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***LIABILITY RULES AND SELF-DRIVING CARS:  
THE EVOLUTION OF TORT LAW IN THE LIGHT  
OF NEW TECHNOLOGIES***

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*to my family,  
for the love and strength  
that they passed on to me*

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## **Introduction**

The development of vehicle automation systems has reached high levels and is projected, due to technological evolution, towards ever faster progress. The technologies currently used in road traffic include Advanced Driver Assistance Systems (ADAS) and vehicles with an increasing level of automation and artificial intelligence.

Autonomous vehicles aim to improve the driver's comfort and minimize human error. This implies, on the one hand, less driver involvement in driving tasks and, on the other hand, a likely improvement in road safety.

The introduction of autonomous vehicles on the market entails considerable advantages, but the production of such cars with high technology leads to wonder if the current civil liability rules are still adequate when a driverless car is involved. As a matter of fact, the existing liability rules do not directly address the problem of liability in the event of car collisions involving an autonomous vehicle. Even if the road traffic regulations provide some cases that can be applied to autonomous vehicles, there is not a complete legislation that allows to fully identify the tortfeasor in this new scenario. Driverless cars could imply the overcoming of the key subject for imputation of liability in road accidents, that has always been covered by the driver and this entails the need to revise the system of civil liability from road traffic, assuming new ways for the risk allocation.

Starting from this point of view, this work is focused on the new profiles of civil liability that can be configured in the event of a traffic accident between two vehicles, at least one of which is self-drive. In this scenario, it will see if the traditional road traffic legislation, which held liable the driver and/or the owner of the vehicle responsible, can be applied, or new subjects which can bears the risk of

the damage can be introduced: the producer, the internet service provider and other third parties (e.g hackers, who illegally access the driving software of the vehicle).

In this way, an analysis of the allocation of risk between the different parties involved in the automotive sector must be carried out and, consequently, also an evaluation of the insurance law principles that could guarantee a high level of protection in the 'autonomous' traffic flow.

In the identification of the tortfeasor, the research, first of all, takes the perspective of the Italian law and concerns the identification of the principle and function of Italian tort law. The solutions that can be envisaged under Italian law, then, will be compared with those in force in the French, German, English and American legal systems, taking into account not only the legislation but also the case-law and the literature. Then, the comparison between Italian legislation and those of European and non-European countries considered, will be extended to the European Union regulation, with particular regard to those on civil liability, product liability (as an alternative to road traffic liability) and the recent soft-law on the issue of robotics and artificial intelligence.

Starting from a critical analysis of the state of the art, it will try to achieve two aims. First of all, it will evaluate whether there is a civil liability regulation which is functional to the protection of the injured person, even in the event of a traffic accident due to a self-driving car. Then, it will verify whether this legislation is sufficient for a complete and systematic regulation of autonomous vehicles, or if it is necessary to modify the existing regulation or to introduce an *ad hoc* framework of rules for self-driving cars.



## **CHAPTER I – SELF-DRIVING CARS AND LIABILITY RULES**

**Summary:** **1.** The traffic accident brought about by self-driving car. **1.1.** Main self-driving car crashes: the borders of the research. **1.2.** The problem of identifying liability rules for autonomous vehicles: the Italian Law such as paradigm and starting point **2.** Types of motor vehicle accidents involving self-driving cars. **2.1.** The classification criteria of motor vehicle accidents. **2.2.** The role of the Private International Law. **2.3.** New actors involved in the traditional civil liability regimes.

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### **1. The traffic accident brought about by self-driving car.**

#### **1.1. Main self-driving car crashes: the borders of the research.**

The spread of new technologies requires a rereading of the traditional legal categories of civil law, among which the role of civil liability plays an important role. In fact, the regimes of civil liability recognized by a legal system endure deep changes and the principles underlying these schemes appear radically altered.<sup>1</sup>

Among the protagonists of this ever-changing scenario, there are undoubtedly the driverless cars, which imply the overcoming of the key subjects for the imputation of liability for road accidents that has always been covered by the driver. As will be seen in the second chapter, when is the vehicle that drives, the

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<sup>1</sup> Irti N, 'Diritto Civile', *Digesto* sez. civ., VI (4<sup>th</sup> edn, UTET 1990) 150, underlines that the flexibility of principles and protections, which involves the construction of new civil law institutions, accompanies the meeting between civil law and the technological society.

role of the common driver<sup>2</sup> fails, being replaced at most by that of the user or users on-board. Furthermore, together with the disappearance of the driver, the gradual overcoming of the owner system for vehicles is unavoidable. Then, with the full automation (or at least with the high automation of the vehicle) perhaps the liability could not even be held by the owner of the vehicle, but to the producer. This entails the need to revise the system of civil liability from road traffic, assuming new ways of distributing road traffic risks.

Autonomous vehicles are a hybrid between car and computers, as they are managed by a complex information system, consisting of cameras, sensors and GPS software as well as a wide range of other technologies, which allows the vehicle to be driven without human intervention, or with minimal human intervention. In this context, there is a risk of accidents caused by defects in on-board technology, that is, resulting from viruses, network failures and programming errors that can commonly afflict IT devices.

Currently, several class actions<sup>3</sup> have already taken place against various car companies, which would seem destined to increase considerably with autonomous vehicles. Just think of the two known Tesla incidents. In the first one, which happened in Williston (Florida) in 2016, a man on-board the Tesla Model S, who was traveling in Autopilot mode, lost his life when the car crashed into a truck; the Tesla then ran off the road, hitting a fence and a power pole before coming to a stop. Instead, in the second incident, two years later, a Tesla Model X in autopilot

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<sup>2</sup> Vienna Convention of 8 November 1968 on road traffic [1968], art 1, lett V: «'Driver' means any person who drives a motor vehicle or other vehicle (including a cycle) [...]». It means that if the vehicle is driven by a computer the user can no be longer considered as a driver.

<sup>3</sup> An example is the class action against the car company Toyota on suspicion of fraud claiming that Toyota had hidden for years the problems to the accelerator of its cars Lexus and Scion and an investigation of the American government was opened against the same automobile company due to a problem with the ABS braking system of the latest Prius model. In this sense 'Toyota, accordo in class action Usa con esborso 1,1 mld dlr' [2012] [www.reuters.com](http://www.reuters.com); see also 'Toyota, scatta la class action per frode' [2010] [www.corriere.it](http://www.corriere.it).

mode crashed into a highway barrier in Mountain View (California) and the driver died after being taken to the hospital.<sup>4</sup>

Finally, this year a woman, while was walking her bicycle outside the crosswalk on a four-lane road in the Phoenix suburb of Tempe (Texas), was hit by a Uber car (model Volvo XC90 SUV). The car was traveling in autonomous mode, even though a driver was behind the wheel.<sup>5</sup>

Since under the current law it is not possible to find rules to fully discipline the new profiles of civil liability, it remains to be established: «how will legal liability be assessed when autonomous cars collide with other vehicle, pedestrians, or property?»<sup>6</sup>

Given the multitude of configurable scenarios in the event of accidents caused by autonomous vehicles, the field of investigation of this work should be defined immediately. The research activity is focused on the new profiles of civil liability that can be configured in the event of a traffic accident between two vehicles, at least one of which is self-drive. By road accident<sup>7</sup> we refer to an event in which

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<sup>4</sup> The characteristic of Tesla vehicles (both Model S and Model X) is to be equipped with both human-drive and autonomous (so-called autopilot) driving modes. Only by turning on the autopilot mode the car reaches an automation level corresponding to level 3 of the SAE J3016 standard, which classifies the automation levels and which will be discussed in chapter II. For further information on Tesla cases *see* A Singhvi, K Russell, 'Inside the Self-Driving Tesla Fatal Accident' [2016] *The New York Times*; M Matousek, 'The Tesla Model X that crashed into a barrier while in Autopilot sped up right before the accident, new NTSB report shows' [2018] *Business Insider*.

<sup>5</sup> For more details *see* F Siddiqui, M Laris, 'Self-driving Uber vehicle strikes and kills pedestrian' [2018] *Washington Post*, [www.washingtonpost.com](http://www.washingtonpost.com); T Bellon, 'Liability and Legal Questions Follow Uber Autonomous Car Fatal Accident' [2018] *Insurance Journal*.

<sup>6</sup> SH Duffy, JP Hopkins, 'Sit, Stay, Drive. The Future of Autonomous Car Liability' (2013) 16 *SMU Science & Technology Law Review* 101.

