($CO_{2)}$. The air emissions resulting from land transportation in the EU is 1/3 of all air emissions.[28] COM(2017) 676 final proposes new emission performance standards for passenger vehicles which urges for a drastic reduce of air emissions from motor vehicles and to promote the development of low to zero emission vehicles.[29] AVs can reduce the use of gasoline with a much more accurate and sustainable driving style thus reducing emissions.

Economical costs. The economical costs of traffic accidents are high. The Commission has used the value of one million or the '*one million principle*' for each life that is lost in a road accident. The number was first used in the EU's Road Safety Programme in 1997-2001[30] and in the European Transport Safety Report in 2007[31]. The. There is no common method of calculating the monetary value of a traffic accident in the EU when concerning injuries and death.[32] It rests upon the Member States and their methods and variables. WHO suggests that the cost of traffic accidents to countries in Europe varies between 0.4 % to 3 % of gross domestic product.[33] This would mean for example the economical loss in Germany in the year 2015 cause by road traffic accidents could have been 411 € per

[26] European Commission, 'Mobility and Transport: EU Road Safety Policy' (2017) <https://ec.europa.eu/transport/road_safety/specialist/policy_en> accessed 17 August 2017.
[27] ETSC (European Transport Safety Council), 'Social and Economic Consequences of Road Traffic Injury in Europe' (2007) 18–27.
[28] Jörgen Lundälv, 'Socialfilosofisk Kontext Utifrån Begreppet Erkännande Och Axel Honneths Erkännandeteori : Exempel Från Ett Socialfilosofisk Kontext Utifrån Begreppet Erkännande Och Axel Honneths Erkännandeteori : Exempel Från Ett Forskningsprojekt Om Erkännande Och Socia' (2006).
[29] European Environment Agency, 'Air Pollution: Transport' (2008) 5.
[30] European Commission, 'Proposal for a Regulation of the European Parliament and of the Council: Setting Emission Performance Standards for New Passenger Cars and for New Light Commercial Vehicles as Part of the Union's Integrated Approach to Reduce CO2 Emissions from Light-Duty'.
[31] Commission of the European Communities, *Communication From The Commission To The Council, The European Parliament, The Economic And Social Committee And The Committee Of The Regions: Priorities In EU Road Safety Progress Report And Ranking Of Actions [COM(2000) 125 Final]* (2000) 2 <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52000DC0125&from=EN> accessed 18 August 2017.
[32] ETSC (European Transport Safety Council) 15.
[33] ibid.

person with a careful evaluation of 1 % of its GDP[34]. For reference, the economical cost in the US was calculated at $242 billion in 2010.[35]

The social and economical loss caused by traffic accidents in the EU are significant and at the same time hard to evaluate. Given the information mentioned up above, and the fact that autonomous vehicles may reduce traffic accidents by over 90 %[36], autonomous vehicles could be seen as a solution to social and economical costs caused by road traffic accidents. This is why developing policies and allocating resources towards innovation and technology is vital in the European agenda. New technology presents new solutions but also new risks and problems.

2.3. NEW PROBLEMS WITH NEW TECHNOLOGY

This thesis revolves around the idea that the AV's system is fully in control. The main culprit, the driver, is no longer the one in charge and thus cannot be accused in a case of an accident or collision. We have a few solutions for that: shift our attention to other agents, create new insurance policies or at some point in the far, far future, give legal status to robots. I digress; there are many other problems politicians and legislators must consider before giving the green light to autonomous vehicles. This thesis would be incomplete without briefly acknowledging other problems that need to be resolved. There are three main categories of new problems that need answers: 1) security and safety of the new technology, 2) privacy and 3) new company models arising.

First, the autonomous vehicles must obtain a certain level of safety standards. Said vehicle must be safe to use in order for the product to become available in the internal market of the EU. This means that the physical, technical and other aspects must be in line with the EU directives and other international or national codes and standards. Safety policies on vehicles withhold policies on the design of the car, product liability and consumer information.[37] The technology must be "safe" in the meaning that in the situation of a meltdown of the system the car does not cause harm and the passengers are protected

[34] World Health Organization, 'European Status Report on Road Safety' (2009) 16.
[35] Worldbank Database, 'Annual GDP Growth (%) Germany' (2017) <http://data.worldbank.org/country/germany?view=chart> accessed 18 August 2017.
[36] Lawrence Blincoe and others, 'The Economic and Societal Impact of Motor Vehicle Crashes, 2010 (Revised)' (2015) 2, 5.
[37] European Commission, 'Travelling Safely in Europe by Road Rail and Water' 4, 21; U.S. Department of Transportation 1.

in a crash. Though, another social aspect must be considered: the elderly and handicapped can have a means of free access of movement and transportation with AVs.[38]

The difference between normal cars and autonomous cars is that there might not be a need for drivers licence in the future at all given that there is no need for human control at all. Information on features and accessories of the vehicle must be available for the consumer. A special (national or international) registry of autonomous vehicles and other robots[39] could be created as suggested by Mady Delvaux.[40] Also it must be noted that uncertainty of liability in a traffic accident may deter consumers from buying the AI product.[41] The technical

Second, the problems concerning privacy of the information of the movement and location and other information the vehicle will produce is crucial to acknowledge. The autonomous cars will need to have access to the internet. Who owns the information and shall have access to it? Can third parties acquire the information and how can the manufacturer utilize error codes of the cars on roads? Cyber-security standards need to be agreed upon as well as the boundaries for software and connectivity.[42] The amount of data that could be received from the autos presents huge opportunity from a safety perspective on how to respond to accidents in the future, but also huge risk.[43]

Third, new company models may arise with the upbringing of autonomous vehicles. The taxi industry has already been revolutionized with Uber, applications and other auto service models. The autonomous cars present a huge opportunity to trade, logistics and the consumers.[44] An enormous cost, i.e. the human driver, can be erased from the picture. Nevertheless, more resources are allocated in the maintenance of the cars, yet they do not need pensions. In a way the taxi industry is about to be revolutionized once more like once was with cars evading. This is in direct effect to EU's labour regulation and human rights regarding it. Automation is taking over peoples jobs. The car leasers may not own the cars

[38] SafetyNet, 'Vehicle Safety' (2009) <https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/specialist/knowledge/pdf/vehicles.pdf> accessed 22 August 2017.

[39] Autonomous cars are a category of robots in the report with recommendations to the Commission on Civil Law Rules on Robotics (205/2013(INL)).

[40] KC Webb, 'Products Liability and Autonomous Vehicles: Who's Driving Whom?' (2016) 23 Richmond Journal of Law & Technology 52, 26–27; Douma and Aue Palodichuk 1158.

[41] Delvaux 7.

[42] Roeland De Bruin, 'Autonomous Intelligent Cars on the EU Intersection of Liability and Privacy' (2015) 13.

[43] Digital Transformation Monitor 5.

[44] Lawrence Karp and Richard Kim, 'Autonomous Vehicles: An $81 Billion Opportunity Between Now And 2025' (2017) 6 <http://ins.accenture.com/rs/897-EWH-515/images/Autonomous-Vehicles-POV.pdf> accessed 30 October 2017.s

themselves: the manufacturers may hold ownership. Though, the rise of new business models does not only create new problems; it also creates new opportunities for entrepreneurism and people with disabilities and people without the possibility to own cars. The EU should take action in advance in regulating new business models.

These problems as well as opportunities seen by some are multiple and the auto industry has its work cut out for it. The EU should work closely with the auto industry in battling said problems and to overcome them. EU level policies and regulation should be flexible and not slow down innovation as previously mentioned in defining autonomous vehicles. Before diving into the deep end, i.e. issues on liability, we need to consider the theory background of the EU for its regulation on vehicles and does the EU in fact have competence to regulate on robots or autonomous cars in general.

3. COMPETENCE OF THE EU CONCERNING AVS

3.1. TRANSPORTATION LEGISLATION IN THE UN AND EU

Before diving into the issues on liability, we must consider whether to tackle the task at hand at the EU level in the first place. According to the principle of institutional balance the institutions must act in accordance with the powers conferred to it by the Treaties.[45] Competence issues are at the core of EU law and MSs have often questioned whether the EU level is regarded as more efficient rather than national, regional or local levels as under the principle of subsidiarity.[46] The principle of proportionality then scrutinizes whether the taken action is in keeping with the pursued aim in regard to content and form.[47] Robotics is a new field of EU law which includes autonomous vehicles even though transportation is regulated extensively in the EU. Legislation at the national level could also prove efficient and educational as to see how the member states have regulated AVs in order to solve the issue at hand, such as Germany has done already being a world-renewed industrial country in auto manufacturing and development[48].

When considering international road legislation, The United Nations and the Vienna Convention on Road Traffic[49] has significant importance. The Convention on Road Traffic regulates the basic the status of road signs and signals[50] and general rules on road behaviour, such as in Art 7(1): "*Road-users shall avoid any behaviour likely to endanger or obstruct traffic, to endanger persons, or to cause damage to public or private property*". The UN and its Economic Commission for Europe (UNECE) regulates transportation as one of its main categories.[51] Under the UNECE is the International Trade Centre (ITC) which promotes road traffic safety and sustainable transportation in Europe. The UN's and EU's jurisdiction somewhat overlap, and the EU is committed in several of the UN's regulation concerning transportation. And the EU is a signatory member to UN legislation. Art 8 or the 1968 Convention on Road Traffic has been amended in order to allow

[45] Craig and De Burca, *EU Law: Text, cases and materials* (6th edn, Oxford University Press 2015) 17.
[46] Art 5(3) TEU.
[47] Art 5(4) TEU.
[48] Hetzner; Carolyn Fortuna, 'Tesla Full Self-Driving Could Soon Be Allowed in Germany, Gov Approves Legislation Aimed at Autonomous Driving' (*31 May 2017*) <http://www.teslarati.com/german-government-approves-legislation-allow-autonomous-driving/> accessed 22 May 2017.s
[49] Vienna Convention on Road Traffic, concluded in Vienna on 8th November 1968. Also the Vienna Convention on Road Signs and Signals was concluded at the same day.
[50] Art 5 of the Convention on Road Traffic.
[51] Kumpulainen & Raivio: Ajoneuvot 2015-strategia: Ajoneuvoalan sääntely-ympäristö, Taustamuistio B. Gaia Consulting Oy 2015 p 4.

autonomous vehicles to be used on the streets with the restriction that the driver must have controls to override or switch off the system, i.e. take control of the vehicle.[52] The following image explains the regulatory background or the auto industry in Europe and how the UN is involved in it.

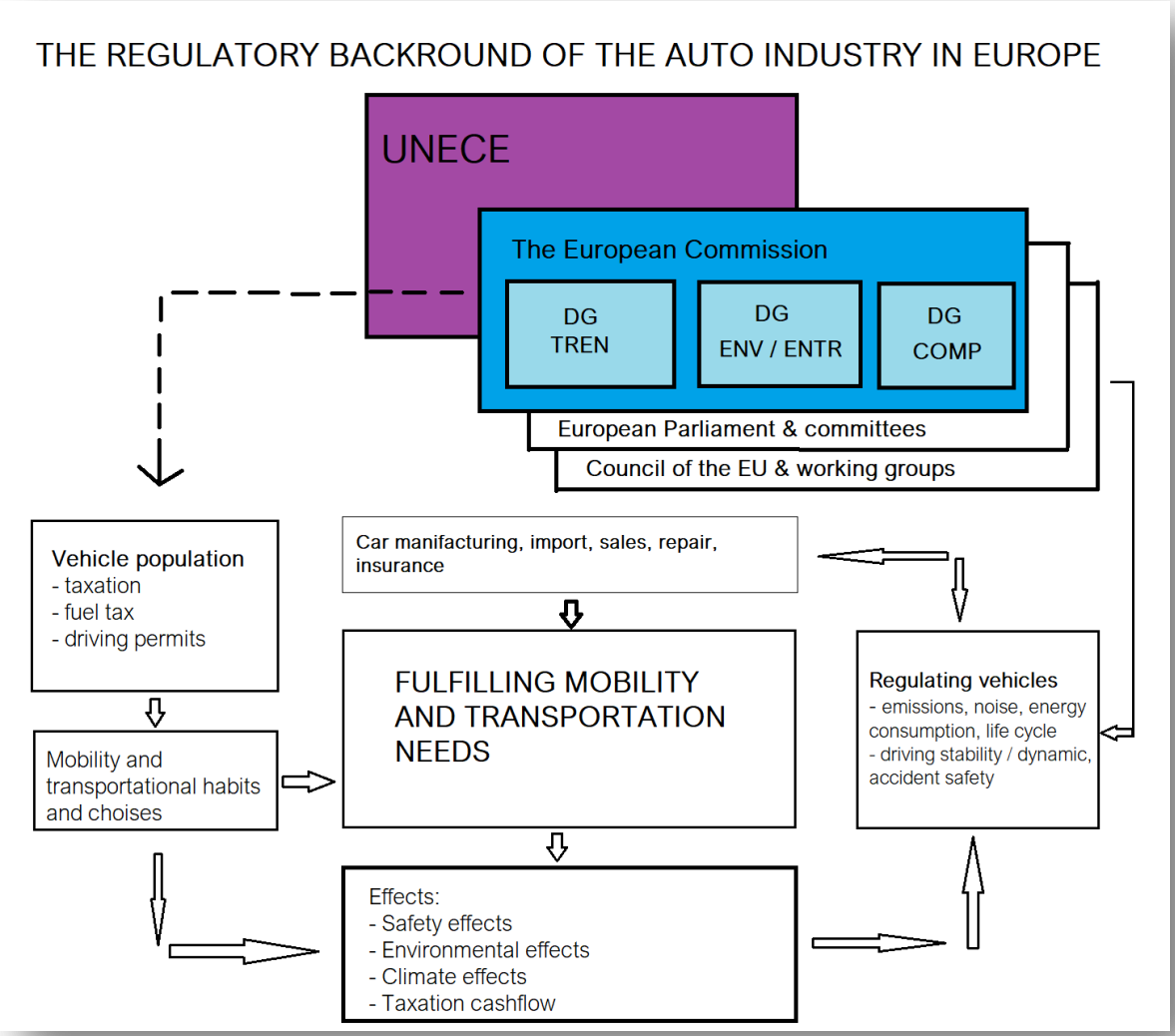

Image 4. Kumpulainen, A.; Raivio, T. 'Ajoneuvot 2015-strategia: Ajoneuvoalan sääntely-ympäristö, Taustamuistio B' 2015, 4. Gaia Consulting Oy. Translated from Finnish to English by Vilma Kiilunen.

In the image we can see that UNECE is place as an overall actor behind the Commissions work. UNECE's areas of work are divided in the ITC, Border Crossing Facilitation, Road Transport and Global Forum for Road Traffic Safety in which the

[52]UN Economic and Social Council, 'Report of the Sixty-Eighth Session of the Working Party on Road Traffic Safety' (2014) 9 <https://www.unece.org/fileadmin/DAM/trans/doc/2014/wp1/ECE-TRANS-WP1-145e.pdf> accessed 25 September 2017.

European countries are active.[53] Transportation regulations are most effective when the global opinion of road and other transportation forms are uniform.

The reason why this thesis is pin pointing the role of the UN in transportation policies is that it is questionable whether the EU should be the instance to regulate autonomous vehicles on its' own. The advantages of a UN policy governing autonomous vehicles would be that it could cover globally more committed countries to the policy in question. This is the ideology that every country would commit to the policy voluntarily. Regardless, the EU has made an initiative on the matter of robotic cars.[54] The baseline for the scepticism above is limited to the fact that the European Union is a member to many UN Conventions and regulations, such as the EU created a road safety policy for 2011-2020 after the 2009 General Assembly in Russia, i.e. the Moscow Declaration. It could be suggested that EU be the first runner in the race as proclaimed in Madame Delvaux's proposition on robotic-legislation. The EU is not contingent on the UN's decision making process nor is the UN on the EU's decision making processes'. Though, the UN and EU are closely connected being international entities and they continuously enhance cooperation between the institutions.[55] The EU is represented as delegations in the UN bodies.[56] Wouters et al. Proposes that the EU and UN have "an ever stronger partnership" on issues such as security and human development.[57] Multilateralism and shared goals are of high importance for the EU.[58]

Getting the best results with new technology is enabling their use on European roads in the first place. A policy for solid and safety requirements for the technology is crucial and the technology must not cause harm to third-parties or objects regardless on which competent institution allows it. The UN has altered its Convention on Road Traffic in order for the autonomous vehicles to have access to roads with certain restrictions as mentioned

'Transport - UNECE' <https://www.unece.org/trans/welcome.html> accessed 25 September 2017.[53]

[54] More on the future models of international policies "*The Future of International Law Is Domestic (or, The European Way of Law)"* by A. Slaughter & W. Burke-White.

[55] Article 116 EEC demanded the Member States to consult the Commission on matters of economical importance.

[56] EU@UN, 'EU Delegations to the United Nations - EU@UN' (2017) <http://eu-un.europa.eu/eu-delegations-to-the-united-nations/> accessed 27 September 2017.