<sup>7</sup> Vienna Convention of 1968 does not give a specific definition of a traffic accident. Anyway, it is undisputed that in road traffic any wilful or negligent act is defined as an accident, in which persons, vehicles, and others may be involved. Commonly, many different terms are used to describe a traffic accident. The World Health Organization uses the term 'road traffic injury', while the U.S. Census Bureau uses the term 'motor vehicle accidents' (MVA), and Transport Canada uses the term 'motor vehicle traffic collision' (MVTC). Other common terms include car accident, car crash, motor vehicle collision (MVC), personal injury collision (PIC), road accident, road traffic accident (RTA), road traffic collision (RTC), and road traffic incident (RTI). In this sense *see* Peden M, Scurfield R, Sleet D and others, 'World report on road traffic injury prevention' [2004] *World Health Organization (WHO) report*, 1 ff.; 'Motor Vehicle Accidents – Number and Deaths: 1980 to 2008' [2012] *United*

vehicles, human beings or animals (stationary or moving) are involved and from which they derive injury to things, animals, or people<sup>8</sup>. Therefore, the cases of damage caused by a self-driving vehicle without involving another vehicle are also investigated. This hypothesis concerns both cases in which the self-driving vehicle produces damage to property (other than other vehicles) or animals, and cases of personal injury to the same driver or to third parties transported<sup>9</sup> or not transported.<sup>10</sup>

At the same time, however, the field of investigation will be limited to the claims where the owner of the vehicle, the driver and the insured coincide. In these cases, in front of the injured party, on the one hand, there is the owner of the vehicle, who is also the driver (if the vehicle is not totally autonomous) as well as the insured person and, on the other, there is the insurer. Only one of them is obligated to compensate the damage for the principle that compensation must not result in the enrichment of the injured person. On the contrary, the rental cases and,

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States Census Bureau (USCB) statistical abstract, section 23 on Transportation 693; 'Canadian Motor Vehicle Traffic Collision Statistics: 2016' [2017] Transport Canada Statistics. However, some organizations have begun to avoid the term 'accident', preferring the terms 'collision', 'crash' or 'incident'. This is because the term 'accident' implies that there is no-one to blame, whereas most traffic collisions are due to the driver behaviour. *See* Badger E, 'When a car 'crash' isn't an 'accident' - and why the difference matters' 2015] *The Washington Post*; Richtel M, 'It's No Accident: Advocates Want to Speak of Car 'Crashes' Instead' [2016] *The New York Times*.

<sup>8</sup> As a matter of fact, the accident may result in damage to property (eg. slight or severe damage to one or more vehicles, structures and things outside the roadway, etc.) to people (physical injury of minor or serious injury, death), and animals. The damage generates a right of the claimant to be compensated, usually by the defendant, but other forms of protection or assistance are configurable. The term 'road' not only determines the context of the damaging event, otherwise it would fall into the category of traffic collision incidents such as street attacks or the illness of a pedestrian. On the contrary, with the term 'road' we refer to a causation link between the road and the circulation of vehicles, also including the damaging event that occurs to the driver of a vehicle, which does not depend by collision with another vehicle. *See* G Buffone (ed.), *Responsabilità civile automobilistica* (Cedam 2016) 3 ff.

<sup>9</sup> It is sufficient to think about the case in which the on-board computer is short-circuited and leads the vehicle into a ravine, causing damage to the driver or to third parties transported or even causing death.

<sup>10</sup> This is the case, for example, of a woman who is on the other side of the roadway, maybe going ahead for the green light on the pedestrian crossing, and who have been hit by a driverless car that chose to invest her in order to do not invest a young mother who was suddenly crossing the road with the red light and outside the crosswalks.

more generally, all those in which the owner and the driver do not coincide are excluded from this work.

## **1.2. The problem of identifying liability rules for autonomous vehicles: the Italian Law such as paradigm and starting point.**

As will be seen in the second chapter, the introduction of autonomous vehicles on the market entails considerable advantages, but the production of such cars with high technology requires bring to ask if the current civil liability rules are still adequate when driverless car are involved. In fact, the existing rules do not directly address the problem of liability in the event of car collisions involving an autonomous vehicle. Even if the road traffic regulations provide some cases that can be applied to autonomous vehicles (in whole or in part), there is no complete body of law in the state that allows to fully identify the related responsibilities and the subject liable.<sup>11</sup>

In this way, a revision process is triggered that can affect the allocation of liability between the different parties in the automotive sector and, consequently, also on the characteristics of the insurance system.

In the identification of the liable, the research takes, first of all, the perspective of Italian law and concerns the identification of the principle and function of Italian law in force that could be applied in court in a situation such as that identified in the previous subsection.

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<sup>11</sup> JK Gurney, 'Sue My Car Not Me. Products Liability and Accidents Involving Autonomous Vehicles' (2013) 2 Journal of Law Tech. & Pol. 247 ff., as it will *see*, try to answer the question about who is liable when an accident is caused in autonomous mode.

The solutions that can be envisaged under Italian law, than, will be compared with those configurable in the French, German, English and American legal systems, taking into account not only the rules currently in force in these countries but also Court and literature guidelines disseminated (*see* chapter III, section 1 and 2). It will see how the legislation normally considers the driver and/or the owner of the autonomous vehicle responsible while Authors<sup>12</sup> introduces new subjects on which the risk could weigh: producer, internet service provider and other third parties (e.g hackers who tamper with vehicle on-board software).

The comparison between Italian legislation and those of European and non-European countries considered, will be extended to the comparison between the rules of Italian law and those proposed by the European Union with particular regard to those on civil liability and the recent soft-law on the issue of robotics<sup>13</sup> (*see* chapter III, section 2, subsection 2.3, and chapter IV, section 1).

Having assumed the perspective of Italian law as a benchmark for the development of a broader and more comprehensive vision of the phenomenon, which extends to the European and international levels, it appear necessary the

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<sup>12</sup> *See* A Bertolini, ‘Robots as Products: The Case for a Realistic Analysis of Robotic Applications and Liability Rules’ (2013) 5 (2) LIT 214-247. E Palmerini and others, ‘Guidelines on Regulating Robotics’ [2014] Project deliverable; MC Gaeta, ‘Automazione e responsabilità civile automobilistica’ (2016) 5 Resp. civ. e prev. 1718 – 1750; A Davola, R Pardolesi, ‘In viaggio col robot: verso nuovi orizzonti della r.c. auto (“driverless”)?’ (2017) 5 Danno e resp. 616 - 629.

<sup>13</sup> The European initiatives for introducing a regulatory framework on Robotics are numerous. Recently, with the Resolution of 16 February 2017, the European Parliament recommend to the European Commission to submit a bill on Civil Law rules on Robotics and Artificial Intelligence (AI) and non-legislative acts (such as guidelines and codes of ethical conduct). The purpose of the European Parliament resolution is to address the main issues foreseeable in the next 10 - 15 years, taking into account the Charter on Robotics attached to the Resolution. In addition, the European Parliament considers that the automotive sector is in most urgent need of efficient European Union and global rules, in order to ensure the cross-border development of self-driving cars, the exploitation of their economic potential and the benefits from the technology. *See* European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)). Also in the Declaration of Amsterdam of 14 and 15 April 2016 on Cooperation in the field of connected and automated driving, the need to develop and maintain a joint program with other European countries has been underlined to support these goals, and to remedy the problems arising from the development of this new type of driving. *See* Declaration of Amsterdam of 14 and 15 April 2016 on Cooperation in the field of connected and automated driving [2016].

reconstruction of the regulatory framework of Italian tort law in road traffic. However, before arriving at the analysis of the Italian legislation on road traffic liability, it is necessary to distinguish the main types of road accidents and the law applicable to them (*see* section 2 below).

## **2. Types of motor vehicle accidents involving self-driving cars.**

### **2.1. The classification criteria of motor vehicle accidents.**

Before moving on to deepening the non-contractual liability from road traffic in order to identify who is responsible for accidents caused by an autonomous vehicle, it is necessary to list the types of motor vehicle accidents involving self-driving cars, setting out the classification criteria of motor vehicle accident, in order to divide it in domestic (occurred in Italy) and foreign (occurred abroad).

Traffic collisions can be also classified by collision types. They include: head-on, road departure, rear-end, side collisions, and rollovers. However, this work will focus on the distinction of collisions in Italian and foreign in order to identify the applicable law to settle the dispute in judicial or extrajudicial phase. Indeed, the purpose of this work is to identify the rules applicable to new road accident scenarios, identifying the person liable for the damage.

The Italian motor vehicle accidents are distinguished in: a) claims in which only Italian vehicles are involved; b) claims between Italian vehicles and foreign

vehicles; c) claims between exclusively foreign vehicles. Each of these subcategories has its peculiarities that involve different disciplinary specificities.<sup>14</sup>

Instead, the foreign vehicle accidents are that which occurred in a Country other than Italy but in which at least one Italian vehicle is involved (usually insured in Italy) or on which drivers and possibly Italian passengers travel. In turn, it is divided into numerous sub-categories.<sup>15</sup>

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<sup>14</sup> Italian motor vehicle accidents are collisions occurred in Italy. To avoid the configuration of excessive hypotheses we will consider that Italian vehicles are insured in Italy and on the same travel driver and possibly Italian passengers, and foreign vehicles are insured abroad and conducted by a foreign driver and on which foreigners subject transported will travel.

(a) Therefore, Italian collision can occur between Italian vehicles, insured in Italy, on which Italian citizens travel and in this case will be governed by Italian law (Civil Code and Code of Private Insurance, with particular regard to the direct compensation established by article 149 of the Code of Private Insurance which will be discussed in chapter III). If, instead, the accident occurred in Italy between Italian vehicles, insured there, on which Italian citizens travel, and foreign vehicles, insured abroad, on which foreign citizens travel, pursuant to art. 62, L n 218/1995 the Italian law will be applicable because the incident occurred in Italy, but the person transported will not be able to claim compensation directly from the insurance company of the vehicle on which he or she was transported; furthermore, pursuant to art. 141 of the Code of Private Insurance, the damaged driver will not be able to resort to the direct compensation procedure under art 149 of Code of Private Insurance. Finally, if the crash always occurred in Italian territory, but between foreign vehicles, insured abroad, with drivers and foreign passengers, Italian or foreign law may be applied according to the criteria set out in art. 62 L n . 218/1995.

(b) On the contrary, car accidents are foreign when they occurred in a country other than Italy but involve at least one Italian vehicle (insured in Italy) with Italian citizens and a foreign vehicle (insured abroad) on which foreign citizens travel.