[57] Wouters et al, *'The United Nations and the European Union: An ever Stronger Partnership' (*Cambridge University Press 2006).

[58] Article 21 TEU section 1 enshrines the EU and UN partnership: "The Union shall seek to develop relations and build partnerships with third countries, and international, regional or global organisations which share the principles referred to in the first subparagraph. It shall promote multilateral solutions to common problems, in particular in the framework of the United Nations.'

above. Most of the Member States have signed the Convention on Road Traffic with some reservations.[59]

The point taken from this chapter is the realization that much of legislation on road vehicles comes from the UN with the respect of EU involvement. There is a chance that the international institutes' competences overlap concerning transportation. The Commission has pointed out the importance of improving market conditions through international harmonisation of vehicle regulations.[60] Going to a more EU specific and more on the scope of this study: the legal argument for the EU to regulate autonomous vehicles one must decide whether or not the EU has overall competence in the field of autonomous vehicles and robotics, it has to be considered under which Treaty articles and/or other regulation the EU's competence could be derived from. Consideration is given to the initiative of the MEPs, legal scholarly and the Commissions reports on robotics. International law, especially within the UN, has also an important role concerning road transportation and robotic policies.

3.2. EU COMPETENCE ON AVS

3.2.1. COMPETENCE IN GENERAL

The problem with competence and autonomous vehicles in the EU contexts is that regulating the vehicles is not just about transportation; it is also about technology, data safety, liability and robotics. Another way to categorize autonomous road vehicles is to say they belong in a subcategory under robotics, next to aviation and marine robotics. So it is hard to paint the picture under which Treaty articles autonomous vehicles should be considered as, if any. Another option is that they fall under the EU's "catch-all competence" of Art 114[61] which the proposition for civil law rules for robotics leans on.

[59] To see the full list of participants on the Convention on Road Traffic, see the UN webpage at: https://treaties.un.org/pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XI-B-19&chapter=11&Temp=mtdsg3&clang=_en.

[60] European Commission, 'COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS: Towards a European Road Safety Area: Policy Orientations on Road Safety 2011-2020 COM(2010) 389 Final' (2010) 4 <https://ec.europa.eu/transport/sites/transport/files/road_safety/pdf/com_20072010_en.pdf> accessed 26 September 2017.

[61] Art 114 (1) TFEU: "Save where otherwise provided in the Treaties, the following provisions shall apply for the achievement of the objectives set out in Article 26. The European Parliament and the Council shall, acting in accordance with the ordinary legislative procedure and after consulting the Economic and Social Committee, adopt the measures for the approximation of the provisions laid down by law, regulation or administrative action in Member States which have as their object the establishment and functioning of the internal market."

Under Art 4(2) section g TFEU where it is stated that the EU and its' member states have shared competence regarding transportation. Shared competence is explained in Art 2(2) TFEU:"The Member States shall exercise their competence to the extent that the Union has not exercised its competence". According to Craig and De Búrca the power of the Member States may diminish after awhile since the EU can override its competence in the areas mentioned in the TFEU.[62] This might be the case for automated vehicles, since new legislative acts on their behalf may be justified under Art 2(2) TFEU. Also, the Treaty on the Functioning of the European Union has transportation under title VI. According to Art 90 TFEU in title VI the EU shall have a common transport policy. The EU does not have a precise agenda or policy intact for autonomous cars. It seems the main argument for cooperation within robotics and regulating it in the first place is to keep the internal market competitive in the global economy and it will be considered as part of EU's digital agenda.[63]

As mentioned, automated vehicles are not only about transportations but also on the development of advanced technology. Art 4(3) TFEU states that in the area of technological development the Union shall have competence to carry out activities, in particular to define and implement programmes; however, the exercise of that competence shall not result in Member Sates being prevented from exercising theirs. The Commission has founded a Public Private Partnership in Robotics (PPP) to improve European competitiveness in the contexts of the Horizon 2020 work programme.[64] These two Treaty provisions do not expressively permit regulation on robotic cars, which leaves us to interpret the safety-net of the EU: Article 114 TFEU.

3.2.2. ART 114 TFEU

Regardless, the reasoning of EU competence on autonomous cars is explained in the explanatory statement attached to the proposal of Civil Law Rules on Robotics. It suggests that proposed legislation should be based on Article 114, i.e. harmonization of rules.[65] It is also suggested that the objectives cannot be sufficiently achieved by the Member States, central, regional or local levels but rather by reason of scale or effects of the proposed

[62] Craig & De Búrca, '*EU Law: Text, Cases and Materials's* (6th edn, Oxford University Press, 2015) 84.
[63] European Commission, 'Fact Sheet: Robotics PPP: The next Generation of Intelligent Robots to Keep EU Manufacturing Competetive' (2013) <http://ec.europa.eu/research/press/2013/pdf/ppp/robotics_factsheet.pdf> accessed 28 September 2017.
[64] European Commission, 'Robotics Public-Private Partnership in Horizon 2020 | Digital Single Market' <https://ec.europa.eu/digital-single-market/en/robotics-public-private-partnership-horizon-2020> accessed 28 September 2017.
[65] European Aviation Safety Agency, 'Notice of Proposed Amendment 2017-05 (B) Introduction of a Regulatory Framework for the Operation of Drones' (2016) 1.

action, better be achieved at Union level. The same reasoning has been used in the proceedings concerning the EU regulating civil drones: "...This leads to a fragmented regulatory system hampering the development of a single EU market for UAS (Unmanned Aircraft System) and cross-border UAS operations"[66]. The EU level is mentioned as the most efficient level of action due to inconsistencies of robotic legislation in the Member States and because of cross-border implications resonating from these technological advancements.

Let us take a closer look on the Art 114 TFEU[67]. The provision enables the EU to regulate on matters which do not fall specifically or literally on the EU's competence. It acts as a flexible mechanism especially in matters the Treaties have not taken into consideration when considering market integration[68]. The case of *Tobacco Advertisement I*[69] set out the basic boundaries for the use of Art 114 TFEU. The ECJ annulled directive 98/43/EC on the advertisement and sponsorship of tobacco products. The court reasoned as the followed:

> "To construe that article as meaning that it vests in the Community legislature a general power to regulate the internal market would not only be contrary to the express wording of the provisions cited above but would also be incompatible with the principle embodied in Article 3b of the EC Treaty .. the powers of the Community are limited to those specifically conferred on it."[70]

The court expressed the article does not provide a general power for the EU. This would be in contrary to the principle of conferral.[71] The end result must genuinely improve the internal market.[72] The court also deduced that the "disparities" in Member States rules and the "abstract risk" of a negative impact on fundamental freedoms without the improvement of the internal market does not justify the use of Article 114.[73] Nevertheless, the ECJ ruled

[66] ibid.
[67] Former known as Arts 100a and 95EC.
[68] Art 26 TFEU defines the goals of the internal market: "1. The Union shall adopt measures with the aim of establishing or ensuring the functioning of the internal market, in accordance with the relevant provisions of the Treaties. 2. The internal market shall comprise an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured in accordance with the provisions of the Treaties. 3. The Council, on a proposal from the Commission, shall determine the guidelines and conditions necessary to ensure balanced progress in all the sectors concerned."
[69] Case C-376/98 *Germany v European Parliament and the Council of the European Union* [2000] ECR I-8419.
[70] Ibid, para 83.
[71] Isidora Maletic, *The Law and Policy of Harmonisation in Europe's Internal Market* (Edward Elgar Publishing Limited 2013) 19–20.
[72] Case C-376/98 *Germany v European Parliament and the Council of the European Union* [2000] ECR I-8419, para 84.
[73] Ibid, para 84.

the Art 114 TFEU could be used as basis for the tobacco advertisement directive. Though, the directive in itself was deemed too far reaching and annulled.[74] The case made a profound basis for the use of Art 114 TFEU; there must be a genuine link between the wanted action (such as regulating AVs) and the removal of existing obstacles in the internal market.[75]

The case law has moulded the use of said article. It is suggested, that a number of cases have softened the tone that the ECJ adopted in the Tobacco Advertisement I case[76], such as the cases of *Arnold André*[77] and *Swedish Match*[78]. The two cases were summed up in the case of *Alliance for Natural Health*[79]: The Community may take "appropriate measures", with respect to the principle of proportionality, when the principle of free movement of goods is threatened by the different measures and levels of protection adopted by the Member States.[80] The ECJ seems to have a lean approach on using Art 114 TFEU as a legal basis for market integration. Directive 2009/103/EC relating to insurance against civil liability in respect of the use of motor vehicles, and the enforcement of the obligation to insure against such liability (Motor Insurance Directive) also had ex Art 95 TFEU (now Art 114 TFEU) as its legal basis.

Art 114 TFEU has been scrutinized because of its overly wide use in the EU as justification and the ECJ has not clarified its application substantively as seen from above. A capitalistic approach would be to retain from standardizing and this would lead to deregulation[81]. There remains tension between the core values of market integration and the as well as the protection of public interests (health, safety and others).[82] Some of the more extreme judgments go even further: Cleynenbreugel claims the Art 114 TFEU as "virtually unlimited internal market regulation".[83] The harmonization article is also in contradiction with the principle of conferral.[84]

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[74] Ibid, para 113.
[75] Rafał Mańko, 'EU Competence in Private Law: The Treaty Framework for a European Private Law and Challenges for Coherence' (2015) 6.
[76] Maletic 32.
[77] Case C-434/02 *Arnold André Gmbh & Co. KG v Landrat des Kreises Herford* [2004] I-11825.
[78] Case C-210/03 *Swedish Match AB and Swedish Match UK Ltd v Secretary of State for Health* [2004] I-11893.
[79] Case C-154/04 *Alliance for Natural Health and Nutri-Link Ltd v Secretary of State for Health* [2005] I-06451.
[80] Ibid, para 32.
[81] ibid 6.
[82] ibid 94.
[83] Pieter Van Cleynenbreugel, 'Meroni Circumvented: Article 114 TFEU and EU Regulatory Agencies' (2014) 21 Maastricht Journal of European and Comparative Law 64, 66.
[84] Stephen Weatherill, 'Harmonization Ten Years after Tobacco Advertising: How the Court's Case Law Has Become a Drafting Guide' (2011) 12 German Law Review 827, 857.

Applying Art 114 TFEU to autonomous vehicles which would need that in order for the EU to regulate over them, the object of the regulation should be to promote internal market integration. One of the European Commission's themes for a Road Transport Strategy includes improving the well-functioning of the internal market.[85] The object of the EU institutions should be sought with the basis of a high level of protection.[86] The Commission aims to tackle the goal with several propositions and ideas, such as encouraging clean and sustainable transport, creating a competitive and socially fair environment for companies, helping in shaping new models of transport and, of course, harnessing the benefits of automation and smart mobility services.[87] Automation will profit the internal market by shortening the time of journey, giving more choices for modes of transportation, increasing business opportunities and it will enable electronic tolling with a single service provider for the whole EU market.[88] More specifically thinking, the perfect scenarios how robotic cars can enhance the internal market are the following, i.e. as to what arguments could be used for market integration as defined in Art 114 TFEU:

- Offering basic and converging guidelines on liability and insurance policies that cover all of the single market, thus creating a safer and more secure environment for road transportation.
- Creating a platform for all auto companies to access the internal market and develop new company models for road transportation.
- Creating a legal environment where the robotic cars can firstly access the streets (free movement of vehicles), and secondly be under tight supervision during and after the development of said cars.
- Generating new jobs in the technology and auto industry.
- Increasing the efficiency of transportation, for example with lowering the duration of shipping and by lowering shipping costs, and reducing costs of passenger transportation (=minimum transaction costs).
- Having a positive impact on the free movement of persons.

[85] European Commission, 'Road Initiative Web Tool - European Commission' (2017) <https://ec.europa.eu/transport/node/4817> accessed 3 October 2017.
[86] Art 114(3) TFEU.
[87] Ibid.
[88] European Commission, 'HARNESSING THE BENEFITS OF AUTOMATION, CONNECTIVITY AND SMART MOBILITY SERVICES' <https://ec.europa.eu/transport/sites/transport/files/mobility-package-factsheet-ii.pdf> accessed 3 October 2017.

- Introducing basic liability rules on robotic cars would enhance knowledge and security in passengers and commercial goods transportation (=minimum information costs).

The most convincing remark on AVs is of market access concerning the use of Art 114 TFEU. AVs should have EU wide distribution as to not prohibit competition. A case for market access and free movement of goods is the case C110/05 Commission v Italy which concerns the market access of motorcycles especially designed for towing trailers in the Italian market:

> The Italian government has a rule that bans the use of mopeds, motorcycles, tricycles and quadricykles of towing trailers. The case is subject to only said motor vehicles as specially designed to tow the trailers. The Commission held the Italian rule restricts market access of the aforementioned products and hinders imports'. The Italian Government presented the argument on road safety. The Court held the Italian rule was justified due to the purpose of ensuring road safety.[89] In its reasoning the Court found in para 65 that 'in the field of road safety a Member State may determine the degree of protection which it wishes to apply in regard to such safety and the way in which that degree of protection is to be achieved'.

The ECJ held the Italian rule on certain mopeds which are specially designed for towing allowed in a MS. The ruling was controversial and Advocate Generals submitted their opinions on the case. The case does not fully transfer to AVs: the mopeds are used by human drivers which the AVs do not need. Yet, the reasoning the Court made in para 65 could be seen as a window for hindering the access of AVs into the markets if there is no rules on harmonization concerning them. The added benefit for the scale would in fact be the reduction of road accidents due to AVs.

3.2.3. THE PRINCIPLES OF SUBSIDIARITY AND PROPORTIONALITY

Even if Art 114 TFEU is accepted as the judicial basis for autonomous vehicles, the principles of subsidiarity and proportionality guide the regulatory process in the EU.[90] The Protocol on the Application of the Principles of Subsidiarity and Proportionality is for the national parliaments to have an enhanced role in questioning all legislative proposals in the EU in regard to the principals of subsidiarity and proportionality.[91] The Protocol includes a direct reference to Article 5 TEU to respect the principles of proportionality and

[89] Italian Moped Case, para 64.
[90] The principle of subsidiarity is defined in Art 5(3) TEU and the principle of proportionality in Art 5(4) TEU.
[91] Paul Craig, '*Eu Administrative Law'*, (2nd edn, Oxford University Press 2012) 393-394.

subsidiarity.[92] The Commission has a wide consultation responsibility before proposing new legislation and must justify all proposals with regard to said principals.[93] Thus, the EU institution must justify why an objective can be better achieved at a Union level rather than a national, regional or local level. An exception can be made if the proposal is of "exceptional urgency".[94] According to Article 12(b) TEU the Member States must also contribute actively to the good functioning of the Union by seeing that the principle of subsidiarity is respected in accordance with the procedures provided in the Protocol. Rather than a right, the national members have an actual obligation to see that the Union acts in accordance with the principle of subsidiarity and proportionality. The Subsidiarity Protocol can be used as a safety net if the Member States see the EU exceeds its competence.

3.3. EU'S COMPETENCE ON CIVIL LIABILITY

> "The obligation, legally, of one party to the victim resulting from a civil wrong or injury."
>
> The Law Dictionary 2017 2nd edn[95]

A broad definition of civil liability[96] is an "obligation, legally, of one party to the victim resulting from a civil wrong or injury".[97] Therefore in cross-border motor vehicle accidents the tortfeasor or injurer (the person who commits a wrongful act or tort, or in our case causes the accident) is liable for damages (personal and property damages / economical and non-economical damages) caused to the victim of the traffic accident. The Treaty of Amsterdam introduced means for the EU to expand its competence to civil law with Arts 67 and 81 TFEU.[98] Art 67 TFEU regulates matters concerning the the area of freedom, security and justice, and Art 81 TFEU judicial cooperation cocerning civil matters. The Treaty of Lisbon brought the right for the EU to govern over matters on IPRs.[99]

Civil liability is most commonly regulated by the Member States themselves. There have been attempts to make a comprehensive convention on matters of private law in the EU: A study group was organized in 1999 and its goal was to create a European Civil Code

[92] Subsidiarity Protocol No 2, Article 1.
[93] Ibid, Article 3 & 4.
[94] Ibid, Article 2.
[95] Black's Law Dictionary Free 2nd Ed. and the Law Dictionary, 'What Is TORT LIABILITY? Definition of TORT LIABILITY' (2017) <http://thelawdictionary.org/tort-liability/> accessed 6 October 2017.s
[96] In legal scholarly civil liability is also said to be tort liability or non-contractual liability.
[97] Black's Law Dictionary Free 2nd Ed. and the Law Dictionary (2017).
[98] Mańko 5.
[99] Ibid.

(ECC).[100] The EEC would have held extensive provisions on commercial and private law. The draft of the EEC contained an article on "Accountability for damage caused by motor vehicles".[101] Alas, Europe was not ready for comprehensive regulations on civil law and the project has been put on hold. Though, huge success in EU civil law was made with the enactment of the Rome I[102] and Rome II[103] regulations.[104] The MEPs are seeking the same success with the on civil law rules for robotics. It seems the trend is to slowly incorporate civil law into the European scheme with individual regulations and directives rather than as a detailed code for all civil matters.

Civil liability on motor vehicles is limited to a few directives: The Motor Insurance Directive[105] relating to insurance against civil liability in respect of the use of motor vehicles, and the enforcement of the obligation to insure against such liability, maintains that insurance is obligatory in the EU for vehicles. The Proposition on Civil Law Rules on Robotics calls for an insurance scheme for motor vehicles to cover autonomous robots.[106] The second directive in force is the Product Liability Directive[107] (PLD), concerning liability for defective products. The Proposition is concerned that the PLD can only cover liability when there are defects in manufacturing the robot or vehicle.[108] Amendments to these directives would be necessary to incorporate AV's to the streets (more on necessary amendments to existing law in chapter 4). The PLD was the first directive to cover civil liability in the EU's internal market which is a huge success in itself. One could argue the existence of the PLD could be a basis for the liability of robots and AVs since it in theory could in some extent be applied to them already.

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[100] Christian Von Bar, 'The Study Group on a European Civil Code' (2000) 4 Juridiska Föreningen i Finland 323, 324.

[101] Study Group on a European Civil Code and the Research Group on EC Private Law (Acquis Group), *Principles, Definitions and Model Rules of European Private Law. Draft Common Frame of Reference (DCFR) Outline Edn* (Sellier European Law Publishers GmbH 2009) 303–304.

[102] Rome I, Regulation (EC) No 593/2008 of the European Parliament and of the Council of 17 June 2008 on the law applicable to contractual obligations.

[103] Rome II, Regulation (EC) No 864/2007 of the European Parliament and of the Council of 11 July 2007 on the law applicable to non-contractual obligations.

[104] Also a win for European Civil Law was the Bryssels I regulation (No 1215/2012 of the European Commission and of the Council of 12 December 2012 on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters, which covers mutual recognition of judgments of the Member States and jurisdiction of in civil and commercial matters. Iceland, Norway and Switzerland are a part of the new Lugano Convention on jurisdiction and the recognition and enforcement of judgments on civil and commercial matters (in force 2007), which is meant for the non-members of Europe.

[105] Motor Insurance Directive, Directive 2009/103/EC of the European Parliament and of the Council of 16 September 2009 relating to insurance against civil liability in respect of the use of motor vehicles, and the enforcement of the obligation to insure against such liability.

[106] Delvaux 11.s

[107] Product Directive, 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

[108] ibid 6.s

A serious issue for the current legal system regarding AVs is that a system in control of driving. An AI or system cannot be prosecuted or held liable for damages caused by it. Like animals, a system does not hold legal personality. If a causal connection is verified between the incident leading to the unfortunate event and the AI or system, who will be held responsible? The Proposition questions if a new category of legal personhood should be created for robots so that the robot could be held liable for occurring accidents.[109] Legal personhood has been artificially given to numerous company models in the Member States. The EU has also created a new form of enterprise, a Societas Europaea (SE), the European Company.[110] The legal basis for the SE was but of course Art 100 a, currently known as Art 114 TFEU. The reasoning in Regulation No 2157/2001 of 8 October 2001 on the Statute of the European Company (SE) refers to improving the internal market by removing barriers to trade, harmonizing national company laws, simplifying mergers and solving tax problems. It seems the use of Art 114 or ex Art 100a is used widely as suggested above. The creation of a robots legal personhood could prove possible. The need for autonomous cars to possess it is another question. For a lazy Sunday it would be rather nice to send your car to McDonalds to pick up a burger without getting out of bed. There are already meal providers with simple apps to do this from your phone.[111]

AV's firstly will be owned by companies or individuals and thus individual contracting will not be necessary for cars.[112] Also, the algorithm would require highly advanced learning abilities to make efficient and specific contracts. Also, a question arises on what a car needs to contract for? A car needs some sort of fuel or electricity to function. An advanced fuelling and payment system could be integrated into the car enabling the car to independently fuel and pay for it as well. Perhaps the car could pay for its parking tickets? Could the car then be able to make a complaint over a wrongful ticket though? An AV could have a balance that the owner transfers to it monthly to do mundane shopping

[109] ibid 5.s

[110] Read more on 'the European Company' in http://europa.eu/youreurope/business/start-grow/european-company-legal-form/index_en.htm, last visited 9.10.2017; or on Council Regulation (EC) No 2157/2001 of 8 October 2001 on the Statute for a European Company (SE).

[111] Amazon has launched a package delivery system to deliver packages via drones. Drones are not limited to rush hours or roads in general and thus can fly faster to its destination. Matt McFarland, 'Amazon's Delivery Drones May Drop Packages via Parachute - Feb. 14, 2017' (*CNNTech*, 2017) <http://money.cnn.com/2017/02/14/technology/amazon-drone-patent/index.html> accessed 9 October 2017.

[112] More on artificial agents and contracting on Samir Chopra and Laurence F White, *A Legal Theory for Autonomous Artificial Agents* (University of Michigan Press 2011) 29–69.s

pre-ordered online. The possibilities are endless and further discussion on legal personhood and robots is vital.[113]

The current civil liability rules are mostly relying on the national legislation.[114] This means, there are almost 30 different legal systems applicable regarding civil liability.[115] The Member States can argue the civil liability rules are not in fact necessary, it is beyond the scope of competence of the EU and that the goal can be achieved at a national level. Civil liability is arguably at the core of national legislation. Political consensus for creating uniform liability rules on robotics can prove difficult as has been seen for the attempt of creating the European Civil Code.

3.4. CONCLUSIONS

Taking a step back and identifying the findings of conclusions on the EU's competence in regulating autonomous vehicles within the subcategory of robotics, it must be said that the Proposition on Civil Law Rules on Robotics does hold ground in regard to autonomous vehicles, especially under Art 114 TFEU. A global solution for robotics would prove best but the international law background, including the UN. Though, a global solution does seem unlikely. The EU and UN do work closely on global road transportation issues which the EU includes in its policies and regulatory framework. Close attention needs to be made on the principles of subsidiarity and proportionality when regulating civil liability and autonomous cars.

From a practical point of view market access and mutual recognition require the EU to regulate on AVs to some extent in the limits of subsidiarity and proportionality. The goal is to permit the AVs access on roads as soon as possible and with the non-EU members with bilateral agreements. It should be acceptable for AVs to drive from one MS to another and not to limit the route of long distance drives in Europe.

As to Art 114 TFEU it should be kept in mind to limit the competence to some degree given the power it gives to the EU. The subsidiarity protocol has not yielded success from the national governments point of view and the yellow card has been initiated

[113] See more on robots and legal personality on Richard Kelley and others, 'Liability in Robotics: An International Perspective on Robots as Animals' (2010) 24 Advanced Robotics 1861; John P Sullins, 'When Is a Robot a Moral Agent?' (2006) 6 International Review of Information Ethics 23 <http://portal.acm.org/citation.cfm?id=1349839&dl=ACM>..

[114] For example, according to Art 3 of the Hague Convention on the Law Applicable to Traffic Accidents (HCLATA) the applicable law in case of a traffic accident is the law of the state of occurrence (*lex loci delicti commissi*).

[115] Helmut Koziol, 'Harmonising Tort Law in the European Union : Advantages and Difficulties' (2013) 1 ELTE Law Journal 73, 74.

only twice since its creation upon the Lisbon Treaty. It is up to the discretion of the MS to react to the overreaching power of the Union. Regulating robots and AVs under the EU regime seems plausible.

4. DISCUSSING CURRENT AND NEW LEGISLATION IN THE EU CONCERNING AVS AND LIABILITY

4.1. SUBJECTS OF LIABILITY IN TRAFFIC ACCIDENTS INVOLVING AVS

There are multiple subjects in traffic accidents that may be held liable. The "normal" situation has one or multiple vehicles crashing into each other or into property. In a single car accident, the victim is the owner of the property damaged and/or the person injured and the torfeasor is the one driving the vehicle which caused the damage. An accident involving an AV might not even include persons, for example if an AV crashes into a tree. An AV might just as well drive a whole family to soccer practice and a human driver without an AV collides with the AV. Who are the subjects identified as possibly liable for the crash? The subjects will be shortly examined in this chapter.

The subjects who could be held liable for traffic accidents are:

1. Owner/user of the AV,
2. manufacturer,
3. programmer / subcontractor,
4. transportation service provider,
5. internet provider/state.

1. *The owner/user*. The first impression would be the owner of the object, the AV, should be held liable for an accident occurring from their property. This is a quite traditional legal approach to liability. The theory of seeing robots as animals would support this kind of idea that the owner of the robot would be held liable such as if your pet does damage to another being or someone else's property.[116] This however extends the idea of liability from just strict liability into something more restrictive. However, the owner cannot affect the driving of the AV. This would mean "full liability" of the owner.[117] The owner might also have the responsibility of insuring the liable vehicle which would reflect negligence on that perspective. The user can also be distinguished or rather, the user may be defined as the "instructor"[118]. The instructor "instructs" the AV to navigate to destination B from destination A, alas the function of the user is limited.

[116] Kelley and others.
[117] Nick Belay, 'ROBOT ETHICS AND SELF-DRIVING CARS: How ETHICAL DETERMINATIONS IN SOFTWARE WILL REQUIRE A NEW LEGAL FRAMEWORK' (2014) 40 The Journal of the Legal Profession 119, 124.
[118] Robert W Peterson, 'New Technology - Old Law: Autonomous Vehicles and California's Insurance Framework' (2012) 52 Santa Clara Law Review 1341, 1359.

The user is referred to the passenger in the AV that could be another subjective of an accident. The user and owner could face the same type of liability in a crash since their involvement in the crash is the same amount: zero. Or could there be situations where the user might affect the drive? An overriding safety mechanism (OSM) could be installed in the AVs that could result in some level of negligence for not using it.

2. *Manufacturer*. The liability of the manufacturer is in line with consumer protection. The liability of a manufacturer does not end with the transfer of ownership. The vehicle could malfunction or some technical aspect might not work as well as advertised. The Product Liability Directive (PLD) deals with the manufacturer's civil liability concerning defective products.
3. *Programmer*. The programmer and manufacturer can be the same subject or the manufacturer might be held liable for the programming of the AV's functions. The programmer seems to be the first in line to make the ethical decisions of the robot. These ethical decisions are situations where the car must make a decision over driving over a side walker or driving into property. The rarity of the situations must be underlined.
4. *Transportation service provider*. Transportation service providers or companies can be held liable if the crash has occurred during a paid or unpaid service, i.e. during a taxi service conducted by an AV. The taxi or other company will want to be insured in such cases.
5. *Internet provider*. An AV will require access to the internet for system updates[119], navigational purposes and to share information resulting from accidents[120]. The wireless systems of AVs require a safe network and broad communication possibilities. The MS might also be held liable if access to the internet is required by the EU.

4.2. APPLICABLE LAW IN CROSS-BORDER TRAFFIC ACCIDENTS

Cross-border road traffic accidents occur in another state than of the driver's home state or the state where the vehicle is registered. There might even be a situation where 1) the state of origin of the driver, 2) the state where the vehicle is registered in and 3) the state where

[119] James M Anderson and others, *Autonomous Vehicle Technology - A Guide For Policymakers* (RAND Corporation 2014) 128.
[120] Ugo Pagallo, *The Laws of Robots - Crimes, Contracts, and Torts*, vol 10 (Pompeu Casanovas and Giovanni Sartor eds, Springer 2013) 106.

the accident occurs are different. This means, there could be three different countries which have jurisdiction over traffic accidents.[121] The HCLATA determines traffic accidents as the following;

> "..a traffic accident shall mean an accident which involves one or more vehicles, whether motorised or not, and is connected with traffic on the public highway, in grounds open to the public or in private grounds to which certain persons have a right of access."[122]

Which law is applied in a cross-border traffic accident in the EU? The Art 3 HCLATA determines the principal rule which is law that applies to the state of the occurrence of the accident. Exception to the main rule of HCLATA is based on where the vehicle is registered at: the law applicable is the law of the country where the vehicle is registered or its' habitual station.[123] So the HCLATA's applicable law firstly depends on where the accident occurred or where the vehicle is registered at.

The reason to bring up the HCLATA is that the Member States[124] are committed to either **HCLATA** or the **Rome II Regulation** regarding to the law applicable to cross-border road accidents.[125] The reason for this is that the Rome II Regulation came into force after the HCLATA with Art 28 of the Rome II Regulation enabling the HCLATA's use. Art 4(1) Rome II Regulation states:

> "Unless otherwise provided for in this Regulation, the law applicable to a non-contractual obligation arising out of a tort/delict shall be the law of the country in which the damage occurs irrespective of the country in which the event giving rise to the damage occurred and irrespective of the country or countries in which the indirect consequences of that event occur."

According to the Rome II Regulation the main principle in torts is that the applicable law is the law where the injury occurred. Two exceptions remain: 1) the law applicable is of the

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[121] According to Brussels I Regulation on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters a person who lives in a Member State can sue in another Member State (Art 5). In addition to this a basic principle of the Regulation is that the Member State has jurisdiction where the defendant is domiciled (Art 4).

[122] Art 1 of the Convention on the law applicable to traffic accidents (Concluded 4 May 1971).

[123] Art 4(a-c) HCLATA.

[124] Member States committed to HCLATA: Austria, Belgium, Czech Republic, France, Latvia, Lithuania, Luxemburg, .Netherlands, Poland, Portugal, Slovakia, Slovenia and Spain (13). Changes to contracting parties to the HCLATA in <https://www.hcch.net/en/instruments/conventions/status-table/?cid=81>, visited 11.10.2017.

Member States committed to Rome II Regulation: Members States NOT committed to the HACLA.

[125] Thomas Kadner Graziano, 'Cross-Border Traffic Accidents in the EU - the Potential Impact of Driverless Cars' (2016) 8 <http://www.europarl.europa.eu/RegData/etudes/STUD/2016/571362/IPOL_STU(2016)571362_EN.pdf> accessed 11 October 2017.

common home place of the tortfeasor and damaged party at the time of the incident[126], and 2) the law of the country which is more closely connected to the accident[127].

The situation with two systems – the HCLATA and Rome II Regulation – seems obscure even without adding robotic cars in the mix. The HCLATA rests on the principle of *lex loci delicti commissi* where as the Rome II Regulation rests on the principle of *lex loci damni*.[128] Lex loci delicti commissi means the applicable law is of the country where the tort is committed. Lex loci damni means the applicable law is of the country where the injury appears. The applicable law is dependent on the MSs that are involved in cross-border traffic accidents. There are major differences between the MSs liability systems concerning civil liability and substantial law.[129] For example, the sums on compensation differ heavily in the Member States, and whether or not personal injury must be compensated and to what extent. [130] An exception in the Rome II Regulation is made in a situation where the non-contracting parties are living in the same country, thus the law applicable is of that country.[131]

> Case C-350/14 *Florin Lazar v Allianz SpA* was the question of what the applicable law is. The Italian Tribunale di Trieste asked for a preliminary ruling on the case from the CJEU. Mr Lazar, a resident of Romania, lost her daughter in a traffic accident in Italy and claims compensation for material and non-material damages from the Italian insurance company Allianz SpA. The Tribunale questioned whether the substantial law applied was Romanian or Italian law according to Art 4(1) Rome II Regulation. Mr Lazar, being a close relative to the deceased and living in another Member State, the CJEU ruled the indirect consequences (non-material damages to the close relative) should be regard in accordance with preamble 17 of Rome II Regulation, in "(t)he law applicable should be determined on the basis of where the damage occurs, regardless of the country or countries in which the indirect consequences could occur". The applicable law was thus the Italian law, not Romanian law.

Nagy suggest the contradiction and tension between the two systems leads to ultimately forum shopping.[132] Forum shopping would enable the victim to choose from the most

[126] Art 4(2) Rome II Regulation.
[127] Art 4(3) Rome II Regulation. "More closely connected" considers situations where for example the two parties are in contract with.
[128] Csongor Istvan Nagy, 'Rome II Regulation and Traffic Accidents: Uniform Conflict Rules with Some Room for Forum Shopping - How So, The' (2010) 6 Journal of Private International Law 93, 12.
[129]Andrea Rena and Lorna Schrefler, 'Compensation of Victims of Cross-Border Road Traffic Accidents in the EU: Assessment of Selected Options' (2007).ibid 3–4; Kadner Graziano 20.
[130] Nagy 2.
[131] Art 4(2) Rome II Regulation.
[132] Nagy.

advantageous legal system to litigate in and get awarded most compensation. This is highly questionable in the eyes of the Human Rights clauses of equality and legal certainty. Nagy found differences between the two systems which promotes forum shopping. The two systems regard the terms conduct and injury differently. If the conduct (such as reckless driving) happens in a different country and the end result (injury of a party) in another country, then the application of law differs in the two systems. Although, the writer admits this is a highly unusual situation.[133] Also to add to the mix, the Motor Insurance Directive enables for the victim to take action against the insurer (most commonly a national insurance company) in cases where damages occurred to a person or property.[134]

Let us consider a situation where the AV is involved. Let us take a German robotic vehicle driving into another vehicle in French ground with a Swedish passenger inside. The Swede is not in control of the car, the system is operating on its own and the fault can be traced to the other vehicle and not of the AV. (If the AV would be at fault, then there would be a system malfunction which would reflect on the principles of product liability.) What do we conclude? The jurisdiction could be of three MSs: Germany, France or Sweden. Applying the Brussels I Regulation Art 4: the jurisdiction lies where the victim is domiciled, in other words Sweden's jurisdiction in this case. The rules on applicable law are determined by first assessing either The Rome II Regulation or HCLATA: France, where the accident occurred, is a member of the HCLATA. Sweden and Germany are a part of the Rome II Regulation. According to Art 4(1) of the Rome II Regulation the applicable law is of the country in which the incident occurred, so the French law. All in all, the Swedish passenger can take civil action in a Swedish court room while applying French law. Another option for the victim remains to claim action against the insurer of the French driver.