Starting from 1 January 2006, the articles 151-155, 296-301 of the Code of Private Insurance, Italian law implementing European source of law about foreign collisions and which aim to facilitate the exercise of the right to compensation for damage suffered by the injured party. In any case, if for the criteria referred to in L n 218/1995 foreign law is applicable, Article 141 of the Code of Private Insurance will not be applicable, as is explicitly stated in art 34, par 1, Direct compensation agreement (DCO or, in Italian CARD), which reduces the application of the CARD only to car accidents occurring in Italy. The art. 149 of the Code of Private Insurance will not be applicable as is explicitly stated by the same art 149, par 2, as well as by art. 4 of the D.P.R. 254/2006. *See* L Gatt, IA Caggiano, MC Gaeta, 'Italian Tort Law and Self-Driving Cars: State of the Art and Open Issues', (forthcoming) 17 ff..

<sup>15</sup> There are authors who have identified six, but there are probably other scenarios: 1) Motor vehicle accident occurring in a Green Card system with a vehicle registered and insured in another State belonging to the European Economic Area; 2) Motor vehicle accident occurring in a Country of the Green Card system with a vehicle not registered in a Country of the European economic area; 3) Motor vehicle accident occurring in a Country of the European Economic Area (EEA) with a vehicle whose identification is impossible; 4) Motor vehicle accident occurring in a Country of the European Economic Area (EEA) with a vehicle which show impossible, within 2 months from the accident, identify the insurance company; 5) Motor vehicle accident occurring in a Country of the European Economic Area (EEA) party to the Convention 6/11/08 (Convention signed by 19 States: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Portugal, Spain, Slovakia, Slovenia) with vehicles bearing the registration number of the Country where the collision occurred, insured with the insurance company in liquidation; 6) Motor vehicle accident occurring in a foreign Country not part



First of all, it is essential to understand, with respect to the type of car accident occurring, which of the actions can actually be proposed by the injured party, before which competent Authority and towards which subjects. Therefore, the classification of road traffic injury in national and foreign is instrumental to the identification of the rules applicable to the main question object of the present work, that is the identification of the liable if it changes in case of a motor vehicle accident caused by a driverless car.<sup>16</sup>

It is believed that the classification of accidents into national and foreign also applies in the case of accidents involving at least one self-driving car. In fact, there are no reasons for impeding this extensive interpretation, since it is in any case vehicles, even if they have a certain level of autonomy. These criteria for the aforementioned classification of accidents are generally valid and do not affect the type (autonomous or non-autonomous) of the vehicle involved.

The classification of road accidents set out above shows, first of all, the need to work on three different regulatory plans: the national one that is articulated in general rules of civil liability, contained in the Italian Civil Code,<sup>17</sup> and special rules of civil liability contained in the Italian Code of Private Insurance.<sup>18</sup> To this bipartite plan is joined, then, the plan of the Private International Law that intervenes when the road accident presents elements of internationality that will be better described in the following subsection and that can lead to the application of a foreign law instead of the Italian one (*see* this chapter, subsection 2.2).

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of the Green Card system, caused by an identified vehicle. *See* R. Savoia, 'I sinistri avvenuti all'estero che vedono coinvolti veicoli di soggetti residenti in Italia' (2010) 9 *Il civilista* 1 ff.

<sup>16</sup> L. Gatt, IA Caggiano, MC Gaeta, 'Italian Tort Law and Self-Driving Cars: State of the Art and Open Issues' (n 14) 15 ff.

<sup>17</sup> Italian Civil Code, R.D. 16 March 1942, n. 262, OJ 79, with particular regard to articles 2014, 2054 and 2055.

<sup>18</sup> Italian Code of Private Insurance, d.lgs. 7 September 2005, n. 209, OJ 239, and in particular articles 122, 125-126; 141-144-145-148; 149-150; 151-155; 296-301.

## 2.2. The role of the Private International Law.

According to article 62, L n 218/1995,<sup>19</sup> to identify the applicable law the criteria to be followed is, first of all, the so-called ‘lex loci commissi delicti’, which is the law of the State where the damage occurred; however, the injured party may request the application of the law of the State in which the damaging fact was committed.<sup>20</sup> In a residual way, then, if the damaging fact involves subjects resident in the same State, the law of that State will be applicable.

Instead, under article 4, Regulation (EC) n. 864/2007, so-called Rome II Regulation,<sup>21</sup> the law to be applied is: 1) that of the Member State in which the damage occurred; 2) that of the Member State in which both parties habitually resided; 3) where the case is more closely related to the law of another Member State, the law of that country. The Rome II Regulation is applicable to all Member State of the European Union, while L n 215/1995, which is a source of Italian national law, is applicable to accidents occurring even outside the European Union. Anyway, in case of conflict between national legislation (L 218/1995) and European law (Rome II Regulation) the second prevails.<sup>22</sup>

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<sup>19</sup> Reform of the Italian system of private international law, l. 31 May 1995, n 218 , OJ 128.

<sup>20</sup> In fact it is possible that the place of the damaging event (car accident), and the place of the fact that caused the accident, differs. However, since it is a traffic accident, it is very difficult to think that the place of the damage differs from the place of the damaging fact.

<sup>21</sup> Regulation of the European Parliament and of the Council 864/2007/EC of 11 July 2007 on the law applicable to non-contractual obligations (Rome II) [2007] OJ L 199/40. Note that there are also specific rules for some non-contractual obligations, such as product liability and intellectual property.

<sup>22</sup> The Rome II regulation contains two provisions relating to coordination with other sources of law with which it is likely to come into conflict by opting for the so-called specialty criteria. Indeed, article 27 states that the other provisions of European Union law governing conflicts of laws concerning non-contractual obligations are not affected by Rome II Regulation, while article 28 provides that the Regulation does not preclude the application of international conventions which one or more Member States are parties and which regulate legislative conflicts regarding non-contractual

To this legal framework, which is not simple in itself, there is also the Hague Convention of 1971,<sup>23</sup> which regulates the applicable law precisely in the event of road accidents. However, Italy has not signed the Hague Convention and, for this reason, we will not dwell on this source of international law.

Finally, other international rules, such as the Agreement on the European Economic Area (EEA), which provides for the free movement of persons, goods, services, and capital within the European Single Market, including the freedom to choose a residence in any country within this area.<sup>24</sup> Then there is also the so-called International Motor Insurance Card System, which is an arrangement between authorities and insurance organizations of European and non-European States to ensure that victims of road traffic accidents do not suffer from the fact that injuries or damage sustained by them were caused by a visiting driver rather than a driver resident and insured in the same country.<sup>25</sup>

Therefore, it should be noted that when the damage has international elements can be applied rules of legal systems different from those of the injured subject, with all the negative consequences on the compensation level. This generates a problem of uniform regulation of road accidents in Europe which is related to the

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obligations, even if the Regulation prevails in the event of a conflict with national implementation law. *See Bonaiuti Marongiu F, Le obbligazioni non contrattuali nel diritto internazionale privato* (Giuffrè 2013) 185 f..

<sup>23</sup> Hague Convention of 4 May 1971 on the law applicable to traffic accidents [1971].

<sup>24</sup> The EEA was established on 1 January 1994 upon entry into force of the EEA Agreement (Agreement of 3 January 1994 on the European Economic Area [1994] OJ L 1/3) The contracting parties are the European Union, its Member States, and the member states of the European Free Trade Association. The EEA currently includes 31 countries, which are three of the four member countries of the European Free Trade Association (EFTA), which are Iceland, Liechtenstein and Norway, without Switzerland, and the 28 member countries of the European Union. *See* Decision of the Council and of the Commission 94/1/EC of 13 December 1993 on the conclusion of the Agreement on the European Economic Area between the European Communities, their Member States and the Republic of Austria, the Republic of Finland, the Republic of Iceland, the Principality of Liechtenstein, the Kingdom of Norway, the Kingdom of Sweden and the Swiss Confederation [1994] OJ L 1/1.

<sup>25</sup> There are multiple motor insurance systems around the world, established on regional basis. The first one was the Green Card system established in 1949 in Europe, but later other regions followed suit.

road accident between human-driven vehicles but appears to be extended also to autonomous vehicles.

### **2.3. New actors involved in the traditional civil liability regimes.**

In the road accidents, both domestic and foreign, the dialectic between two groups of subjects is always alive and difficult to solve. On the one hand we find the owner of the vehicle, which in this work will always coincide with the driver (if the vehicle is completely autonomous otherwise the role of the driver is not really conceivable but there will be only passengers or users on-board), as well as the insured person, understood as the person covered by the car insurance in case of a road accident (i.e. the owner and the driver). On the other hand, however, there is the insurance company that ensures the vehicle. The dialectic between these subjects is fundamental for the identification of the law applicable to the concrete case and the subject required to compensate the damage to the injured party.

In Italian legal system, the dialectic is based on the two bodies of law, which are the Civil Code (applicable to the owner and the driver of the vehicle) and the Code of Private Insurance (applicable to the insured and the insurer of the vehicle); they provide for different protections between which must be chosen. Among other things, the overview of the sources of law is further complicated when the driver, the owner and the insured do not coincide, multiplying the possible solutions according to the law chosen. For example, which law should be applied if the accident is caused by a vehicle owned by a subject, but conducted by a different person, and possibly a foreigner? And if the vehicle is autonomous, other applicable law could be envisaged, such as the one on product liability?