Now, if we take the Swedish passenger out of the equation, how would it end up? Then the situation would leave us with a damaged vehicle registered in Germany and the fault would be the French driver's in French territory. The Rome II Regulation would apply because This could also be a question of product liability given the AV's do not posses legal personhood. We will discuss product liability in the following chapters to come.

A different solution is given in the report on '*The Choice of Law for Cross Border Road Traffic Accidents'* (2012) requested by the European Parliament. The solution for the

[133] ibid 5–6.
[134] Art 18 Motor Insurance Directive.

issue on applicable law on cross-border traffic accidents would be the harmonization of substantial laws of the Member States.[135] This would mean that the EU would impose a directive harmonizing the laws on motor vehicle accidents, mainly laws concerning limitation periods and damages. Limitation period is the time in which an action must be brought in a national court against a tort which also varies in the MSs. This would prove beneficial on the account of AVs, since it would enable the injection of robotic liability laws straight into the motor accident directives or regulations governing them. The report does point out the harmonization of limitation periods is more likely to obtain support than the harmonization of laws relating to damages.[136]

Clarification on the situation of the applicable law in cross-border traffic accidents is needed. The creation of robotic cars will not alter the situation vastly. The field of jurisdiction and applicable law are an abundant mixes of international and EU level regulations which needs clarification. Also the issue of forum shopping will reduce uncertainty. According to the Proposition on Civil Law Rules on Robotics clarifying the dual system between the Rome II Regulation and the HCLATA would have an impact on "legal certainty" and "limit forum shopping".[137] Though it is argued that most traffic accidents are resolved outside the courtroom without litigation[138], the situation does not seem maintainable. Decisions must be made at an international political level for the problems to resolve.

4.3. MOTOR INSURANCE POLICIES WITHIN THE EU

4.3.1. COMPULSORY MOTOR VEHICLE INSURANCE

Insurance is an efficient way of allocating risk and limit liability of the driver and reallocating it to private insurance companies. Most car owners have insurance in case of a car accident and it is mandatory in the EU. Insurances cover the negative impacts of the accidents such as repair of a vehicle, medical expenses and type and value of the vehicle in case of theft.[139] Insurance policies for motor vehicles are taken to protect victims as well as to protect your own property and self.[140] The Motor Insurance Directive of 2009 obliges

[135] European Parliament, 'Choice of Law for Cross-Border Road Traffic Accidents' (2012) 5, 21–23.
[136] Ibid, 21.
[137] Delvaux 8–9.
[138] European Parliament, 'Choice of Law for Cross-Border Road Traffic Accidents' 5.s
[139] Insurance Europe, 'European Motor Insurance Markets' (2015) 10.
[140] Insurance policies in Europe are roughly divided into three categories: a) Life insurance, b) non-life insurance and c) health insurance. Motor vehicle insurance and property insurance belong in the non-life insurance schemes. The insurance industry in Europe was the largest in the world in 2015, covering over €1200 billion in total premiums. The average European motor premium per capita was 221 € in 2015.See

car owners to obtain third party insurance in the EU against civil liability.[141] That is, the third parties affected by an accident are always covered by the insurer. There are ultimately two differing insurances in the EU: first- and third party insurances. Third party insurances cover damage to property and personal injuries occurred to third parties.[142] In first party insurances the insured may take action against his or her insurance company in order to claim damages, losses or injuries occurred to ones' self. The first party insurance is optional and gives you additional coverage. Additional coverage may secure from theft, fire and so on depending on the extent of the policy you are willing to pay for which is not mandatory in the EU. The Motor Insurance Directive forbids inspections of insurances entering another MS.[143]

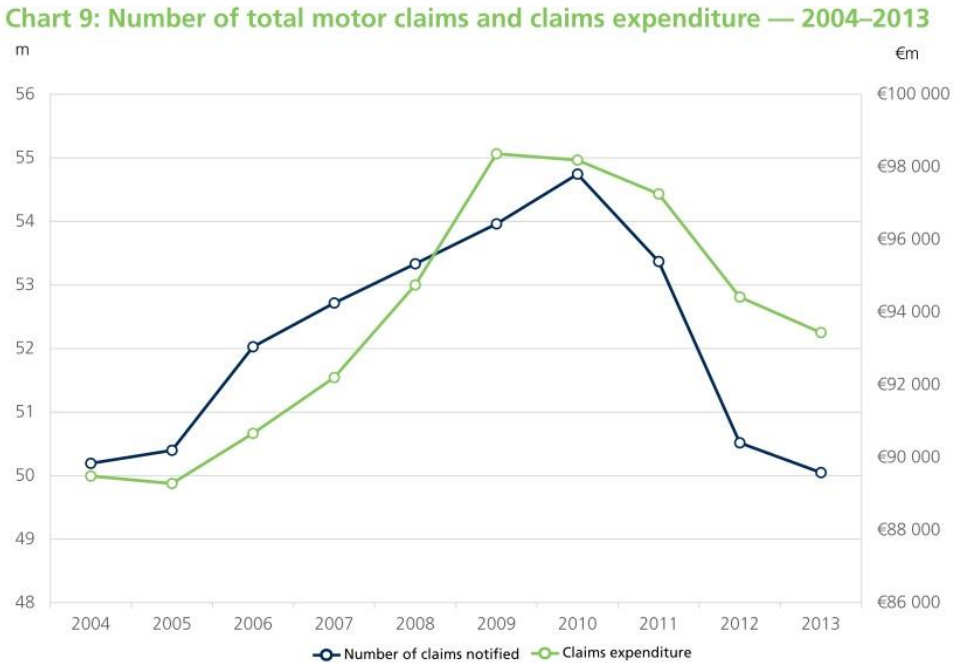

Image 5. Number of total motor claims and claims expenditure between 2004-2013 in the EU. Insurance Europe, '*European Motor Insurance Markets'* (2015), 18.

According to Insurance Europe the total number of motor claims in 2013 was around 50 million claims which almost 5 million less from the year 2010. The number highlights only the reported claims excluding privately settled incidents.

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more on Insurance Europe, 'European Insurance: Key Facts' (2016) <https://www.insuranceeurope.eu/sites/default/files/attachments/European Insurance - Key Facts - August 2016.pdf>.

[141] Motor Insurance Directive, para (8).

[142] Ibid, Art 3.

[143] Ibid, Art 4.

The Motor Insurance Directive defines motor vehicles in Art 1(1) a motor vehicle as 'any motor vehicle intended for travel on land and propelled by mechanical power, but not running on rails, and any trailer, whether or not coupled'. The broad definition could in fact include AVs in it. The AV's basic function is to travel in a direction by mechanical power.

Semi-automated, or SAE levels 1-4, are already included in the Insurance Directive of 2009. This could lead to the assumption that SAE level 5, the AVs, can be seen already covered in the EU's insurance scheme since the concept of vehicle remains the same. I.e., the main objective remains in transporting from place A to B. Delvaux's report para 29 notes the EU's insurance scheme should be modified in cases where the insurance covers both human acts and failures.[144] There could be an example where the AV and a human driver collide in which there is fault in the human driver since it is most likely that the two will be roaming the streets at the same time rather than the full march of AVs on the streets, i.e. the transition period. The report also demands the insurance policy to be compulsory concerning AVs.[145]

We shall examine a questionnaire made in 2016 to some MS's in order to get a more comprehensive outlook on insurance policies and regulations within Europe. The questionnaire produced a report in 2016: '*Compulsory Liability Insurance from a European Perspective'* (hereinafter Insurance Report).[146] The goal of the Insurance Report was to better understand the compulsory liability schemes in some MSs.[147] The hypothesis set out was that compulsory insurances contribute to the rise on risk-taking, for example in driving motor vehicles.[148] In other words, taking insurance on an object reduces the will of one to take care of said object, "if it breaks, I am covered". The following MSs participated in the questionnaire: Austria, Belgium, the Czech Republic, Finland, Germany, Hungary, Italy, Switzerland, and the United Kingdom (9).[149] The questionnaire covered all forms of

[144] Delvaux 11.
[145] ibid.
[146] Attila Fenyves and others, 'Compulsory Liability Insurance from a European Perspective' (2016) 36 Compulsory Liability Insurance from a European Perspective.
[147] For the exhaustive list of research questions see Insurance Report, 4-5.
[148] Insurance Report, 3.
[149] Concern is to be drawn upon the fact not all Member States are represented in the questionnaire. The report argues that Nordic countries, Germanic family, Romanic family, post-communist countries are represented in the questionnaire. Also, Britain is represented in the report as the upcoming showdown on Brexit is underway whilst writing this thesis. See more on the reasoning behind choosing the nine countries on the Insurance Report, 6.

liability including motor vehicle insurance. No surprise was that there were no indications on robotic insurance or equivalent to it in the report.[150]

According to the study, there are no clear compulsory insurance systems in place within the respondents. Thus the insurance schemes within the countries have a rather mixed system as to when insurance is a must. For example, Austria has over 50 federal laws that set out an obligation to insure[151], as to the UK has nearly 20 obligatory insurance laws set out[152]. The Motor Vehicle Directive has been well implemented in the respondents' legal systems. Compulsory insurance is sometimes linked with strict liability, sometimes not.[153] On a positive note, the Belgium law requires unlimited coverage for bodily injury in motor vehicle accidents.[154] The aim of the insurance policies within the respondents is unanimously to protect the victim.[155] Other aims were the protection of the insurance holder and societal implications.[156]

The default hypothesis (compulsory insurances contribute to the rise on risk-taking) does not apply to autonomous vehicles. The system and programming of an AV stays constant throughout its lifecycle (if well programmed and no malfunctions appear). The system should ideally be in full risk-averting mode constantly to protect itself, people inside and outside of it and property. In other words there is no possibility of the machine to feel as humans do which might affect human behaviour. In this light, there remains true potential in creating new mandatory insurance policies on AVs or to modify modern legislation, mainly amending the Motor Vehicle Directive.

The capability of the system, the AI, to "feel" may alter the preceding thought. I do believe the systems are not going to be programmed to "feel" as a normal human being would, or not at least motor vehicles. Caring robots (a case apart from surgical robotics), such as used in nursery homes, could be programmed to feel sympathy towards the user.[157] There is no point in programming feelings for AVs, not for the time being.

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[150] Cyber insurance is taking over globally with the up rise of the internet and hackers. More on cyber insurance see chapter 4.3. and ENISA's report *'Cyber Insurance: Recent Advances, Good Practices and Challenges'* (2016) available at https://www.enisa.europa.eu/publications/cyber-insurance-recent-advances-good-practices-and-challenges, last visited 26.10.2017.

[151] Daniel Rubin, '*Compulsory Liability Insurance in Austria',* Insurance Report (2016), 17; Daniel Rubin, '*Comparative Report'*, Insurance Report (2016), 385-386.

[152] Daniel Rubin, '*Comparative Report,* Insurance Report (2016), 386.

[153] Ibid.

[154] Herman Cousy & Caroline Van Schoubroeck, '*Compulsory Insurance in Belgium*', Insurance Report (2016), 60; Daniel Rubin, '*Comparative Report,* Insurance Report (2016), 397.

[155] Daniel Rubin, '*Comparative Report,* Insurance Report (2016), 393.

[156] Ibid, 394.

[157] More on surgical and caring robots in....

An exceptional item discovered in the study for motor vehicle insurances was that some countries regulated which *risk exclusion clauses* (clauses that prohibit certain circumstances in which a tort occurs, such as a natural disaster) are allowed and which are not.[158] Austria, Czech Republic, Germany and the UK had different aspects on risk exclusion clauses. Art 4 of the Austrian Motor Vehicle Liability Insurance Act, a federal act, contains a rather exhaustive list of how an insurance policy may be limited.[159] The list includes situations where (1) there is no insurance contract under obligation; (2) the vehicle was used without consent; (3) insolvency proceedings had been initiated.[160] The Czech Rebulic Motor Third-Party Liability Insurance Act allows liability insurance exceptions concerning for example (i) a terrorist attack.[161] The German's on the other hand, also have an exhaustive list on risk exclusion clauses in § 4 of the Statutory Order on Compulsory Motor Vehicle Insurance. The list allows the exclusion of damage to property or pure economic loss as well as accidents occurring in car races.[162] The Insurance Directive allows certain exclusion clauses if they are in accordance with Art 14 of said Directive.

The AV's could be excluded with an exclusion clause in an insurance policy, for instance in the Insurance Directive. This would lead to the situation where AV's have a separate motor vehicle insurance policy. Delvaux's report encourages the insurance industry to develop new insurances for robotics.[163] The US regime in AV's has encouraged the insurance industry to develop no-fault policies.[164] There are three theories of tort in the US regime for traffic accidents: 1) no-fault liability, 2) strict liability and 3) traditional negligence.[165] The no-fault insurance system is based on the idea that the victim may not take action against the tortfeasor unless the threshold of level of severity is passed which means the number of lawsuits usually reduces.[166] The victims are compensated through their own insurance.[167] The no-fault insurance[168] policy would exclude the long, expensive

[158] Ibid, 398-399.
[159] Daniel Rubin, '*Compulsory Liability Insurance in Austria',* Insurance Report (2016), 29.
[160] Austrian Financial Market Authority (FMA), 'Act on the Compensation of Road Accident Victims (VOEG - Verkehrsopfer-Entschädigungsgesetz), Unofficial Translation in English' (2017).
[161] Art 7, Czech Republic Act No. 168/1999 Coll. - Motor Third Party Liability Insurance act on liability insurance for damage caused by operation of vehicle and on amendments to certain related acts; Daniel Rubin, '*Comparative Report',* Insurance Report (2016), 398.
[162] Robert Koch, *'Compulsory Liability Insurance in Germany'*, Insurance Report (2016), 146-147.
[163] Delvaux 11.
[164] Anderson and others 118.
[165] ibid 112–113.
[166] ibid 113.
[167] Ibid.

procedure of defining who is liable for the accident. If this were the case, the deductible must be within reason for the policyholder. The reasonability of the cost of the deductibles in insurance may not be in the competence of the EU if considering the principles of subsidiarity and proportionality.

The study indicates that a within the compulsory third party motor vehicle insurance scheme the national substantial laws differ from others which is the case with exclusion clauses. The Insurance Directive is in effect and in use in the respondents legal systems.

Insurance Europe on a news report on their website on 3rd May 2017 stated there is "no need for new liability rules for new technologies".[169] The short statement referred to the sufficiency of the current state with the Product Liability Directive and its coverage. Also, a new policy would hinder technology and the development of the insurance industry to create new products for technology. This is quite a common opinion within the private sector that legislation would restrain innovation and technology. We must keep in mind Insurance Europe is an independent organization that represents as a voice and lobbyist for the European insurance community, i.e. it is more of a private entity. This is also a good point to keep in mind on how deep the core legislation may reach. Compulsory insurance is though an exceptional item in motor vehicle accidents since the accidents tend to be of large scale: monetary losses of property are often significant for the average Joe and personal injuries may alter the standard of living at least temporary. Compulsory third party insurance for AV's is to be seriously considered.[170]

Other than a mandatory insurance policy is to develop voluntary insurance policies for robots and AVs. Here the insurance industry would play a huge role. The Motor Insurance Directive stays in force but complementary insurance policies would be available for the consumer and corporations.

The insurance industry has already woken up to the up rise of AVs: in the US Accenture predicts the AV insurance business will be over 81 billion US dollars from 2020

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[168] The no-fault liability is already in use in some MSs such as France (*Loi Badinter*) concerning motor vehicle traffic accidents. See more on

[169] Insurance Europe, 'No Need for New Liability Rules for New Technologies | Insurance Europe' (*5 May 2017*) <https://www.insuranceeurope.eu/no-need-new-liability-rules-new-technologies> accessed 27 October 2017.

[170] In other news; Zurich Insurance uses AI for personal injury claims, ie replaced 40'000 working hours per year with automated robots which has improved accuracy. More on Reuter's website https://www.reuters.com/article/zurich-ins-group-claims/zurich-insurance-starts-using-robots-to-decide-personal-injury-claims-idUSL2N1IK268, last visited 30.10.2017.

to 2025.[171] The report concludes that with fewer collisions and insurance claims due to AVs the price for insurance policies would in fact be lower.[172] The report also sees potential in three new subcategories of insurance: 1) cyber insurance, 2) software and hardware insurance and 3) infrastructure insurance.[173] Cyber insurance deals with risks accommodated with information systems of asset owners[174], such as hacking[175]. Software and hardware insurance deal with the risks to manufacturers, such as hardware malfunction.[176] Infrastructure insurance deals with environmental factors, i.e. where the AV rides itself. The AV takes information from the environment, such as traffic lights and its surroundings and there might be failures in sensors.[177] These are some of the new products that might arise in the EU context.

The aforementioned Accenture report suggests that new premiums will be paid mostly out of the manufacturers and governments pockets.[178] The mentioned shift of costs of premiums is a note worthy assessment of the changes AVs will make in the future. The shift is directly proportionate to the influx of getting the AVs a green light on Europe's roads.

4.3.2. EU INSURANCE FUND FOR AVS

The Insurance Directive holds under Art 24 the MSs must create an insurance guarantee fund for certain situations. The victims may claim against a guarantee fund if the other party's vehicle is either uninsured[179] or unidentified as a last resort option for compensation in cases where the accident occurred in another MS other than of his or her home residence, i.e. cross-border traffic accident. The guarantee fund the victim may contact is the MS where the car is normally based at.[180]

[171] Karp and Kim 2.
[172] Ibid.
[173] Ibid, 5-7.
[174] ENISA, 'Cyber Insurance: Recent Advances, Good Practices and Challenges' 26, 6.
[175] Karp and Kim 6.
[176] Ibid.
[177] Ibid.
[178] Ibid.
[179] Driving uninsured is still s worrying issue in the EU. According to the Insurance Europe's report '*European Motor Insurance Markets'* (Nov 2015, 56) uninsured claims paid by the national guarantee funds due to uninsured vehicles was at 618 million euro's in 2013.
[180] Motor Insurance Directive, Art 5(2).

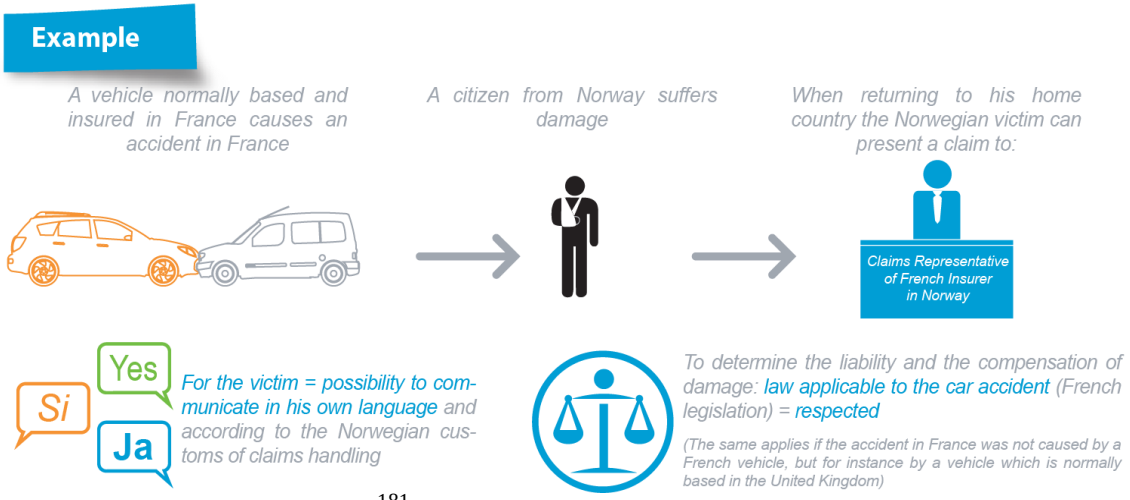

Image 6. Council of Bureaux[181], '*The Protection of Visitors scheme*' 2017.

Thus the Insurance Directive is designed to protect the victims of cross-border traffic accidents. Currently, the last resort compensation mechanism for the victim is at a national level. [182]The Parliament's Resolution on Civil Law Rules on Robotics suggests a fund, national or EU level that will compensate the victim in case of an accident involving robots.[183] The Parliament envisages there could be several options how compensation of victims could be established which the Commissions impact assessment should take into account:

a) A compulsory insurance scheme,
b) A last resort fund for victims,
c) Granting limited liability to a manufacturer/programmer/owner/user if they participate in the compensation fund or if they jointly insure a robot for damages,
d) Creating a general fund or a fund for each robot category, such as AVs,
e) Creating a Union register for robot that would show certain details of its specific fund, and/or
f) Creating legal status for robots.

We have covered option a) previously. Part e) will be examined in part 4.6.3. of this research, as to if the registration of AVs is necessary. Parts b)-d) are under examination.

[181] The Council of Bureaux acts as contact point for the green card system which is a protection mechanism for victims of cross-border traffic accidents. The green-card system was initially adopted by UNECE and is in use in all the MSs. The green-card system has been facilitated in the EU and is in direct coherence with the Motor Insurance Directive of 2009. More on the green-card system see their website at <http://www.cobx.org/content/default.asp?PageID=57> accessed 1.11.2017).
[182] Image http://www.cobx.org/Content/Default.asp?PageID=61.
[183] European Parliament, '[P8_TA(2017)0051] European Parliament Resolution of 16 February 2017 with Recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL))' (2016), para 59(a-d).

The main objective of the fund would remain in compensating the victims of traffic accidents. Whether the amount is of full compensation it remains for the impact assessment to weigh options.

Option b). The suggested fund would be of the like as in the Motor Insurance Directive. The Parliament's recommendation for the Commission suggests only a situation where the car is not insured. The Motor Insurance Directive covers more than just uninsured vehicles: it also covers unidentified vehicles. There is no opinion on what level the fund should remain, either at the EU level or national level. There are benefits to both: national level insurance funds are more close to the citizen and lower the threshold to access compensation, though an EU level fund would secure harmonization of utilization in the MSs. There also remains the question of insolvency: The Motor Insurance Directive is under the Commission's Regulatory Fitness and Performance Review (REFIT) at the time of writing this thesis, one of the reasons why that is there are no rules on when one party is insolvent.[184] The new found fund should take insolvency into consideration.

Option c). Granting limited liability to manufacturers and others creates an interesting scheme, especially given the fact that the insurance premiums for AVs are going to be more of the worry of the manufacturers (and governments). This creates opportunity to allocate the risks from AVs more over to manufacturers from the governmental side. Another thing to consider is that limited liability could in theory reduce the intention of the manufacturers or programmers to maximally ensure the security of AVs and other robots if it is what the legislator chooses to support. There are thus two core-values at play: security and risk-taking. Security in fail-proofing the robots and risk allocation from the host to the insurance fund. The fund needs to correctly allocate the amount of payments or monetary input and limited liability to an optimized situation where the security of the AV is at its highest. An example of a similar limited liability system is currently in use in New Zealand for motor vehicle insurance. In New Zealand you have an option of paying additional costs on top of petrol that goes to a different fund to compensate victims from.[185] However, New Zealand has a voluntary system on motor

[184] European Commission, 'REFIT Review of the Motor Insurance Directive' (*Ares(2017)3714481*) <https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-3714481_en> accessed 1 November 2017.
[185] ACC, 'Paying Levies If You Own or Drive a Vehicle' (*10 October 2017*) <https://www.acc.co.nz/about-us/how-levies-work/paying-levies-if-you-own-or-drive-a-vehicle/> accessed 1 November 2017.

vehicle insurance. The rate of uninsured vehicles is under 8 % in New Zealand which is a global average.[186]

Option d). Creating a fund for AVs especially may be in order since most vehicles are already in a register. Other robots, such as nursing and surgical robots, might also find advantageous for having their own register but that falls outside of the scope of this thesis. The fund would split the risks of all agents involved n an AV involved accident: all agents would bear the costs of the accident.[187] An option for financing a fund specifically for AVs could come through taxes from the agents of the field: manufacturers, users/owners and other AV companies, such as the taxi companies.[188]

4.4. EUROPEAN VEHICLE TYPE APPROVAL SYSTEM

For the manufacturers of the auto industry to put a product into circulation in the first place, they have to comply with the EU type-approval system established by the Directive 2007/46/EC establishing the framework for the type approval of motor vehicles and their trailers and of systems, components and separate technical units intended for such vehicles. The directive calls for "a high level of road safety, health protection, environmental protection, energy efficiency and protection against unauthorised use".[189] The directive harmonizes the approval of one MS to be considered approved in another MS, i.e. one approval of a vehicle for sales distribution is enough. The manufacturer is thus given a certificate of conformity for the vehicle in question by a verified national authority.[190]

The big question revolving around AVs is that is it considered a vehicle or is it a robot? Or will there be a new categorization specifically for AVs. The last option seems the most likely one. The Vehicle Type Approval System in Europe needs to specify the technical and mechanical requirements for vehicles without drivers, and if so, the approval of AVs must be harmonized in the EU for EU wide distribution of the product and usage. The technical aspects of an AV, such as multiple sensors, differentiate them from normal vehicles, which is why it needs special requirements defined by auto-engineers and other specialists.[191]

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[186] Ministry of Transport, 'Vehicle Insurance in New Zealand' (2009) 6.s

[187] Carrie Schroll, 'Splitting the Bill: Creating a National Car Insurance Fund to Pay for Accidents in Autonomous Vehicles' (2015) 109 Northwestern University Law Review 803, 822.

[188] Ibid.

[189] Directive 2007/46/EC establishing the framework for the type approval of motor vehicles and their trailers and of systems, components and separate technical units intended for such vehicles, preamble 3.

[190] Art 18.

[191] Lennart Lutz has researched the needed amendments to the type-approval system in Europe in his proposal of '*Automated Vehicles in the EU: Proposals to Amend the Type Approval Framework and Regulation of Driver Conduct*' (Casualty Matters International 2016).

4.5. PRODUCT LIABILITY

4.5.1. APPLICABLE LAW CONCERNING PRODUCT LIABILITY

Product liability in the EU is governed by two main laws: the Brussels I Regulation and the Product Liability Directive (PLD) 85/374/EEC. The Brussels I Regulation concerns which substantial liability law is applicable in a given case.[192] The main principle of the Brussels I Regulation is in Art 4(1) which implies the jurisdiction lies in the MS where the defendant is domiciled irrelevant of his/her nationality. Section 2 of the regulation deals with special jurisdiction of a MS, such as jurisdiction based on contract. Another case law driven principle on special jurisdiction concerns with where the damage occurred: the defendant may also sue in that place accordingly.[193]

The PLD on the other hand governs the harmonization of MSs' product liability laws. The main objective of the PLD is to protect the victims of defective products which we will examine next.

4.5.2. GENERAL IMPLICATIONS OF THE PLD AND OWNERSHIP

Product liability will be of close connection and concern of the AV industry since the risks concerning them are shifting in the direction of manufacturers. There will also be a shift from user liability to product liability.[194] The Product Liability Directive (PLD) protects the consumers who have bought defective products. The PLD harmonized (in accordance with Art 114 TFEU) product liability issues within the MS. One of the reasons for enacting the PLD was to protect consumers from the advancements made in technology which can create uncertainty with some products.[195] The PLD was a spectacular achievement of the EU and its institutions in the sense that civil liability is now a part of the Union's interests as is the protection of consumers. The main principle of the PLD holds producers liable for defective products.[196] The PLD is of strict liability, thus the victim does not need to prove fault or negligence of the manufacturer. The PLD covers damages made to property (only when the value of the property exceeds 500€) and personal injury.[197] The liability of a manufacturer may be reduced or disallowed if the user has acted in a negligent way.[198]

[192] Kadner Graziano 30.
[193] ibid 31.
[194] Zsolt Szalay and others, 'Development of a Test Track for Driverless Cars : Vehicle Design , Track Configuration , and Liability Considerations' (2017) 6.
[195] PLD, preamble.
[196] Art 1 PLD.
[197] Art 9 PLD.
[198] Art 8(2) PLD.

Future owners of AVs are protected under the PLD. The self-driving vehicle is an object in itself that will be available for purchase for consumers sometime in the near future. The manufacturers are facing the fact that they are more likely held liable in crashes without a human driver to blame. The chain of liability within the suppliers and manufacturers are taken into account in the PLD. In Art 3(3) PLD a supplier avoids liability with identifying their own supplier of a defective part.[199] There are claims the supplier may make under Art 7 PLD which exclude liability:

> The product was not put in circulation by said producer[200],
>
> the product was not made for sale or circulation or[201]
>
> the scientific and technical knowledge at the time when the product was put into circulation was not such as to enable the existence of the defect to be discovered.[202]

Concerning the legal theory in the PLD, the Report with Recommendations to Civil Law Rules on Robotics questions in non-contractual liability whether strict liability or liability without fault framework is sufficient enough: proving the defect and causal link with the defect of the product covers only damage caused by a robot's manufacturing defects.[203] Needless to say, the ideal situation is where AVs do not have defects. At least of which the manufacturers do not know of. It is in the interest of the manufacturers to eliminate all defects of their products since a wide spread malfunction of the breaking mechanism for example could lead to widespread withdrawal of the product.[204] It must be noted that "defectiveness" does not mean it must lead to an accident for an individual to seek cover with the PLD, a mere defect of the product is enough.[205] Though, when buying a brand new car the seller often issues some sort of guarantee for the vehicle in case of defects.

The manufacturer or producer ultimately makes the decision of programming. Some suggest programming an AV means you must make the ethical choices beforehand which can make the manufacturer liable for an accident.[206] From an ethical standpoint, picture

[199] Stephen Weatherill, *EU Consumer Law and Policy* (Edward Elgar Publishing Limited 2013) 175.
[200] Art 7(a) PLD.
[201] Art 7(c) PLD.
[202] Art 7(e) PLD.
[203] European Parliament Committee on Legal Affairs preamble AH.
[204] Audi had to withdraw thousands of vehicles since they had distorted the amounts of emission the vehicles discharge into the air in Britain. More on http://www.telegraph.co.uk/news/2017/07/21/now-audi-recalls-thousands-cars-harmful-emission-levels/, accesses 6 November 2017.
[205] Weatherill, *EU Consumer Law and Policy* 175.
[206] Belay 123.

situation where the lives of the passenger of the AV and a person walking a dog are involved: which would you want the system of the AV to protect, you or the person walking the dog? Such ethical choices may in fact be decided by a programmer in front of a computer.[207] Thus, before putting the product or vehicle into circulation, the manufacturer must make ethical choices concerning the algorithm of the system. The opposition of such claims would give rise to the fact that an AV would never get into such a situation. The sensors and indication systems of the AV can cover a long distance up to two American football fields.[208]

It must be noted that service products are not included in the PLD. This means if you for instance call for a taxi, you cannot take action on the basis of the PLD since there is no product to complain about. A question remains whether a decrease of car ownership and the rise of service products, such as new types of taxis, will induce the legislator to incorporate or create new legislation for service products, especially in the auto industry. The EU should encourage entrepreneurship in this instance since it would reflect (hopefully) upon the decrease of emissions from cars. Nevertheless, the ownership of the AVs is a big question mark that even the Proposition on Civil Law Rules on Robotics has not properly taken into consideration.

4.5.3. BURDEN OF PROOF

When thinking of consumer law, the consumer is usually more protected as it is insurance law, where the victim is protected. The PLD follows the same method in protecting the weaker party, the injured victim. According to Art 4 of the PLD the burden of proof is delegated onto the injured victim. The victim must prove three things: a) the defect, b) actual damage and c) a causal link between a) and b). Proving a defect in the AV may prove difficult. The victim may rely on expert statements. Expert statements on robotic failure may prove to be difficult since the technology is often fairly enhanced and it is questionable whether the producer will leave out information and in what quantity for the user and/or other parties. This is ultimately a question of data protection. Although, the fact the manufacturer may receive information on malfunctions almost instantly may raise their liability concerning accidents. The PLD does not require that the victim proves either

[207] Ibid.

[208] Doug Newcomb, 'Ford Introduces New Autonomous Development Vehicle, Expands Test Fleet To 90 Cars' (*Forbes*, 2016) <https://www.forbes.com/sites/dougnewcomb/2016/12/28/ford-introduces-new-autonomous-development-vehicle-expands-test-fleet-to-90-cars/#5b586a9954e9> accessed 7 November 2017.

negligence or fault of the manufacturer or importer.[209] Here, the lawmaker has opted to lighten the burden of proof of the victim with strict liability. This is also due to the fact of the heavily insurances field of transportation.

According to Art 6 PLD considering all circumstances, a defect is in the product if the product does not provide safety for the user. There are three points to take into account considering safety in conform with the PLD: a) the presentation of the product, b) the use of the product and c) the time the product was put into circulation.[210] Point a) considers media and advertisement of the product, also what the seller wants you to believe what the product can do and what it actually can do. Point b) refers to defects or failures which occur or hinder the usage of the product.

A far reaching approach to an AV liability claim could be to claim the AV's system had a fault in its programming if the accident had an ethical dilemma, let us say for example the car hits one human instead of the another human. The family of the dead person might sue the manufacturer for choosing one human over another. The liability pf the programmer comes to question. The safety of the programming of the AV must be held high yet the legislator must not deter innovation. The ethical situations need discussion as for numerous scholars have written on robotics and ethics.