It is wonder, therefore, whether the involvement of the self-driving car in the accident can further increase the level of difficulty in identifying the subject required to pay damages. In fact, while in the accidents between human-driven vehicles, following the general and special rules mentioned, we focus respectively on the role of the owner/driver/insured and on that of the insurer, in case of involvement of the autonomous vehicle other parties could be involved. As a matter of fact, as the level of automation increases, the possible parties involved increase proportionally. In particular, it would be possible to provide joint or exclusively liability for the vehicle producer, the ADAS producer, the software programmer and so on. Finally, with the achievement of total automation it would no longer be appropriate to talk about drivers, since in fact there is not a driver of the vehicle but the car is driven autonomously and all those who are in the vehicle are passengers (or users on-board). In this latter case, therefore, besides the traditional figures and the kind of producers already mentioned, additional subjects can be found, such as the Internet service provider, who provide services for accessing, using, or participating in the Internet, connecting the vehicle with the infrastructures.<sup>26</sup> Other possible subjects could be, for instance, public companies or private companies, that manage such road infrastructures<sup>27</sup> (i.e. roads, or motorways and all the tools contained therein, such as traffic lights, cameras and so on), or communication infrastructure (i.e. internet). With the internet connection of the vehicles, in addition to road traffic liability, there are also issues related to data

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<sup>26</sup> To in-depth the liability of the ISP regarding the online information, see C Reed, 'Liability of On-line Information Providers: Towards a Global Solution' (2003) 17(3) *International Review of Law, Computing & Technology* 255 ff.

<sup>27</sup> Roads infrastructure are included in the macro category of transport infrastructure distinguished in: road infrastructures, which include the motorway, big roads, regional and municipal roads and their systems; railway infrastructures, composed of national railway, local railways and metropolitan railway; airport infrastructure for air transport; port infrastructure for maritime transport; waterways for river transport. See Grimaldi A, 'Infrastruttura', Treccani G. (ed.) *Enciclopedia Giuridica* (online edn, 2017) (accessed 3<sup>rd</sup> September 2018).

breach of those data exchanged between vehicles, infrastructures or other smart things (*see* chapter II, section 1, subsection 1.2.)

This leads to wondering if the current dialectic between the traditional actors of the civil liability regimes remain unchanged or if this dialectic is broken and increases the number of subjects potentially liable for the accident caused by an autonomous vehicle, with the consequent increase of the applicable rules.

If this is the problem, the rules of private international law are not decisive for the solution of the cases. Perhaps, it could help an analysis of the ‘ratio’ of the tort law and compulsory insurance in Italy as in other European countries, identifying similarities and differences. In this way, it could be easier to answer the question of whether the involvement of an autonomous vehicle in a traffic accident (national or foreign) generates or not the need for new rules, as proposed by the European Parliament,<sup>28</sup> or requires the amendment of existing ones, as happened in Germany.<sup>29</sup> To this is added also the possibility of the extensively application of the already existing law, as all the others European countries would like to do, in which a special law contemplating the hypothesis of a road accident involving an autonomous vehicle has not been elaborated<sup>30</sup> (*see* chapter IV).

In an attempt to answer the questions posed in this work, we will try to outline in Chapter II the main characteristics of self-driving cars and of the artificial intelligence embodied in them, in order to highlight the different levels of automation and the consequences of this on the identification of the applicable liability rules if a road accident due to a driverless car occurs.

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<sup>28</sup> *See* note n 13 on European Parliament resolution of 2017.

<sup>29</sup> On march 30, 2017 Germany approved the draft of the German Federal Government on autonomous driving, of 20 February 2017, n 18/11300, amending the German Road Traffic Act of 3 May 1909

<sup>30</sup> L Gatt, IA Caggiano, MC Gaeta, ‘Italian Tort Law and Self-Driving Cars: State of the Art and Open Issues’(n 14) 23.

### **3. Methods of investigation**

At this point a parenthesis on the method of investigation seems necessary, given that the results achieved may change according to the research method used.

The objective of this work is to analyse the legislation on civil liability arising from vehicle accident, with particular regard to the case where is an autonomous vehicle to leads the accident. More precisely, it will in depth the Italian legislation, comparing it to that of other legal systems, such as France, Germany, United Kingdom and the United States of America. Furthermore, the civil liability will be studied at European level, with particular regard to product liability and the impact of robotics on it.

Starting from a critical analysis of the state of the art (legislation, case law, literature and contract document), it will try to achieve two aims: (1) first of all, it will evaluate whether current civil liability regulation is functional (efficient and effective) to the protection of the injured person, even in the event of a traffic accident due to a self-driving car; (2) secondly, it will verify whether the existing legislation is sufficient for a complete and systematic regulation of autonomous vehicles (extensively interpreted or applicable by analogy), or whether it is necessary to modify the existing regulation or introduce an *ad hoc* regulation.

In order to conduct an analysis of this type, the interpretation of the law in force according to the criteria codified in article 12 of the preliminary provision to the

Italian civil code<sup>31</sup> and this interpretative activity will take place from a comparative perspective. In particular, the function of civil liability will be examined by analysing the rules not only of the Italian legal system but also of the other legal systems already mentioned. In fact, this work aims to find a regulation applicable at European and later at international level, since issues related to autonomous vehicles can not be contained in national borders due to the current high level of mobility.

To investigate the function of civil liability, especially in the light of the new scenarios that are set up with the introduction of autonomous vehicles on the market, it will be essential to verify the protection of the interests of the parties involved, i.e. the material and moral purposes that are objectively pursued by society and which constitute the unifying element of law. Indeed, Courts and legal scholars in general should avoid a logical-deductive elaboration of legal consent in favor of a more policy-based approach that would take in consideration the actual needs of the current community as in the so-called *interessenjurisprudenz* , or jurisprudence of interests). This orientation exceeds that of so-called jurisprudence

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<sup>31</sup> Pursuant to art 12 of the preliminary provision to the Italian civil code, the first form of interpretation to be implemented is the so-called literal interpretation (also called *vox iuris*), aimed at attributing to the law the meaning that is immediately apparent from the words used. This form of interpretation is accompanied by the so-called logical interpretation that, overcoming the literal meaning of the provision, aims to establish its true content, i.e. the purpose that the legislator intended to achieve by issuing it. However, the legislator expressly contemplates the possibility that there are cases not foreseen or resolved by legal norms. In fact, he foresees the existence of normative lacunae which must be filled by the judge who can not refuse to solve a practical case, citing the lack of rules. Therefore, if a dispute can not be decided according to a specific provision, it will be referred to the so-called *analogia legis*, admissible only if based on the following assumptions: a) the case in question should not be provided for by any law; b) there must be similarities between the case governed by the law and that not provided for; c) the relationship of similarity must relate to the elements of the case in which the justification of the discipline dictated by the legislator is recognized (so-called *eadem ratio*). In the hypothesis in which the case still remains doubts, it will resort to the so-called *analogia iuris*, understood as the recourse to the general principles of the legal system. See F Bocchini, E Quadri, *Diritto privato* (7<sup>a</sup> edn, Giappichelli 2018); CM Bianca, M Bianca, *Istituzioni di diritto privato* (2<sup>nd</sup> edn, Giuffrè 2018).



of concepts (in German Begriffsjurisprudenz)<sup>32</sup>, traditional dogmatic from which, however, no one can disregard in order to analyse the principles underlying civil liability.

Then, it is essential to resort to the behavioural sciences, as well as to practical cases and technical simulations. For this reason, the research method adopted is mixed, using not only the traditional material related to the legal area, but also behavioural studies and empirical analysis (so-called empirical legal studies or, in abbreviated for ELS) of an interdisciplinary nature.<sup>33</sup> In the 21<sup>st</sup> century, especially where we are concerned with areas of law in which technology has had a strong impact, even legal studies can no longer be tackled according to a purely traditional methodological approach. As a matter of fact, this would limit us to analyse, more or less critically, legislation, case law and existing literature. The traditional method, indeed, tends to produce a circular methodological trend and the scientific works risks losing all utility, sometimes reducing itself to a mere repetition of what

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<sup>32</sup> Juridical science, developed between the 19<sup>th</sup> and 20<sup>th</sup> centuries, especially in Germany and Italy, and now out-dated, which proceeded to the elaboration of general and abstract concepts on the basis of norms valid only because existing and having as such the nature of dogmas . It is a method of interpretation of the rules based on the incorporation of laws into general concepts, to which the interpreter had to refer rigidly regardless of the consideration of any heteronomous element to the right coming from the society (ethics, economics, psychology, etc.). From this derives one of the most characteristic theses of legal positivism, the completeness of the order, that is the impossibility in it of lacunae, since the law integrates from the inside, through a logical procedure of its own, which does not need contributions from the outside - such as the use of natural law - and regardless of its ethical and social content. Cf. F Belvisi, *Dalla giurisprudenza dei concetti alla giurisprudenza degli interessi* (Giappichelli 2010). The author describes the story of the change in the way of understanding the law that has occurred in the passage from the conception of the historical school and the pandettistics' school of Friedrich Carl von Savigny, Georg Friedrich Puchta and Bernhard Windscheid to the jurisprudence of the interests of Philipp Heck and Hermann Kantorowicz . The jurist who best embodies this change from the formal study of the law to the substantial and teleological was Rudolf von Jhering.