The causal link between a) and b), the defect and actual damage, might prove difficult in AVs. It might be possible to "call for" the car to pick you up from point A. There might not be any witnesses in the AV or in the surroundings if the AV crashes in its route to point A, for example in a tree. The causal link will rest on administrative findings, i.e. the police investigation or such, or in the AVs own system report if that is required by the legislator. Some kind of internal logging will be useful in cases of incidents.

Germany has opted in a solution for the problem of the liability growing on manufacturers: a black box is to be installed in all AVs.[211] This technology is used particularly in aviation and it tracks the movements of the plane and system failures.[212] The black boxes record flight data records.[213] Some MSs, including Italy, have seen the benefits

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[209] Eur-lex, 'Summary of Directive 85/374/EEC - Product Liability' (2016) <http://eur-lex.europa.eu/legal-content/EN/LSU/?uri=celex:31985L0374> accessed 6 November 2017.
[210] Ibid.
[211] Reuters, 'Germany to Require "Black Box" in Autonomous Cars' (*18 July 2016*) <http://www.reuters.com/article/us-germany-autos/germany-to-require-black-box-in-autonomous-cars-idUSKCN0ZY1LT?il=0> accessed 3 November 2017.
[212] Bureau d'Enquetes et D'Analyses pour la Securite de l'Aviation Civile, 'Flight Data Recorder Read-Out: Technical and Regulatory Aspects' (2005) 6 <https://www.bea.aero/uploads/tx_scalaetudessecurite/use.of.fdr_01.pdf> accessed 6 November 2017.s
[213] ibid.

of black boxes.[214] Also in the US California and Nevada made black boxes compulsory for AVs.[215] The black boxes would prove beneficial in AVs since they can collect data that show reasons for technical errors, thus liability would be easier to prove. Black boxes can also reduce the amount of premiums of insurances.[216]

The burden of proof is rooted in strict liability on the PLD. Other liability theories, such as negligence and no-fault liability rules are examined in the latter part or the thesis. Black boxes would help secure the liability regime if made mandatory for AVs. It would not only help seek who is liable but also deter from criminal activities.

4.5.4. OVERRIDING SAFETY MECHANISMS

Overriding safety mechanisms are designed for a last resort mechanism where the user of the car is able to override the AVs own system. The auto-industry has two options: either to include such an overriding system into the AV or not to include it. The inclusion of overriding safety mechanisms (OSM) might alter the outcome of liability issues revolving around AVs. For example, the manufacturer could include a steering wheel and pedals which emerge when there is a fault in the system of the AV. Including an OSM as such in the AV would mean the passenger should have some level of knowledge or driving permit for the vehicle. Also, considering the SAE levels of automation, the inclusion of an OSM could drop the AV from level 5 the level to 4. This would mean the AV is not fully autonomous at all and could in fact be possible to drop from the categorization of robotics. Though, this all depends on whether the EU chooses to conform to the SAE levels or how to define the term autonomous vehicle.

The inclusion of an OSM would mean there is a chance for negligence on the part of the passenger or user. This would ease the strict liability regime and burden of the manufacturer. There could be situations where the computer or software of the AV could malfunction and the user should take control. Determining when the user has to take control over the vehicle could prove difficult. Also, if the AV contains the capability of learning it might further complicate the situation.[217]

Another question close to OSMs is the concept of open hardware. In "open robot hardware" the code of the robot is left open so that the owner or user or others can modify

[214] Blincoe and others 192.
[215] Webb 39–40.
[216] Insurance Europe, 'European Motor Insurance Markets' 93.
[217] Nathalie Nevejans, 'European Civil Law Rules on Robotics' (2016) 16.

the algorithm of the robot.[218] This would lead to a situation where it would prove difficult to securely determine whether the code that caused a malfunction for example was the fault of the open hardware –community or the manufacturer. The idea of vehicle manufacturers of opening their code for the public seems full of risks: one troll could create a pile-up or drive a truck into a building. This is evidently also an issue of privacy and data-protection which cannot be ignored.

So is the overriding safety mechanism even safe at all? The point of the AVs is that the amounts of accidents reduce heavily and emissions from cars can be maintainable. Drawing from the background of the research, the transitional period of the AVs might demand some sort of mid-phase: AVs can take control if the driver or user lets it be in full control. The legislator must thus consider the liability issues when driving the AV itself. A self explanatory solution would be the old rules apply in these cases like they have previously applied. The open hardware concept of robotics unfolds many risks for auto manufacturers.

Product liability has tremendous potential in governing liability issues governing AVs. Product liability combined with compulsory insurance schemes seems like a likely route for the EU to govern AVs through if not by completely new regulations and standardization.

4.6. REWARDING DAMAGES

The substantial laws on rewarding damages resulting from traffic accidents in the EU are up to national governments. The Rome II Regulation, the Motor Insurance Directive and the PLD do not govern how the damages are calculated on rewarding damages, yet they leave a wide framework for the MSs to regulate in.

Rome II Regulation. The basic principle of the Rome II Regulation is as preamble 17 states: "the law applicable should be determined on the basis of where the damage occurs". Now, the Rome II Regulation does not determine substantive laws. The report on the Choice of Law for Cross-border Traffic Accidents (2012) has suggested the harmonization of substantial laws concerning damages as to resolve the issues revolving around the law applicable to cross-border traffic accidents.[219] Article 2(1) Rome II Regulation stipulates

[218] ibid 19.
[219] European Parliament, 'Choice of Law for Cross-Border Road Traffic Accidents' 5.

the damage shall cover any consequence arising out of tort. The term "any consequence" is widely interpreted.

This leaves a wide regulatory framework for national governments to decide upon. Though, 33 of the preamble of the regulation cite the following on cases resulting in personal injury:

> 'According to the current national rules on compensation awarded to victims of road traffic accidents, when quantifying damages for personal injury in cases in which the accident takes place in a State other than that of the habitual residence of the victim, the court seized should take into account all the relevant actual circumstances of the specific victim, including in particular the actual losses and costs of after-care and medical attention.'

The regulation does not regulate on which types of damages must be compensated. The regulation does suggest national parliaments to pass laws on unjust enrichment[220] and most importantly, under Art 15 what the law of the non-contractual obligation shall govern. For example in Art 15 the basis and extent of liability has to be set in the applicable law. Thus, the national governments posses a wide range on what the award is.

Motor Insurance Directive. The Motor Insurance Directive obliged the MSs to cover a minimum amount of cover per victim as in Art 9 of the directive. For personal injury the minimum amount of coverage is 1 million euros per victim or 5 million euros per claim.[221] For property damage the minimum amount of coverage is 1 million euros per claim which does not depend on the amount of victims.[222] In Art 3a of the directive the MSs must take appropriate measures to ensure the insurance covers 'any loss or injury' which occurs in a MS. The directive does not regulate on amounts of rewards. Also, rewarding damages according to the MSs' substantial laws differ heavily in the EU. Some MS reward much higher and some much lower for non-pecuniary damages.[223]

Considering the fact that there is no political consensus on the amount of rewarding damages to victims, there would be vast oppose on governing on it on the EU level. It would be a deep injection of substantial civil law in the EU. It would also be questionable on the principles of subsidiarity and proportionality. Also, there remains the idea of forum shopping in seeking damages as is mentioned in chapter 4.3.

[220] Art 10 Rome II Regulation.
[221] Art 9(1a) Motor Insurance Directive.
[222] Art 9(1b), ibid.
[223] Rena and Schrefler 10.

4.7. FRAMEWORK FOR NEW LEGISLATION

Previously we have examined current legislation and amendments needed to be made or considered to them regarding AVs. The current legislation proposes a basis for AVs yet a more profound and exact legislation would prove beneficial for a more rapid introduction for said vehicles. Next we are examining creating new legislation on robotic vehicles assuming the EU has competence on such matters. Another substantial question is which legal liability theorem could prove beneficial and what new aspects the legislator must take into consideration concerning AVs.

4.7.1. DEFINITION

Giving a definition for AVs on an EU level will prevent misconceptions and mainly the scope of new legislation would require an accurate meaning as to know what the legislation intends to govern over. An exact definition would be of use in the community of robotics and manufacturing. The definition should also be flexible in a way to not hinder innovation[224] and the MSs thus would have the same technical requirements for AVs[225]. Essentially the same safety requirements would need to be attained in each MS. The definitio 020605a7365n should also be clear and precise with distinction to other robots, such as medical robots that have a different purpose for their creation. The new regulation will either have all subcategories of robots in one regulation, directive or policy. Given that there is only one policy on robotic liability, robots should be systemized and defined to their specific tasks.

The SAE levels for automation level 5 determines full autonomous vehicles as a system that can perform all driving tasks as a human would perform them. However, the SAE levels only refer to levels of autonomy. Also, there is a vague and blurry difference between the SAE levels 4 and 5: in level 4, the human driver may intervene.[226] A political decision is whether an OSM or other device is required for the AV. This will also reflect on the definition. The SAE levels of automation serve as a basis and mention should be made to its full capability to perform without human control, i.e. independence of human activity. SAE International has also issued a report on definitions and terms concerning

[224] (2015/2103(INL)), p 2.
[225] European Aviation Safety Agency 31.
[226] Dorothy J. Glancy 632.

road vehicles and automation[227]. The opinion of the Committee on Transport and Tourism suggests the differentiation of automated and autonomous vehicles in definitions.[228]

The definition of AVs should include other aspects than just the level of autonomity or independence. It should also have reference to mechanical aspects of the AV as is currently in the Motor Insurance Directive.[229] Said directive defines motor vehicles 'any motor vehicle intended for travel on land and propelled by mechanical power, but not running on rails..'. Adding autonomity to the mix, the definition could be for instance the following: 'a motor vehicle intended for land travel propelled by mechanical power without human interference'. Nevejans proposes certain characteristics for robots in general: a) sensors detect data from its surroundings that it transforms to information; b) requires physical support and c) adaptation to its environment. An optional characteristic would be the ability to learn, as in an AI system requirement.[230]

The term driver will evidently be left out in legislation since there is none. Another question is whether the user or operator, if there is an OSM, deserves recognition. The State of Nevada – one of the first states to pass a bill on AVs in the US – defined the *operator* of an AV as the person who "causes the autonomous vehicle to engage..".[231]

The definition of an AV should refrain from using the words 'robot's liability'.[232] The above mentioned term would suggest the robot could be held responsible in case of an accident which relates to the idea of giving legal personhood for robots.[233] It is highly unlikely that the legislator or political environment wants to give the robots legal personhood even before straightening out the basic liability issues facing law and robotics. Evading the use of the terminology 'robot's anything' paints the picture that liability rests in the robot itself.

Finally, taking all of the aforementioned into consideration, I suggest a definition proposal for an Autonomous Vehicle:

[227] SAE International, 'Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles J3016^{TM}' (2016).
[228] European Parliament, 'Opinion of the Committee on Transport and Tourism with Recommendations to the Commission on Civil Law Rules on Robotics (20157/2103(INL))'.
[229] Art 1(1) Motor Insurance Directive.
[230] Nevejans 8.s
[231] Kyle Colonna, 'Autonomous Cars and Tort Liability' (2012) 4 Journal of Law, Technology & the Internet 8, 83.
[232] Nevejans 16.
[233] Ibid.

'An autonomous motor vehicle which purpose is to independently travel on road and human interference is needed solely for the purpose of defining a destination before or during the ride without the possibility of taking control of the vehicle.'

The definition takes into consideration the purpose of an AV as well as excludes the human interference factor, yet leaves room for technological advancement. Reference could be made to the SAE International levels.

4.7.2. FORM

The EU has many legal and non-legal instruments for legislation.[234] This section examines the advantages and disadvantages of different levels and forms of legislation in the EU which would benefit regulating the AVs best. Art 114 TFEU allows adopting measures for the approximation of the provisions laid down by law, regulation or administrative action. Art 114 TFEU allows a large range of measures to achieve the goal of the functioning and establishing of the internal market. Harmonization according to Art 114 TFEU may be used either in a way of "minimum or maximum harmonization". In maximum harmonization the MSs must implement the EU measures to the fullest; they cannot refrain from any of the rules or exceed said rules. The PLD is an example of maximum harmonization. Minimum harmonization sets the minimum basis for the MS to enact a law, i.e. they can exceed the EU level rules with national rules.[235] The principle of proportionality governs which form of instrument should be used.

The forms of regulation that are examined are divided into compulsory law and soft law instruments. In compulsory instruments examined are directives and regulations. Within soft law the methods examined are standards, recommendations and ethical codes.

4.7.2.1. Hard Law

Compulsory law or hard law is a more strict form of legislation. There are both benefits and disadvantages to using forms of hard law in the EU. The Motor Insurance Directive serves as a promising basis for AVs in the field of compulsory legislation as examined earlier in section 4.3. The form of completely new legislation on AVs needs a closer look and there is a definite need for the Impact Assessment on liability rules for AVs. Next, the positive and negative effects of hard law are examined under Art 114 TFEU.

The benefits of hard law stem from uniform application in all the MSs. New legislation would benefit from hard law measures on a general level since the law would be

[234] Craig and De Búrca, 'EU law: Text, cases and materials (6th edn, Oxford University Press 2015) 105.
[235] Mańko 6–7.

governed the same and in uniformity in all MSs. According to Art 288 TFEU regulations are directly applicable in MSs. Directives on the other hand leave choice for the MSs, also as to the form of national legislation.[236] Directives determine the desired goal, as to regulation which is already the goal in itself, i.e. there is no need for national implementation measures. Directives tend to take national variations more into consideration if the goal of said act prefers it.

The negative side of governing through the means of hard law, such as regulations, is that there is no guarantee for uniform treatment and the application of the law is difficult to measure. [237] Hard law might also prove more difficult to amend through time and the advancement of technology might require a more lenient means of harnessing the tech. The Art 114 TFEU requires the use of the ordinary legislative procedure as in Art 294 TFEU. Soft law on the other hand does not require commitment and thus is easily changeable.
The negative impact of hard law is that it often constricts technical advancement and innovation.

Terpan (2015) suggests the European integration is governed through hard law and the EU's expanded competence is governed with soft law instruments which are differentiated from hard law and non-binding instruments.[238] Soft law is suggested to be the first step in integrating new areas of competence[239] which is somewhat alarming considering the wide spillover of the EUs competences.

4.7.2.2. Soft Law

Soft law instruments in the EU include standards, ethical codes and recommendations. Soft law instruments are non-binding which in general should offer a tool for an adaptable background or basis.[240] The fast moving development of technology requires swift decisions and enabling from the governments and EU which soft law instruments might provide.

Bertolini and Palmerini suggest soft law to be a favored option in harnessing new and complex technology which enables flexibility and possibilities for adjustment more

[236] Craig and De Búrca, 'EU law: Text, cases and materials' (6th edn, Oxford University Press 2015) 108.
[237] David M Trubek, Patrick Cottrell and Mark Nance, '"Soft Law", "hard Law" and European Integration: Toward a Theory of Hybridity"' [2005] University of Wisconsin Legal Studies Research Paper Series 1, 3.
[238] Fabien Terpan, 'Soft Law in the European Union: The Changing Nature of EU Law' (2015) 21 European Law Journal 68, 69.
[239] ibid 95.
[240] The term soft-law has not reached consensus. For more, see Fabien Terpan, 'Soft Law in the European Union: The Changing Nature of EU Law', European Law Journal 2015 Vol 21 Issue 1, 70-77.

easily, especially when related to robotics.[241] Soft law instruments advantage is that it is often a light and qualified policy option with supranational importance.[242] Supervision and follow-up should be left for independent agents with knowledge of technological advancement.[243] The advantage of such an instrument is that it would offer qualified policy guidance both to the national and regional authorities and to the researchers and other actors operating in the fields of robotics.

Different types of non-binding codes are considered as soft law instruments. An ethical code for robotic manufacturers and programmers could steer their approach to a more sustainable and ethically. The same there are ethical codes of conducts for specific occupational groups such as for doctors and legal professionals. Probably the most known code for robotics, and a robotic scholar would not leave it out from the thesis, is but of course Asimov's laws:

> 1) A robot may not injure a human being or, through inaction, allow a human being to come to harm.
> 2) A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
> 3) A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.[244]

The basic idea of human rights for robotics is summed up in the three 'laws'. The same ideas are captioned in the codes drawn up for programmers and manufacturers and other interest groups. One suggests narrowing the technical standards with constant updates of independent agents to secure adequate levels of safety, the compensation of victims could be addressed through alternative mechanisms.[245] A measure of standardisation in this field is desirable, in the same way as other aspects of vehicle control systems have been harmonised over the years.[246] The auto industry is governed by different standards, such as is for emissions. The word standard is confusing: the EU has systematically governed the auto industry through the means of directives and harmonization.

The not binding status of its rules would be counterbalanced by the benefits that the compliance to it would ensure: any prototype or product designed and manufactured in accordance to the code should be considered both safe and ethically acceptable, thus fit for

[241] Andrea Bertolini and Erica Palmerini, 'Regulating Robotics : A Challenge for Europe' (2014) 101-103.
[242] ibid 102.
[243] ibid 101.
[244] Nevejans 12.
[245] Bertolini and Palmerini 113.
[246] House Department for Transportation Great Minister, 'The Pathway to Driverless Cars: A Detailed Review of Regulation for Automated Vehicle Technologies' 191, 36.

the circulation within the European market. Adhering to the code could give a competitive advantage.[247]

The down-side of a flexible instrument is that the administrative, national or supranational, control and surveillance may be weakened due to voluntary based instruments. Though, voluntary base instruments often require a (yearly) report system or other system for some level of surveillance. Soft law can also sometimes appear as vague or imprecise.[248] The instrument may have only a general level of guidance for specific performance. Soft law may not have the impact that is needed to govern a specific action, such as the liability regime of AVs. Also, AVs have to have the strictest safety requirements as set up in the EU. Can soft law instruments live up to that?

The most successful means of form of legislation for AVs is one of both soft and hard law options. The insurance based laws must be harmonized to some extent by the means of a directive. Having insurance is mandatory to the auto industry. As to soft law, harmonizing private law in the EU could be a first step with the soft law instruments available. Standardization pose an opportunity especially for the manufacturers since it least hinders innovation and technological advancements.

4.7.3. CHOICE OF LEGAL LIABILITY THEORY

The choice of legal theory for AVs throughout the EU is no easy task. The Proposition on Civil Law Rules for Robotics suggests liability rules for all robots, including AVs. This might prove difficult given the different operations and purposes designed for different robots. The legal theory must also adapt to the advancements of technology and the European Courts will play a tremendous role in defining the actual application of the theorem if new regulations are passed. Also, suggesting civil law rules in Europe is a significant step for deepening Europe's integration process. The EU is not just an economic community: the Proposition suggests much more even though its basis is on market integration and access.

The choice of legal theory for a completely new area – namely robotics – in the EU requires a deep analysis which this thesis may only touch upon. In other words, the legal liability theory would regulate the allocation of responsibility for damage caused by robots. The agent responsible for the robot should be appointed, such as the owner, user, etc. The

[247] Bertolini and Palmerini 102.
[248] Trubek, Cottrell and Nance 3.

amount of damages awarded for the incident or accident and limitation periods could be regulated as well. The harmonisation of tort law and legal liability theorems would increase legal certainty in cross-border traffic accidents and clarify the rights of the victims.

The Proposition on Civil Law Rules on Robotics suggests two legal liability theorems which should be profoundly examined: a) strict liability and b) the risk management approach. The classical risk management approach governs the allocation of liability through monitoring and inspection in a complex organizational background.[249] This thesis will examine new regulation through three different legal theorems: 1) strict liability, 2) negligence and 3) no-fault liability theory. It is possible there will remain a mixture of the theorems in practice with the current legislation on product liability and the insurance regime staying in place. This part of the thesis examines new legislation that underlines the liability of different agents concerning AVs. Regardless, there needs to be an insurance scheme for robots either created by supranational or national authorities in addition to the clarification of liability concerning robots.

Previously we have considered factors on current legislation concerning AVs. Some changes need to be made, such as clarifying the applicable law on cross-border traffic accidents. AVs are a new technology which means new factors need to be taken into consideration on a legislative perspective: are there other liability theorems other than strict liability that would be more beneficial in the EU context? Starting from strict liability, the theorems will be analyzed through fictional case scenarios. There are two case scenarios:

> **Scenario 1)** An AV crashes into another AV, both having passengers inside, all passengers are injured and the vehicles are damaged. (AV1→AV2)
>
> **Scenario 2)** An AV and a normal vehicle crash, the driver of the normal vehicle is injured and both cars are damaged. (AV← /→NC)

4.7.3.1. Strict Liability

Global and international consensus has revolved around the idea of governing actions that are most harmful should be under the strict liability theorem. The theory of strict liability requires the victim to prove actual damage and causal link between the accident and damage but the victim does not need to prove negligence on the part of the tortfeasor.[250] The user must most likely only prove that the vehicle was used for its purpose and that the

[249] Wetenschappelijke Raad voor het Regeringsbeleid and Scientific Council for Government Policy, *Uncertain Safety* (WRR Raport, Amsterdam University Press 2009) 62.
[250] Hemmo 91-92.

accident occurred during said use.[251] Most MSs opt for strict liability rules concerning tort law even though the use and regulations vary heavily.[252] The so called "civil law countries" in the EU that opt for strict liability are Austria, Belgium, France, Germany, Italy, the Netherlands and Spain. Other MSs use fault-based rules.[253] Strict liability would go beyond what some MSs have regulated in their own liability codes.[254] The French tort law relies heavily on the principles of strict liability as well as the Scandinavian countries.[255] The French *Loi Badinter*[256]expresses the driver must compensate all the victims damages unless it is the "inexcusable fault of the victim".[257] The French liability system represents the far side of the strict liability regime.

Taking a look on scenario 1 with the basic theory of strict liability, "An AV crashes into another AV, both having passengers inside, all passengers are injured and the vehicles are damaged" (AV1→AV2). The victim of the injury must prove a) actual damage and b) a causal link between the accident and damage in order to get compensated. The causal link might be able to rather easily proven due to black boxes or other technical means. This situation is a highly unlikely situation since the most dangerous aspect of normal vehicles, the driver, has been replaced by a machine and system with better accuracy and reflexes. Nevertheless, an accident occurred. Who do the victims sue in this scenario? The other victims had no possibility to influence the outcome. Obviously the car cannot sue anyone and the property damage occurred to it is left for the owner/registry holder to be in charge of unless granted legal personality. The victims might also have incentive to sue the owner of the cars for damages. The malfunction of a system or a broken part of the vehicle on either AV1 or AV2 would suggest product liability, i.e. the liability of the manufacturer or repairer. Thus, the causal link would have to indicate such fault in the vehicle. To summarize, the fault rests either in the owner of the vehicle or the manufacturer depending on the type of accident.

Secondly, in scenario 2 "an AV and a normal vehicle crash, the driver of the normal vehicle is injured and both cars are damaged". (AV ← / →NC) The victim of the injury

[251] Pagallo 137.
[252] Koziol 82.
[253] Rena and Schrefler 3–4.
[254] Christian von Bar, *Non-Contractual Liability Arising out of Damage Caused to Another (PEL Liab. Dam.)*, vol 7 (Principles, Sellier European Law Publishers GmbH 2009) 566.
[255] Koziol 73, 81.
[256] Loi No 85-677 tendant a l'amelioration de la situation des victimes d'accidents de la circulation et a l'acceleration des procedures d'indemnisation 5 July 1985. Translated to Act no 85-677 aiming at the improvement of the position of the victims of traffic accidents and the acceleration of compensation procedures of 5 July 1985.
[257] De Bruin 10.

must prove yet again a) actual damage and b) a causal link between the accident and damage in order to get compensated. So the driver of normal car NC would have to prove his/her injury and damage to the car as well as the causal link *if* the accident was caused by the AV. If the scenario is vice versa – the NC crashes into the AV – then the owner of the vehicle would have to act on the damages caused to the car. There might even be a scenario where the owner is not in the damaged vehicle or other passengers in the AV. Proving the causal link will prove difficult in this scenario. Strict liability would though lighten the burden of the AV owner since the owner of the AV does not have to prove negligence, or which would be impossible to prove. The only way to prove negligence in the situation where the AV does not include passengers is that there is a camera device or some other mechanical means of surveillance to prove the NC was in fact the wrongdoer.[258]

We have now established the differences within the legal systems of the MSs concerning strict liability and how the basic strict liability theory applies to AVs. Some differing theories have risen within the strict liability regime: a) vicarious liability and respondeat superior liability theorems, and b) robots as animals –argument.

Vicarious Liability. Vicarious liability culminates the idea where the master is liable for the actions of an agent, such as is the case when an employer is responsible for his or her employees and the damages they cause in their work place or during work hours or a child left unsupervised[259]. Vicarious liability does not require proof of negligence.[260] Though, vicarious liability does not wholly exclude the liability of an employee.[261] Thus vicarious liability and AVs are not completely comparable: the AV cannot be truly comparable with the employee since it cannot be held responsible for its actions at any level as of now. Vicarious liability might on the other hand be comparable to liability of AV's concerning the idea of expanding the master's liability. The agent (AV) is under the

[258] More on negligence and fault-based systems to come.
[259] The liability regime for parents being held liable for the actions of their chilred differ heavily within the MSs. See more on vicarious liability and children in Bar C. *'Non-Contractual Liability Arising out of Damage Caused to Another (PEL Liab. Dam.)'* 2009, 618-631.
[260] Chopra and White 128.
[261] Bar, *Non-Contractual Liability Arising out of Damage Caused to Another (PEL Liab. Dam.)* 566.

master's (owners, users or possibly the manufacturers) control.[262] Vicarious liability reverses the burden of proof from the victim to the master of the AV.[263]

What is the difference if the liability is either on the owner or user? The owner can be easier to identify from an administrative record or register. The user on the other hand is currently on the scene of the accident. The problem is whether the user does truly influence the mishap or accident that took place which the user in "using" fully autonomous vehicles is limited to deciding the destination of travel. It does not seem fair the user be blamed for an accident just for using the vehicle for its purpose without any meaningful action. Does the owner require different treatment? The owner in fact has less to do with the accident and is not involved in the accident except for the ownership of the vehicle. Though, the owner might not have made required maintenance on the car. A owner of an vehicle, AV or not, has most likely insured the vehicle for the damages of third parties. The insurance opts for the liability for the owner, since the victim will get compensated for the insurance which the user does not have. The liability of the AV should rest with the owner if there are neither users/passengers in the vehicle, i.e. the vehicle is empty. If there is no insurance scheme concerning AVs, which seems quite evident that there must be, then the user is more easily targeted in case of an accident. Extending vicarious liability to users or owners could prevent individuals from buying the vehicles since the vicarious liability puts such a crucial role to them concerning compensation costs.[264]

One might criticise that identifying just someone responsible is not the end game that truly did not influence the occurring accident. The manufacturer might come to mind since the AVs programming and sensor detectors rest in the manufacturers hands. We could also mould the vicarious liability thinking into an idea where the AVs are seen as agents of the manufacturer: the AV caused accidents would be compensated from the manufacturers insurance. This scenario is highly expensive in the eyes of the manufacturer since premiums would sky rocket. The upside of vicarious liability set for the manufacturer is the safety aspect: the AVs would be made the safest cars on the streets if the liability regime would not make the manufacturers come to a full stop in creating the AVs because of the risk allocation.

[262] Art 2 HCLATA excludes vicarious liability; the Rome II Regulation does not make any reference to it. This might cause problems concerning AVs since some MSs apply HCLATA and others the Rome II Regulation.
[263] Pagallo 130.
[264] ibid 132.

Extending vicarious liability to AVs seems beneficial on the victim's part since the victim may file suit for damages directly to the owner. Applying it on the manufacturers and AVs might restrain the manufacturers from creating the AVs in the first place. It must be said, the extension of vicarious liability and AVs seen as agents is somewhat artificial.

Respondeat superior. The respondeat superior is a theory where the employer's responsibility over the employee is emphasized much like with the vicarious liability. One could say the respondeat superior is a subcategory of vicarious liability. In the French Civil Code Art 1384 the 'masters and employers' are liable for actions leading to damage caused by their 'servants and employees in the functions for which they have been employed'. The employer is responsible for the acts of the employee within the scope of the employment.[265] According to this theorem the financially more capable employer must compensate the damages caused by the employee regardless of the employer having to do nothing with the accidents.[266] The justification for this theorem is of financial one: the compensation of the victim is more likely form the employer's point of view. The focus on respondeat superios is on the damages made by the employee, much as how an animal's owner is responsible for the damages caused by the animal.

An interesting thought in consequence of reviewing the respondeat superior theorem is creating a completely new theory just for robots and damages caused by them. Kelley et al argue the chosen theory should also be realistic, conservative and evolvable.[267] The scope and restriction simply focusing on robots could enable certain features likely to them. The theory ideally would balance the risks between all actors concerning robots: users, owners, manufacturers, programmers, third parties etc. Though, considering the new legal theorem just for robots is an interesting idea. Features on a new liability theorem under vicarious responsibility could focus on the AI part of robots and AVs. Liability could be addressed to the robot given the 'stage of consciousness' or learning capability of the robot. This would need the enabling of legal personality if the AI would show a high level of learning possibilities. Without legal personhood of robots, liability could be issued to either to the owner or manufacturer of the robot. Here is where it gets blurry: How to determine the stage of the robot's learning capability? A standard could be created much

[265] Peterson 1357, reference 97.
[266] Chopra and White 128.
[267] Enrique Schaerer, Richard Kelley and Monica Nicolescu, 'Robots as Animals: A Framework for Liability and Responsibility in Human-Robot Interactions', *The 18th IEEE International Symposium on Robot and Human Interactive Communication Toyama, Japan, Sept. 27-Oct. 2* (2009) 73.

like the SAE levels of automation, i.e. another standard within the SAE level 5 "fully autonomous category". Balancing the liability with the owner and manufacturer could be balanced with an insurance policy much like the New Zealand's policy of including the insurance fees in taxes. This would mean that whether the AV's or robots owner has not paid his/her 'robot taxes' then he/she would not be covered by the insurance scheme. Though, imposing new taxes onto citizens would require much persuasion since the ones able to buy the robots in the beginning are assumed to be of the wealthier consumers.

Robots as animals. The robots as animals argument draws the idea that the owner of the animal is responsible for the damages caused by the animal with supplementary insurance schemes. Insurances for animals can cover their healthcare plans and damages caused by them. The liability insurances for animals are voluntary. Many MSs concur with the above mentioned regulatory framework. Under German law the keeper of the animal is liable for damages caused by the animal.[268] According to Art 1385 the French Code Civile 'the owner of an animal, or the person using it, during the period of usage, is liable for the damage the animal has caused, whether the animal was under his custody, or whether it had strayed or escaped'. Contrary to France and Germany, in Finland damages caused by animals are under the principals of negligence: an animal under the supervision of the keeper is liable for the animals actions in certain cases, for example if a dog is not kept under a leash and attacks a person.[269] The theories applying to liability for animals are regulated differently in the MSs.

A group of American legal theorists suggest a theory where semi-autonomous[270] robots' liability is compared the same way as liability concerning animals is conveyed.[271] The idea sketches that a current framework for liability could be modified for robots liability issues. There are two papers from the writers: Robots as animals: '*A framework for liability and responsibility in human-robot interactions*' (2009) and '*Liability in Robotics: An International Perspective on Robots as Animals*' (2010). Both will be discussed, since the 2009 piece gives the basic principles of justification for the theory. The latter one takes international and global aspects into consideration and the former one

[268] 833 § The Bürgerliches Gesetzbuch.
[269] Ståhlberg Pauli and Karhu Juha, 'Suomen Vahingonkorvausoikeus' (6th edn, Talentum 2013) 136.
[270] 'Semi-automomous machines' or robots are defined as robots that have limited autonomy and capable of simple actions. Though, the autonomy of the robot is increasing constantly.
[271] Kelley and others; Schaerer, Kelley and Nicolescu.

is more of an American common-law approach. The writers urge the liability framework in human-robot accidents needs to take into consideration the following points:

- The novelty of robots and their uniqueness compels the legislator to take action,
- Present regulation forms a good ground for robotic liability theorems and
- Consumer protection and technological innovation must be balanced.[272]

The American common-law background theory of animals as robots, the suggestion is to issue strict product liability combined with a negligence analysis 'where semi-autonomous machines are treated like other products if they are defective, and like domesticated animals if their owners or victims are negligent'.[273] The victim may be held liable in cases where he/she acts negligently on his/her part.[274] In this theory, if the product is defective at the time of sale, the manufacturer will be held liable regardless of the consumer's negligent actions.[275] Yet, if the consumer acts negligently, the consumer will be held liable. Strict product liability for the manufacturer is applied, and the owner is held liable if liability cannot be sustained on the manufacturer's part.[276] Animals are described as somewhat predictable similar to children. Though, the justification of not referring to robots as children is a simple one: the human factor is taken out to not make ethical implications of robots.[277] The predictability of a robot rests on the software which is programmed to make the robot act in a certain way within certain programmed boundaries.[278] The semi-autonomous machine would require supervision on use, i.e. the possibility for human based negligence follows. The method of applying the theory is simple: 1) suspecting whether the product was defective in the first place – if answered yeas then the analysis ends here – and 2) has the consumer acted negligently?[279] We can apply the theory to AVs as suggested for our scenarios:

> **Scenario 2)** An AV and a normal vehicle crash, the driver of the normal vehicle is injured and both cars are damaged. (AV← /→NC)

Firstly, we would analyze whether the AV had a defect in the system or machinery. If it is discovered there was a malfunction or fault in the system, then the manufacturer will be held responsible. Secondly, if there is no defect in the product, then the negligence of the

[272] Kelley and others 2.
[273] Schaerer, Kelley and Nicolescu 74.
[274] Ibid.
[275] The newer (2010) release on the same concept requires manufacturers to add warning labels on their products to avoid being held responsible in certain cases.
[276] ibid 74–75.
[277] ibid 75.
[278] Kelley and others 4.
[279] Schaerer, Kelley and Nicolescu 76.

consumer is examined. The analysis falls short here: is the consumer considered the owner as well as the user of an AV? If we carry on with the analysis of saying yes to the previous question, then we will come to the conclusion that the user/owner is held liable regardless of the fact that he/she has not acted in a negligent way since there is no action to start with. The negligent action could have been that the consumer bought the car in the first place. The AV does not require or should not require supervision of any sort. The previous analysis can be made with scenario 1: an AV crashes into another AV, both having passengers inside, all passengers are injured and the vehicles are damaged. (AV1→AV2)

The theory of treating robots as animals can be scrutinized. The suggested theory is based on robots that are semi-autonomous rather than fully autonomous. The difference between semi-autonomous and fully autonomous is that there is not necessary any room for the owner or user to act negligently. Or in other words the user or owner is not required to act in any way or take control over the robot or AV. Another issue is that the animals as robots –argument refers to all machines. AVs are a subcategory of robots or machines where special consideration must be made to existing compulsory insurance schemes and realizing the difficulty of distinguishing semi-autonomous vehicles and fully autonomous vehicles. Though, must be noted that the writers never intended to propose a theory for autonomous vehicles, only semi-autonomous.