<sup>33</sup> For some time now, a part of the literature has found that in a given context, characterized by the involvement of different disciplinary sectors of science and not only by law, scientific research can not be conducted using a merely theoretical perspective. On the contrary, it is more appropriate to resort to empirical analyses and be based on case studies. See A Mantelero, 'Data protection, e-tracking and intelligent systems for public transport' (2015) 5 (4) *International Data Privacy Law*, 310; A Wood, DR O'Brien, U Gasser, 'Privacy and Open Data', (2016) *Networked Policy Series*, Berkman Klein Center, 4. For a more in-depth study of the practical nature of empirical studies, see *Empirical Research Services della Harvard Law School*, in <http://hls.harvard.edu/library/empirical-research-services/>.

has already been said. On the contrary, research should be linear, with a starting point and a goal to be achieved, to really contribute to the advancement of the state of the art.<sup>34</sup>

Regarding the behavioural sciences, to investigate the behaviour of the user who is involved in a traffic accident caused by a driverless car, it is extremely important to start from the human-robot interaction (HRI) analysis<sup>35</sup> and then check the effectiveness of the existing legislation.<sup>36</sup> This is a behavioural analysis based on cognitive psychology of the relationship between man and the robot (the autonomous vehicle in the case of this work). The results obtained by HRI analysis will then have to be deepened from a legal point of view to evaluate the

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<sup>34</sup> L. Gatt, R. Montanari, I.A. Caggiano, 'Consensus on the treatment of personal data and behavioral analysis. Spunti di riflessione sull'effettività della tutela dei dati personali' (2017) 2 *Politica del diritto* 337 ff.

<sup>35</sup> The HRI, sub-category of the human machine interface (HMI), is fundamental both for the identification of different levels of automation and for vehicle connection levels, since these are directly proportional to the increase in automation. On the basis of these behavioural studies it is possible to evaluate the effectiveness of the legislation and the adequacy of the protections it contains, drawing the necessary conclusions. For a more in-depth study of HMI see D. Sidobre and others, 'Human-Robot Interaction', Siciliano B. (ed.), *Advanced Bimanual Manipulation*, in *Springer Tracts in Advanced Robotics*, LXXX (Springer 2012), 123 ff. On cognitive law in general and on behavioural study in general see L. Arnaudo, 'Diritto cognitivo. Prolegomeni a una ricerca' (2010) 1 *Politica del diritto* 101 ff.; B. Lurger, 'Empiricism and Private Law: Behavioral Research as Part of a Legal-Empirical Governance Analysis and Form of New Legal Realism' [2014] *Aust Law Jour.* 19 ff.

<sup>36</sup> In this regard, in terms of data protection, it should be noted that in 2016 the Living Lab Utopia of the Suor Orsola Benincasa University of Naples, on the commission of an important technological partner, conducted a behavioural analysis experiment with a legal evaluation of the results in order to consider the effectiveness of the current European legislation on the processing of personal data (and in particular on consent), leading the project 'Privacy and Internet of Things: a behavioral and legal approach', directed by Professor Lucilla Gatt and vice-directed by Professor Ilaria Amelia Caggiano. The experiment was carried out on a sample of 97 users who were asked to interact with a given operating system (install the system, download an application, surf the internet, etc.). The users' awareness and their knowledge of the processing of personal data was analysed, through questionnaires and behaviour measurement technologies during the performance of the tasks and, in particular, during the granting of consent (to verify the power of self-determination of the single). In particular, in order to quantify the level of awareness and knowledge of data protection of the user, he was asked to submit mixed and open-ended questionnaires. About the behavioural analysis: to measure the attention, it was used the heatmap graphical representations; to calculate the execution time of the tasks it has timed the execution timing; to analyse the reading order within the individual screens were used gaze plots; to evaluate usability, finally, the reading order in the screens and the execution times of the tasks were taken into consideration. See L. Gatt, R. Montanari, I.A. Caggiano, 'Consensus on the treatment of personal data and behavioral analysis. Spunti di riflessione sull'effettività della tutela dei dati personali' (n. 14) 338 ff.; I.A. Caggiano, 'A quest for efficacy in data protection: a legal and behavioural analysis', Working Paper n.10/2017, 11 ff..

effectiveness of the existing legislation on civil liability<sup>37</sup> or the possible need to modify it or introduce a specific one, from a *de iure condendo* perspective.

It should be noted that technology is not just a subject of study. It is also a tool used for the analysis of human behaviour, conducted in multiple studies<sup>38</sup> thanks to the use of various technological tools (eye tracker, gaze plot, heat-map, etc.), as well as the foundation of the technological regulation that intervenes in aid of normative regulation to protect users (as in the case of the so-called data protection by design in terms of privacy)<sup>39</sup>.

Finally, with regard to the citations, it should be noted that the Oxford University Standards for Citation of Legal Authorities (so-called OSCOLA) have been followed in the footnotes and in the bibliography. In fact, this work is written in English as a result of a period of research spent in London at Queen Mary University and at the Institute of Advanced Legal Studies. Indeed, this citation criteria are followed at these educational institutions.

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<sup>37</sup> L. Gatt, R. Montanari, IA Caggiano, 'Consenso al trattamento dei dati personali e analisi giuridicocomportamentale. Spunti di riflessione sull'effettività della tutela dei dati personali' (n 14) 342.

<sup>38</sup> Among the many studies on human behaviour carried out with the support of technologies, see the already mentioned project *Privacy and Internet of Things: a behavioural and legal approach* (n 16); NuTonomy, a Cambridge-based start-up company, thanks to a high level of technology is building an autonomous vehicle software (NuCore) that performs as similar as possible to man in driving behaviour and that can interact with it in the best way possible. NuCore can be integrated with a wide range of vehicle types and has been successfully deployed across different continents. For further information, see [www.nutonomy.com](http://www.nutonomy.com).

<sup>39</sup> M. Eriksson, 'The normativity of automated driving: a case study of embedding norms in technology' (2017) 26 (2) *Information & Communications Technology Law* 46 ff. In this sense also G. Pascuzzi, *Il diritto dell'era digitale* (3<sup>a</sup> edn, Il Mulino 2010) 92-93, who believes that the advent of the digital age entails a number of changes, including the change in the technology itself of the task of ensuring compliance with the law. Frosini TE, 'Rappresentanza e legislazione nell'età della globalizzazione', *Annuario di diritto comparato e di studi legislativi*, VIII (ESI 2017) 296 ff., focuses on changing the characteristics and function of the law with the advent of globalization. The author believes that the law has entered a phase of fading since in the modern era it was a rigid law, while the post-modern law is much more flexible. As a consequence, the use of the law, currently subject to continuous interpretation, has changed.

## **CHAPTER II – POSSIBILITIES AND RISKS FOR AUTONOMOUS AND CONNECTED VEHICLE**

**Summary:** **1.** An introduction on driverless car. **1.1.** Definition of autonomous vehicle and automation levels in order to identify the liable in case of ‘autonomous vehicle accident’. **1.2.** The connected vehicle in the Internet of Things, with particular regard to the new parties involved. **2.** Artificial Intelligence such as key to achieve the highest automation levels. **2.1.** The concept of artificial intelligence and its regulation. **2.2.** Artificial Intelligence embodied in robotics: self-driving car as artificial intelligent robot.

### **1. An introduction on driverless car.**

#### **1.1. Definition of autonomous vehicle and automation levels in order to identify the liable in case of ‘autonomous vehicle accident’.**

Advanced driver assistance systems (ADAS) are defined as those technologies that collect data on the performance of the car and on the space-time context of its circulation, informing the driver and reaching up to make suggestions to the driver or, even, to take the partial or total control of the vehicle.<sup>40</sup>

According to estimates by the McKinsey Global Institute,<sup>41</sup> the spread of these technologies (especially the more advanced ones based on artificial intelligence) could avoid from 30.000 to 150.000 road victims every year. Moreover, thanks to

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<sup>40</sup> In this sense ‘Human Factors Evaluation of Level 2 And Level 3 Automated Driving Concepts’ [2014] U.S. Department of Transportation of National Highway Traffic Safety Administration study, 30 f.. To indepth ADAS with particular regard to safety aspect ‘Advanced Driver Assistance System’ [2016] European commission study 3 ff..

<sup>41</sup> J Manyika, M Chui, J Bughin, ‘Disruptive technologies: Advances that will transform life, business, and the global economy’ [2013] McKinsey Global Institute report.

the most efficient driving modes resulting from the use of autonomous systems, it could reduce the emission of carbon dioxide (up to 300,000 tons per year), limiting environmental pollution. From an economic point of view, then, savings of between 200 and 1.900 billion dollars per year are expected by 2025.<sup>42</sup>

In recent years, ADAS has rapidly developed. The main reason of this development is the progressive improvement of road safety, which, as has been considered,<sup>43</sup> more than 90% of accidents are attributable to human error (tiredness, inattention or sleepiness). The increase in vehicle on-board technology and, even more, the production of completely autonomous vehicles, therefore, lead to believe that they will significantly reduce the rate of road accidents.<sup>44</sup> However, there are authors who point out that currently there is little data available to really demonstrate that autonomous vehicles will reduce the number of accidents and at the moment only deductions can be made in this field.<sup>45</sup>

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<sup>42</sup> L Dello Iacovo, 'Stampanti 3D, auto che si guidano da sole, intelligenza artificiale: ecco le 12 tecnologie che cambieranno il mondo' [2014] Il Sole 24 Ore online.