Semi-autonomous robots will precede fully autonomous robots so in that sense it is meaningful to study and develop methods for semi-autonomous robots- One way is to evolve the theorems on semi-autonomous robots to fully autonomous liability rules which will most likely be the case. Also, there are going to be fully autonomous and semi-autonomous vehicles and zero autonomous vehicles on the streets at the same time in which the theory applies to the normal vehicle in the sense that it is liable for acting negligently. The driver of the normal vehicle cannot blame a system for his/her own conduct or actions. This highlights the fact that semi-autonomous robots and autonomous robots would require different liability regimes.

Insuring one's pet is common within the European countries, especially with dogs.[280] The theory lacked the implementation of an insurance scheme which is mentioned but not applied in the international analysis report (2010) as '*additions to the basic framework*'.[281] It remains unclear but it would evidently become the case of taking insurance for AVs. The critique is set on the lack of analysis of cost-efficiency regarding insurance policies. The

[280] Kelley and others 5.
[281] ibid 5 & 7.

2010 report also creates a 'Robot Taxonomy' which divides robots into categories: dangerous and non-dangerous or safe robots: the more dangerous the robot, the restrictions made for it – for example registering it – are permissible and necessary.[282] The researchers are currently aiming at enchancing and fine-tuning their theory on animals as robots.[283]

The theory of the animals as robots serves a multitude of good reasoning as well. The basis of strict liability combined with negligence rules on the victim and owner/user is a well thought theory, although not fully compatible to AVs as such. It also lacks the analysis of adding insurance policies. Though, it was never meant to be the underlying theory for fully autonomous robots only semi-autonomous which require human surveillance. Strict liability on product liability would serve the customers well; it reduces their risk and is in line with the current theory of product liability.

4.7.3.2. Negligence

According to Chapter 2, section 1(1) of Finland's Tort Liability Act of 1974 'a person who deliberately or negligently causes injury or damage to another shall be liable for damages, unless otherwise follows from the provisions of this Act'. Under Art 1902 the Spanish Civil Code (1889) 'the person who, as a result of an action or omission, causes damage to another by his fault or negligence shall be obliged to repair the damaged caused'. A person has acted negligently if the person has been careless or has failed to perform a task which led to the accident. A well-known theory for testing negligence is whether the person has acted as a 'reasonable person'.[284] Another theory for testing negligence is the 'learned hand' test: if the costs of evading damages would be lower than the expectation (=the predictability of the damages times the presumed amount of damages), omission of precautions is presumed to be under negligence. In other words, if it is more inexpensive to allocate resources to evade an accident from happening, then the person must do so. Otherwise the person has acted in a negligent way. The UK differs from other MSs on their motor vehicle liability rules: it is a completely negligence based system and there a high standard for care of the drivers.[285] The defence for the injurer is also often based on the negligence of the victim.[286] The burden of proof rests on the victim: the victim must prove negligence on the driver's part.

[282] ibid 8–9.
[283] ibid 10.
[284] Belay 121.
[285] De Bruin 12.
[286] ibid.

Negligence for AVs is somewhat a blurry theory when implementing on AVs. There are a few problems concerning negligence and AVs: An AV cannot act negligently per se nor is there a driver who is in control of the vehicle. The car responds in accordance to how the manufacturer pre-determined it should react within the limits of the environment.[287] Thus, negligence can be more easily observed as contributory negligence. Though, few scenarios come to mind when considering the negligent behaviour of the user or owner: a) setting a destination by the user and b) the owner has neglected maintenance on the vehicle.

The system requires a few simple tasks from the user's part. The main simple task is setting a destination for your travel. The system must be user friendly and easy to use. Voice-command is of the future. The task of deciding a destination cannot be in causal connection with an accident. The user is still in the belief that the AV will perform as usual regardless of the route option. Neglecting obligatory maintenance on the vehicle might raise the liability of the owner or user (if the user knew the vehicle was not taken care of). Obligatory maintenance could be required on an administrative level (law required) or an omission of repairing a certain defect or malfunction such as the headlights of the vehicle.

The victim might lower the liability of the owner/user by his/her own actions or omissions. This is called contributory negligence in which the victim has not prevented the damages from growing. The amount of the victim's contribution or omission to the accident reduces the amount of damages the injurer must compensate.[288] Some MSs[289] take contributory negligence into account, some do not.[290] For AVs the contributory negligence might turn out as the indifference of using a seatbelt, although some vehicles might refuse to travel before the passenger puts the seatbelt on. Another example for the victims own fault is that he/she has neglected to maintain his/her own AV (headlights, change of tires, and so on).

Given the example scenario 2 [An AV and a normal vehicle crash, the driver of the normal vehicle is injured and both cars are damaged. (AV← /→NC)] the amount of the victims fault will reduce the amount of compensation the injurer must pay (30 % for example). Only negligence rules will not resolve the case, or if it was the only applicable theory, it would not be a satisfactory one. Negligence based rules could be applied to the

[287] Belay 121.
[288] Schaerer, Kelley and Nicolescu 74.
[289] The French civil act, Loi Badinter, has a strict policy for contributory negligence and car accidents, i.e. it does not carry well as a defence. See more at Rena & Schrefler, '*Compensation of Victims of Cross-Border Road Traffic Accidents in the EU: Assessment of Selected Options'* (2007), 3-4.
[290] Kadner Graziano 21.

manufacturer, yet product liability (a strict liability based theory) guarantees the consumer better protection because the consumer does not have to prove negligence of the manufacturer. Proving the manufacturer's negligence would require the testimony of experts which could prove expensive.

Given the example scenario 1 ['An AV crashes into another AV, both having passengers inside, all passengers are injured and the vehicles are damaged. (AV1→AV2)], there are no human driver's to hold liable. As mentioned, proving negligence of the manufacturer could prove difficult, expensive and would require a (time and effort consuming) trial.

The theory of negligence as the single theory would suit poorly on AVs: the users and owners have rarely situations where to act negligently (AV→AV), though it might be useful in situations where there are an AV and a normal vehicle. The victim's responsibility might augment due to his/her actions or omission concerning the accident when applying contributory negligence theorem.

4.7.3.3. No-Fault Liability

The no-fault liability or no-fault insurance theory covers the damages for the victim through an insurance company with predetermined amounts of compensation.[291] Compensation is often for economic loss including medical bills and excluding pain and suffering.[292] The negligent activity of the injurer is irrelevant.[293] The system relies heavily on insurance coverage. The no-fault insurance system is based on the idea that the victim may not take action against the tortfeasor unless the threshold of level of severity is passed which means the number of lawsuits usually reduces.[294] In a complete no-fault liability scheme there is no need for litigation or in some instances there is not even a possibility for trial.[295] New Zealand for example is a complete no-fault liability system where the injury is compensated through the victim's own insurance.[296] The no-fault liability scheme is in use in a few MS: Sweden and France.[297] Sweden for example has a no-fault liability scheme[298]

[291] European Centre of Tort and Insurance Law together with the Research Unit for European Tort Law of the Austrian Academy of Sciences, *Tort and Insurance Law Vol 16* (Gerhard Wagner ed, Springer-Verlag/Wien 2005) 8–10.
[292] James M Anderson, Paul Heaton and Stephen J Carroll, *The U.S. Experience with No-Fault Automobile Insurance: A Retrospective* (RAND Corporation 2010) 12.
[293] Pagallo 8.
[294] ibid 113.
[295] Anderson, Heaton and Carroll 8.
[296] ibid 11–12.
[297] Bertolini and Palmerini 112.
[298] ibid.

as written in the Motor Traffic Damage Act (1975:1410). According to the Swedish Transport Agency (Transport Styrelsen) compensation for personal injury and property damage is covered by the insurance of the injurer.[299] This theorem is promising for the application of AVs since negligence is taken out of the equation: driverless cars cannot act in a negligent way.

Applying theory to our made up scenario 1 [an AV crashes into another AV, both having passengers inside, all passengers are injured and the vehicles are damaged (AV1→AV2)]. In this scenario both owners and/or users[300] of the AV's have taken out insurance for the AV in case of an accident. In theory the insurance of the injurer will cover the damages caused to the victim. In the purest form of this theory, both individuals cover their damages through their own insurances regardless of fault. No need for litigation or other costs. All parties recover compensation. Application with scenario 2 [an AV and a normal vehicle crash, the driver of the normal vehicle is injured and both cars are damaged (AV← /→NC)] results the same way as scenario 1 if both normal vehicle and AV owners and users are required to opt for insurance.

There are a few criticisms to the theory of no-fault liability. The theory lacks a righteous allocation of risk.[301] This means the risk of accident is tangled with owning a vehicle, which is divided amongst all drivers or AV owners. It can be said that the no-fault liability scheme serves as 'collective liability' among drivers or users.[302] In the Finnish insurance scheme much like the Swedish system, the policy owners get bonuses from insurance companies given the years that they have not caused accidents. For example, 25-year old Jonne who got his first car when he turned 18 gets 65 % bonuses form his insurance company which means a 65 % discount from said insurance without previous accidents. Other factors than the years without accidents that add to the bonuses are the drivers age, place of residence, driving experience, vehicle type and age.[303] The bonuses are discounts for motor insurance holders. The insurance company reduce the amount of bonuses in the case of an accident. So in a way, it is up to the policy owner, i.e. driver, to

[299] Transport Styrelsen, 'Compulsory Road Traffic Insurance - Transportstyrelsen' <https://www.transportstyrelsen.se/en/road/Vehicles/Compulsory-road-traffic-insurance1/> accessed 7 December 2017.

[300] The users might need to take insurance for AVs or other vehicles when renting a vehicle as an add-on to the company's own insurance in order to avoid costs resulting from accidents. The national laws make reference to compulsory insurance taken out by owners of the cars.

[301] Weatherill, *EU Consumer Law and Policy* 174.

[302] European Centre of Tort and Insurance Law together with the Research Unit for European Tort Law of the Austrian Academy of Sciences 174.

[303] The insurance companies often determine their own rules on bonuses for drivers.

not harm others and that will reflect on the price of the insurance, meaning the more accidents, the more costly the insurance. The bonus system as such is not applicable to AVs. The attributes of the driver cannot be transferred to the insurance. The only basis for the insurance bonus system for AVs could be the attributes of the machine and system as well as the accident history of the vehicle. Therefore, a bonus system could reduce the unjust allocation of risk concerning traffic accidents resulting from AVs. Age and maintenance of the AV could have an effect to the price of the insurance. A secure insurance system where the victim has the chance to get compensated quickly and adequately requires further research. Also, the bonus system of the Scandinavian countries could prove efficient. Though, high premiums could prevent the consumers from purchasing AVs in the first place.

The no-fault liability scheme could be used as a parallel system as suggested in the U.S. in the 1960s.[304] Litigation and the right to sue would still be the victim's right as guaranteed in the international human rights conventions. Compensation for the victim would only be awarded for certain minor accidents.[305] The amount of compensation could be let for the MS to determine themselves. The legislator can choose to award compensation on certain damages; medical, income loss or property damages.

[304] ibid 215.
[305] ibid.

5. CONCLUSIONS

The development of robotics creates new solutions and risks for people all around the world. Developing new policies and regulation for robotics will be a task that the EU and other international institutions want to tackle in the near future. Political consensus on robotics and especially on autonomous vehicles will need adaptive and harmonized measures to overcome difficulties facing them. The MSs have their own regimes on civil liability which creates an uncertain playfield for AVs and innovators. Creation of AVs must be encouraged yet clear rules that guide their creation and usage has to follow.

There are clear risks and possibilities for AVs. The best scenario for AVs is that they reduce the amount of deaths and injuries resulting from accidents worldwide. They present an alternative means of transport for the elderly and handicapped. AVs have the possibility of reducing greenhouse emissions resulting from a more economical way of driving and petrol use. The risks concerning AVs revolve around new technology's security, safety and privacy issues. The information flow from AVs needs to be secure and gathering of such information transparent. The transition period for AVs and normal cars will prove difficult as well. The AVs and normal vehicles driving on the same roads at once can cause accidents due to the factor of human control or malfunctioning of machinery. The smart cars may not anticipate the (irrational) movements of human drivers although they should. Though the more AVs spend time on the roads the more accustomed they become to human drivers. They may be more aware of other cars than AVs which will increase safety.[306] New company models in transportation will be created such as Uber, Google and other companies envision. Such models pose an opportunity and risks at the same time. Legislation needs to act quickly with precise action to harness its' opportunity and to protect consumers in the least intrusive manner.

Art 114 TFEU can be applied to AVs on an EU level. The loose usage of Art 114 is questionable. A global solution for robotics and AVs would prove best regulatory the legal and international background which includes the UN. The UN is one of the forerunners and game changers in international land transportation law. A globally uniform solution does seem unlikely. The EU and UN do work closely on global road transportation issues which the EU then includes in its policies and regulatory framework. An EU level regulatory framework does not necessarily disclose international cooperation. The idea for

[306]Kyle Graham, 'Of Frightened Horses and Autonomous Vehicles: Tort Law and Its Assimilation of Innovations' (2012) 52 Santa Clara Law Review 1241, 1248–1250.

the EU should be to enable the safe and uniform use of AVs on roads. A liability theorem for incidents is on the agenda.

Current legislation on AVs would be based on the same principles as is for normal vehicles. Legislation on normal vehicles is based on three main categories: 1) product liability, 2) insurance and 3) national substance legislation. Product liability on AVs is shifting to the liability of the manufacturer. The manufacturer currently has great responsibility on the safety of their products. The PLD covers defects on products as it could include AVs as well. An insurance scheme for the consumers would require the AV owners to purchase insurance. It is not a 100 % clear the AVs are seen as normal vehicles and it is suggested that the AVs be included in the Motor Insurance Directive. Thus, it would be evident to define an AV – and other robots – for including them in other directives and regulations. A suggestion was given previously for the definition of an AV; *'An autonomous motor vehicle which purpose is to independently travel on road and human interference is needed solely for the purpose of defining a destination before or during the ride without the possibility of taking control of the vehicle.'* The definition should be precise, clear and flexible as well as take future advancements into consideration. National legislation as it is covers the substance of liability theorems which vary between MSs. To the question which nationality is competent to trial a cross-border traffic accident, the answer is either determined with the European Rome II Regulation or the HCLATA. Clarification on the matter is advised, especially with a non-European country in question.

An EU wide liability theorem that could prove efficient in the EU is a question of political matter. The three liability theorems examined in this thesis does not give an end result. The adaptation of a theory such as no-fault liability would be a stretch in the EU since most MS opt for a strict liability theory involving traffic accidents. Strict liability theory proves a good alternative if tuned properly, i.e. if there is a balance between the owner's and manufacturer's responsibility. Someone has to be responsible for the robots actions such is for animals. Another question is whether robots could be legal actors themselves. Current regulation could prove sufficient for the AVs to access the streets. No EU level legislation prevents them from being a European success story. National legislation could however hinder their access to the markets with strict speed limitations or other requirements. The positive outcome of AVs – such as saved lives and the reduction of emissions – demands recognition and action from international and national administrations.

No conclusion is complete without a final story from the authors own experiences: After a concert of a local Finnish band in Turku, I took a taxi from downtown to my home residence. During my conversation with the cab driver, I asked for his outlook on robot cars. The cabby fell silent for a moment and responded: “There are a few things which will not make our occupation obsolete: Can a car aid an elderly person from the hospital’s doorway into the taxi? Can the car carry the shopping bags of the weak? There is much more to driving a taxi than just steering the wheel.” With this conversation, the idea of social inclusion came to my legal mind or can the lack of social contact ever make up for a robot’s efficiency? We are in fact humans so is the automation of everything really truly an end in itself? I believe not. Autonomous cars will be in fact a reality sooner or later. We just need to not forget about the humane reality which is that we need social interaction to function as human beings. With this story I conclude: May our road transportation be as fast and safe as possible with the occasional late night cabby conversations. The conversations may not last for long.