<sup>43</sup> 'La sicurezza stradale di uomo e tecnologia. Strategie politiche di prevenzione' [2011] DEKRA Study. In the same sense *see* also KA Brookhuis, D de Waard, WH Janssen, 'Behavioural impacts of Advanced Driver Assistance Systems-an overview' (2001) 1 (3) EJTIR 245 ff.: «Safety is primarily a "human factors" case. Driver impairment is the first cause of accidents on (European) motorways. Based on a literature survey, Smiley and Brookhuis (1987) stated that about 90% of all traffic accidents are to be attributed to human failure, for instance, through fatigue, inattention or drowsiness at the wheel. According to Vallet (1991) it is generally a loss of alertness, which is the principal cause of fatal accidents (34%). While some suggest that alcohol is in at least 20% of all accidents the "prime causative factor", at least during the weekend, fatigue as "single factor" is estimated to be responsible for 7-10% of all accidents (Tunbridge et al., 2000). The costs of road traffic accidents for society are enormous in terms of both human suffering and economic loss. In Europe alone around 50.000 people are killed in traffic accidents each year, while more than 1.500.000 are injured. Traffic congestion, i.e. the regular ones and following traffic accidents, is a daily nuisance, predominantly present in the economically most sensitive places. At least 70 Billion Euro's are spent each year on medical treatment of injured people, the cost of congestion is many times that amount, and many thousands of person-years of work are lost».

<sup>44</sup> 'Rapporto 2015 sulla sicurezza stradale' [2015] DEKRA report, 4, explains that mobility (both in the transport sector and in infrastructure one) is in the midst of a huge change. In this context digitization and internet connection are essential engines. The digitization of the entire mobility involves a significant added value for each individual user of the road, with very positive reflection into safety issue.

<sup>45</sup> A Bertolini and others, 'On Robots and Insurance' [2016] Int J of Soc Robotics, 6; In this context, 'decision-making' is referred to using information provided and rules given that, thanks to the machine reasoning task, allow to reach approximate or definite conclusions and decision. These AI technologies have the ability to replace human decision-makers, and where they do so they give rise

There are also economic reasons. For example, autonomous driving is a good way to save time in traffic; in fact, the driverless cars drive more correctly reducing traffic jams and consuming less fuel. Furthermore, in terms of mobility, new technologies would provide mobility and independence to those who would otherwise have serious displacement difficulties, such as the elderly, the disabled, and even children.<sup>46</sup>

Last but not least, environmental reasons must be considered. As already said, thanks to a more efficient guide, in fact, atmospheric pollution could be considerably reduced, but also acoustically pollution.<sup>47</sup>

Therefore, the purpose of ADAS is to reduce or, where possible, eliminate driver error and at the same time improve the efficiency of traffic and transport, as well as the environmental context. With this in mind, the advantages of the most advanced systems<sup>48</sup> are among the most appreciable, since their use results in a significant decrease in human errors and a substantial reduction in economic cost and environmental pollution. Nevertheless, it is equally clear that, by proceeding in the direction of autonomous vehicles, new liability profiles of the driver and of the

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to liability questions. C Reed, E Kennedy, SN Silva, 'Responsibility, Autonomy and Accountability: legal liability for machine learning', Legal Studies Research Paper no. 243 [2016] Queen Mary University of London website 27.

<sup>46</sup> A Bertolini, E Palmerini, 'Regulating robotics: A challenge for Europe' [2014] Upcoming issues of EU law for the IURI Committee, EU Parliament Workshop, Bruxelles, 110.

<sup>47</sup> This is the c.d. smart driving, that is an intelligent, fluid and constant guide that not only reduces environmental pollution but also reduces traffic jams or avoids them, where they have already been created.. NICE draft guideline talk about smooth drive and speed reduction, see 'Air pollution: outdoor air quality and health' [2016] NICE draft guideline.

<sup>48</sup> K Van Wees, K Brookhuis, 'Product Liability for ADAS: legal and human factors perspectives' (2005) 5 (4) EJTIR 357 ff.:«A variety of Advanced Driver Assistance Systems (ADAS) has been and is still being developed, aiming to make car driving more comfortable and safe, while at the same time enhancing traffic efficiency. However, the successful implementation of ADAS is affected by a variety of technical and non-technical issues, one of them being possible implications in the field of legal liability [...]».

producer would appear.<sup>49</sup> At the same times, autonomous vehicles involve new insurance profiles, according to the change in the liability rules.<sup>50</sup>

In this sense, the definition of new profiles of liability cannot be separated from a correct classification of vehicle automation levels, which allows establishing the relationship between advanced driving systems and driver behaviour, in order to identify the liable. Automation levels have been classified by several authors<sup>51</sup> and

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<sup>49</sup> N Kalra, J Anderson, M Wachs, 'Liability and Regulation of Autonomous Vehicle Technologies', Study report of Berkeley University of California [2009] California Department of Transportation website 11 ff., stress that the time has come for a rethinking of the legal categories that have represented a constant reference point and which today appear partly outdated.

<sup>50</sup> In this field, one of the main risks related to the introduction of autonomous vehicles concerns the so-called 'complacency', that is an excessive confidence in the infallibility of automatic devices. EL Wiener, RE Curry 'Flight deck automation: promises and problems' (1980) 23 (10) Ergonomics 995 ff..

<sup>51</sup> An interesting classification, widely shared, includes six steps: (1) 'driver only', (2) 'driver warning systems', (3) 'short term driving systems', (4) 'conventional partial control systems vehicles', (5) 'autonomous vehicles with driver in the loop' and (6) 'driverless cars'.

The first step (step 1) concerns the exclusive driving of the driver. The level immediately following (step 2) is that of the 'driver warning systems' that notice pedestrians, cyclists and objects of different nature around the road, especially if they are in poor visibility areas of the vehicle (such as the rear part of the vehicle itself or a blind spot for the driver). The alert systems assist the driver in driving maneuvers (e.g. Lane Change Assist) but still affect the driving process only indirectly, influencing the driver rather than acting on the vehicle. In this context, therefore, the driver is always required to interpret the suggestions and warnings of the systems and to take into account other factors that may influence the validity of the information received (for example, weather, traffic, or road conditions).

A further step towards the complete autonomy of the vehicle is offered by systems designed to take partial control of the car in the short term (step 3). Among these systems, the best known is probably 'Adaptive Cruise Control' (ACC). Compared to the traditional cruise control, which sets the vehicle speed without regard for the external environment, the adaptive cruise control adapts precisely to the traffic flow: it reduces the speed when the front vehicles move slower than the desired speed and then increases speed again when traffic flow increase the speed. Although these technologies control the vehicle, they must be activated and deactivated by the driver according to the various situations to be faced; there are, however, systems that automatically disengage.

There are also, although still in the experimental phase, a series of systems (step 4 and, even better, step 5) that autonomously drive the vehicle for short periods of time or under certain circumstances, at the discretion of the driver. For example, combining ACC and Lane Keeping creates a system capable of driving on the motorway: the ACC controls the speed and the Lane Keeping maintains the driving lane that is being travelled. By virtue of other technological systems it is then possible, although at the discretion of the driver, to change lanes automatically.

Finally, the last step (step 6) concerns completely autonomous driving systems, which are able to drive the vehicle from the beginning of the journey to the destination. These are experimental versions in fast development in recent years. *See* OMJ Camsten, L Nilsson, 'Safety assessment of driver assistance system' (2001) 1 (3) EJTIR 225 ff..

Another very important classification divides the vehicle automation degrees into 5 levels, ranging from complete control of the vehicle by the driver to the complete control directly operated by the vehicle itself: 'driver only', 'driver assistance', 'partial automation', 'high automation' and 'full automation'. This classification, moreover, is in line with what was admitted by the National Highway Traffic Safety Administration (NHTSA), which also envisaged five vehicle automation

usually all they are based on the level of on-board technologies intervention on the human driving. This processing is based on the human-machine relationship (so-called Human-Machine Interface). However, in 2014 SAE International published a new international standard J3016<sup>52</sup> which has defined six different automation levels which will be taken into account in this work to deepen the new frontiers of civil liability in road traffic. The automation levels identified by the SAE international standard are based on the degree of driver's intervention in driving activities, which decreases proportionally as the vehicle's automation increases. They are: (L0) no automation, (L1) driver assistance, (L2) partial automation, (L3) conditional automation, (L4) high automation e (L5) full automation. As the same expression say, in the level zero (L0) there is no automation but the driver constantly has the control of the vehicle; however, the vehicle is equipped with automated system issues warnings which helps the driver<sup>53</sup>. In level one of automation (L1), i.e. 'assisted automation' also called 'hands on', driver perform longitudinal and lateral driving tasks, and the few residual skills are performed by the vehicle. On the contrary, 'partial automation' or 'hands off' (L2) is the first level where the vehicle is able to perform longitudinal and lateral driving task and this continues in the following level; anyway, in 'partial automation' the driver

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levels: 'no-automation', 'function-specific automation', 'combined function automation', 'limited self-driving automation' and 'full self-driving automation'. T Gasser, D Westhoff, 'Definitions of Automation and Legal Issues in Germany' [2012] Workshop of German Federal Highway Research Institute; Human Factors Evaluation of Level 2 And Level 3 Automated Driving Concepts, U.S. Department of Transportation of NHSTA (n 40) 2 f..

<sup>52</sup> SAE standard J3016, Taxonomy and Definitions for Terms Related to On-Road Motor Vehicle Automated Driving Systems [2012] (revised in 2016 but the automation level are the same). On the connected and autonomous vehicles a study was conducted in the United Kingdom, which resumed the six levels of automation of the SAE standard highlighting that, by 2030, 25% of the vehicles in the UK will be completely autonomous. See 'Connected and autonomous vehicles, the UK economic opportunity' [2015] KPMG Study 9.

<sup>53</sup> Examples of 'driver assistance' are: Adaptive Cruise Control (ACC), where the driver controls steering wheel and the automated system controls speed; Parking Assistance, where steering wheel is automated while speed is under driver's control.; and Lane Keeping Assistance (LKA) which automatically takes steps to ensure the vehicle stays in its lane.



must constantly monitor the dynamic drive task and the driving environment and is the most widespread automation level put on the market.<sup>54</sup> Level three of automation (L3), developed especially in USA, is the ‘conditional automation’ or ‘eye off’ level, where in time the vehicle system requires the driver to take the control when it is necessary; it means that the driver does not need to monitor the vehicle driving task (e.g. in L3 driver can watch a movie or send a message) and the surrounding environment at all times but just when he is asked to do it.<sup>55</sup> ‘High automation’ (L4) is the immediate development of ‘conditional automation’ level and follow the same division of driving tasks between the driving system and the driver; the difference lies in the fact that the cases in which the driver must intervene are reduced to anomalous cases (i.e. in L4 driver can go to sleep). Finally, in ‘full automation’ level (L5) all the tasks are performed by the vehicle and no driver is requested. For this reason, in level five of automation the role of the driver disappears.

**Figure no. 1 - SAE standard J3016**

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<sup>54</sup> N Busto, ‘Carta europea sulla robotica: una proposta di roboethics per le self-driving car’ (2017) 2 *Cyberspazio e diritto* 293 f..

<sup>55</sup> An example of ‘conditional automation’ is Audi A8 Luxury Sedan. This car is equipped with Traffic Jam Pilot, that takes full control of all aspects of driving in slow-moving traffic at up to 60 kilometres per hour. This driving function works only on highways with a physical barrier separating one stream of traffic from oncoming traffic.

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System Capability (Driving Modes)
<b>Human driver monitors the driving environment</b>						
<b>0</b>	<b>No Automation</b>	the full-time performance by the <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
<b>1</b>	<b>Driver Assistance</b>	the <i>driving mode</i> -specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	Human driver and system	Human driver	Human driver	Some driving modes
<b>2</b>	<b>Partial Automation</b>	the <i>driving mode</i> -specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	<b>System</b>	Human driver	Human driver	Some driving modes
<b>Automated driving system ("system") monitors the driving environment</b>						
<b>3</b>	<b>Conditional Automation</b>	the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i>	System	<b>System</b>	Human driver	Some driving modes
<b>4</b>	<b>High Automation</b>	the <i>driving mode</i> -specific performance by an automated driving system of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i>	System	System	<b>System</b>	Some driving modes
<b>5</b>	<b>Full Automation</b>	the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i>	System	System	System	<b>All driving modes</b>

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A few decades ago, driverless cars appeared to be only a dream delivered to a distant future, while today driverless vehicles<sup>56</sup> are spreading everywhere. The development of self-driving cars began more than thirty years ago with the project PROMETHEUS<sup>57</sup> (PROgramme for European Traffic with Highest Efficiency and Unprecedented Safety), launched in 1987 by Mercedes-Benz. Result of the project were the two VaMP and VITA-2 twin vehicles that run across more than 1,000 kilometres in completely autonomous mode on the Paris motorways in 1994. Then,

<sup>56</sup> A Bertolini, 'Robots as Products: The Case for a Realistic Analysis of Robotic Applications and Liability Rules' (n 12) 225, assumes that the concept of autonomy should be understood as the ability to act without human supervision, receiving and processing data in a complex environment. This ability to operate independently varies according to the level of vehicle autonomy.

<sup>57</sup> The project was managed from 1986 to 1995 by EUREKA, a European intergovernmental organization, founded in 1985 to support market-oriented research and development projects, in collaboration with industries, research centres, and universities. Eureka, Programme for a European traffic system with the highest efficiency and unprecedented safety, in [www.eurekanetwork.org](http://www.eurekanetwork.org) (accessed 31<sup>st</sup> August 2018).

in 2014 the Defence Advanced Research Project Agency (DARPA)<sup>58</sup> organized the first Grand Challenge, a race in which autonomous vehicles had to cross the Mojave Desert (California). Unfortunately, none of the race participants finished the course (142 miles) and the vehicles that went farther travelled less than 8 miles. In the Second Grand Challenge, that took place the following year, however, five vehicles successfully completed the 132 mile course in Nevada and to win was the team of Sebastian Thrun of Stanford University, one of the inventors of Google Street View that since 2009 works on the project started as Google self-driving car and currently called Waymo.<sup>59</sup> Subsequently, in the Third Grand Challenge (2007) six vehicles completed the race.

Another investment in the field of autonomous vehicles was made already in 2010 in Italy where, thanks to the project<sup>60</sup> of University of Parma, directed by Professor Alberto Broggi, two vans without driver were successfully sent along a journey of more than 15.000 km, from Rome to Shanghai. Subsequently, in 2013 Professor Broggi put into circulation the autonomous vehicle BRAiVE on the roads of Parma in a mixed suburban and urban route (Public Road Urban Driverless-Car Test 2013).<sup>61</sup>

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<sup>58</sup> 'The DARPA Grand Challenge: Ten Years Later' [2014] DARPA post (accessed 3<sup>rd</sup> September 2018).

<sup>59</sup> The project was directed by Chris Urmson and implemented by engineer Sebastian Thrun. For further information on the Google project, see [www.waymo.com](http://www.waymo.com) (accessed 31st August 2018). Apple's self-driving car, instead, initially suffered from delays in its autonomous vehicle project, as project manager Steve Zadesky left the company. However, since permission was granted by California DMV to Apple in April 2017, it seems that Apple has begun testing its advanced autonomous driving technology on the road and has started working in secret to develop Apple. iCar within the Titan project. However, there is no official news in this regard.

<sup>60</sup> VisLab is the acronym of Artificial Vision and Intelligent Systems Laboratory at Parma University, Information Engineering Department. VisLab is now part of Ambarella Inc., for more information about the project *see* [www.ambarella.com](http://www.ambarella.com) (accessed 3<sup>rd</sup> September 2018).

<sup>61</sup> 'La sfida del VisLab conclusa con successo: i veicoli automatici hanno raggiunto l'Expo di Shanghai' [2010] VisLab post (accessed 3<sup>rd</sup> September 2018); 'Nuovo esperimento su strada della tecnologia VisLab: guida in città' [2013] VisLab post (accessed 3<sup>rd</sup> September 2018).

Finally, the Tesla automotive company has recently entered into the autonomous vehicle market<sup>62</sup>, that in 2016 has already marketed the S model and the X model, and Uber<sup>63</sup>, the automobile transport company that in the same year started to use the driverless cars for the passenger transport service. The following year, also Ford started to invest in the artificial intelligence sector for its future self-driving vehicles with the acquisition of Argo AI, a start-up founded by former executives of Google and Uber and specialized precisely in artificial intelligence systems.<sup>64</sup>

## **1.2. The connected vehicle in the Internet of Things, with particular regard to the new parties involved.**

Nowadays the pervasiveness of the Internet connection<sup>65</sup> is undeniable. It affects the private and working life of every human being, who is constantly monitored through the growing number of identification and tracking technologies.

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<sup>62</sup> 'Tesla, Guida autonoma disponibile su tutte le auto' [2018] Tesla post (accessed 3<sup>rd</sup> September 2018) (accessed 3<sup>rd</sup> September 2018).

<sup>63</sup> 'Self-Driving Ubers. The world's first Self-Driving Ubers are on the road in the Steel City'[2016] Uber post (accessed 3<sup>rd</sup> September 2018).

<sup>64</sup> 'Ford, la "parola" ai veicoli autonomi', [2017] l'Automobile post (accessed 3<sup>rd</sup> September 2018).

<sup>65</sup> With the Internet, in fact, it is determined a global interconnection between computer networks of different nature and extension (LAN, WLAN, WAN, GAN and so on). In this context, devices communicate with each other through a suite of Transmission Control Protocol (TCP) and Internet Protocol (IP), allowing the transfer from one user to another one of data that can be published or shared. The interconnected devices (so-called hosts) mainly follow the 'server-client' model which consists of the whole of an IT data processing and management subsystem (server) that provides any type of service to other components called clients, allowing them to share information. The peer to peer (P2P) model is a valid alternative in which server and client roles can be exchanged. G Pascuzzi, *Il diritto dell'era digitale* (3<sup>a</sup> edn, Il Mulino 2010), 23 f. Furthermore, in the Italian legal system, l'art. 1, lett. *dd*, d. lgs. 1 August 2003, n 259, OJ 214 (Italian electronic Communication Code) provides an explicit definition of the electronic communications networks. In this sense also art. 2, co. 1, lett c, d.lgs 31 July 2005, n 177, OJ 208 (Single text of media and radio services).

At the same time, though, people cannot do without these technologies because they improve the services offered, which are extremely useful (perhaps essential) for most of the daily activities.<sup>66</sup>

Internet development has been greatly enhanced by the extension of this network to the world of the objects, a phenomenon known as the Internet of Things (IoT). In particular, it is an evolution of the Internet network, thanks to which the objects interact each other, through sensors and without human intervention, exchanging data and accessing information stored in databases.<sup>67</sup> This information architecture has been defined as a network which connects physical or virtual objects that become recognizable and acquire intelligence through the ability to communicate data about oneself and on the environment around them.<sup>68</sup> For this reason, such objects are defined as intelligent objects. They are tagged with a Radio Frequency Identification tag with a single ID called Electronic Product Code

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<sup>66</sup> Within the Internet, the Internet of Things is revolutionizing contemporary society. It is a revolution that is different but parallel to that which sees robotics as the protagonist. Indeed, even the development of robotics and, at the same time, of artificial intelligence, is able to transform the habits of life and work of each of us, increasing efficiency, savings and security, as well as improving services, bringing significant benefits not only in the manufacturing and commercial sectors, but also in different sectors such as transport (European Parliament resolution of 2017 (n. 13)). In the same sense *see* also Communication from the Commission to the European parliament, the council, the European economic and social committee and the Committee of the regions COM(2017) 288 of 19 May 2017 on the Mid-Term Review on the implementation of the Digital Single Market Strategy [2017], 1 ff.; the role of technology in the transformation of the European Union is also highlighted in the White Paper COM (2017) 2025 of 1 March 2017 on the Future of Europe, Reflections and Scenarios for the EU27 towards 2025 [2017] 4.

<sup>67</sup> The term database refers to the collection of information, organized in such a way as to allow the user to quickly find it. Technically the database structure is organized on three levels: 1) the unit of physical memory that contains the material, i.e. the computer; 2) the layout scheme of the material intended as the logical model chosen by the programmer (e.g. hierarchical model, relational model, etc.); 3) software for consulting stored information (database management system). Users interact with the database through a terminal (hardware device), using a query language (query language). *See* AM Gambino, 'Informatica giuridica e diritto dell'informatica' Treccani G (ed.) *Enciclopedia Giuridica* (online edn 2013).

<sup>68</sup> V Dr. Ovidiu, F Dr. Peter, G Patrick and others, 'Internet of Things Strategic Research Roadmap' (2nd edn. 2011) 10.: « [...] dynamic global network infrastructure with self configuring capabilities based on standard and interoperable communication protocols where physical and virtual "things" have identities, physical attributes, and virtual personalities, use intelligent interface, and are seamlessly integrated into the information network».

(EPC).<sup>69</sup> Currently included in this category are incredibly disparate kinds of objects - traffic lights, cars, thermostats, refrigerators, alarm clocks, watches, surveillance cameras and many others. There are so many smart things that the concept has moved from 'Internet of Things' to 'Internet of everything'. In addition, connectivity is growing steadily and it is expected that by 2020 more than twenty million objects will be connected to each other.<sup>70</sup>

In this area, one of the most advanced business is undoubtedly the car industry. Indeed, by the end of the first twenty years of our century, there will be about 250 million vehicles connected online<sup>71</sup> and the automotive market will grow exponentially, up to quadruple.<sup>72</sup> Moreover, around 2025, there will be such a level of automation that the driver will not have to constantly monitor the vehicle, even if he has to be able to resume control at all times.

To communicate with each other, the new vehicles must be connected online, and as a result of this connection the automotive industry too is included in the Internet of Things network. Autonomous vehicles are often defined as connected vehicles to emphasize their ability to connect to the network. There are essentially three types of vehicle connections. The first and most common type of

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<sup>69</sup> About Radio Frequency Identification (RFID) see EC Pallone, 'Internet of Things e l'importanza del diritto alla privacy tra opportunità e rischi' (2016), 17 (55) *Cyberspazio e diritto* 174 f. About Internet of Things definition see RH Weber, 'Internet of Things, New security and privacy challenges' (2010) 26 *Computer law & security report*, 23 f. Finally, with regard to the introduction of the term Internet of Things K Ashton, 'That "Internet of Things" Thing. In the real world, things matter more than ideas' [2009] *RFID*, 1; S Haller, S Karnouskos, C Schiroh, 'The Internet of Things in an enterprise context' (2008) *Future Internet, Lecture Notes in 5468 Computer Science*, 1.

<sup>70</sup> 'Leading the IoT, Gartner insight on how to lead in a connected world' [2017] Gartner estimate 13 (accessed 8<sup>th</sup> September 2018); E Hannon C McKerracher, I Orlandi and others, 'An integrated perspective on the future of mobility' [2016] *McKinsey Post* 1 ff. (8<sup>th</sup> September 2018).

<sup>71</sup> 'Gartner Says By 2020, a Quarter Billion Connected Vehicles Will Enable New In-Vehicle Services and Automated Driving Capabilities' [2015] Gartner Estimate (8<sup>th</sup> September 2018); 'Disruptive technologies: Advances that will transform life, business, and the global economy' [2013] *McKinsey Post* (8<sup>th</sup> September 2018).

<sup>72</sup> 'In the fast lane, the bright future of connected cars' [2014] *Price Waterhouse Cooper Estimate* 5 f. (8<sup>th</sup> September 2018).

communication is between automated vehicles and different categories of devices (e.g. smartphones, smart watches, tablets and personal computers) known as the Vehicle to Device Communications (V2D). Secondly, there is Vehicle to Infrastructure Communications (V2I), a more specific type of communication between vehicles and infrastructures (such as road traffic lights or speed camera). Finally, the most sophisticated type of communication is Vehicle to Vehicle Communications (V2V), as it presupposes fully autonomous driving, or at least a high level of automation.<sup>73</sup>

The level of the vehicle communication is directly proportional to the level of automation of the vehicles, even though connectivity is just one of the requisites needed to achieve complete automation of vehicles.

The IoT is undoubtedly the most important innovation in the field of Information Technology (IT). However, in addition to the many advantages, there are a number of issues still to be resolved and the automotive sector is one that most urgently requires regulation.<sup>74</sup> Among the key issues are how to allocate liability in case of road accidents caused by malfunctioning connection of self-driving car. In this case, new subject could be held liable for the vehicle accident, such as the ISP whom the vehicle were connected at the time of the accident or the software developer of the program installed on the vehicle's on-board computer.

Furthermore, in the light of the European reform of the protection of personal data,<sup>75</sup> an other current issue concerns the protection of personal data processed by

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<sup>73</sup> Para II, lett. d., Declaration of Amsterdam (n 13 )

<sup>74</sup> European Parliament Resolution of 2017 (n 13), rec 24 ff.

<sup>75</sup> On May 4, 2016, they were published in the Official Journal of the European Union (OJ): Regulation 679/2016/EU of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC [2016] OJ L119, well know as General Data Protection Regulation (GDPR); Directive 2016/680/EU of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of

autonomous vehicles and the related profiling process of the user, who daily uses such technologies often unaware of the risks.<sup>76</sup> Anyway, this was already in-depth in other papers to which reference is made<sup>77</sup> and it is not the topic of the current work.

## **2. Artificial Intelligence such as key to achieve the highest automation levels.**

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personal data by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and on the free movement of such data, and repealing Council Framework Decision 2008/977/JHA [2016] OJ L119; Directive 2016/681/EU of the European Parliament and of the Council of 27 April 2016 on the use of passenger name record (PNR) data for the prevention, detection, investigation and prosecution of terrorist offences and serious crime [2016] OJ L119.

<sup>76</sup> In the field of data protection, the consent to the processing of personal data in self-driving cars involves several issues, which lead to wonder if consent is still an appropriate regulatory tool for the protection of personal data. Indeed, the consent model just does not work without causing risk to driver or passengers on-board, and asking for it is too impractical. Furthermore, in particular in the V2I and V2V communication, some of the data have to be exchanged in split seconds and the user could not have time to give his or her consent to the processing of personal data. Finally, the driver is not the only person whose data is collected. Data is also collected about passengers, and also potentially third parties outside the vehicle, captured while driving by self-driving car communication. It is obvious that the consent model does not work here and that some processing of personal data is always necessary. See G Alpa, preface R Pardolesi (ed.), *Diritto alla riservatezza e circolazione dei dati personali* (Giuffrè 2003).VII ff. states on the protection of personal data that it is a discipline difficult to articulate and translate into regulations, both for the balancing of interests that implies, and for the volatility of the forecasts. S Rodotà, 'Tecnologie dell'informazione e frontiere del sistema sociopolitico' (1982) 4 Pol. dir., 25 believes that legal rules must adapt to the rapid pace of technological change.

<sup>77</sup> Allow me to return to Gaeta MC, 'The issue of data protection in the Internet of Things with particular regard to self-driving cars' [2017] DIMT 1 ff..



## 2.1. The concept of artificial intelligence and its regulation.

Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning<sup>78</sup>, self-correction,<sup>79</sup> and decision-making<sup>80</sup>.

The term ‘Artificial Intelligence’ was coined by John McCarthy<sup>81</sup>, in 1956 during the ‘Dartmouth Summer Research Project on Artificial Intelligence’ workshop, organised at Stanford University. Today, modern dictionaries<sup>82</sup> define

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<sup>78</sup> The term ‘learning’ applied to machine, means the acquisition of information, rules and algorithm learning from them. This concept is better known as ‘machine learning’. C Reed, E Kennedy, SN Silva, ‘Responsibility, Autonomy and Accountability: legal liability for machine learning’ (n 45) 2 ff., investigates the question of legal liability for the consequences of decisions made by machine learning technology rather than by humans, explaining that one of the most important example of machine learning are self-driving cars: «Self-driving, or autonomous, vehicles use technologies which have learnt how to operate the vehicle as an evolutionary process, and thus developed a model of the driving process, rather than being controlled in accordance with a model generated by the mind of a human programmer. Decisions about how the vehicle should be controlled are not longer made by a human driver, but by the technology acting autonomously».

<sup>79</sup> ‘Self-correction’ is the machine capability to correct itself analysing the mistakes done in the light of the information received but without the intervention of third parties.

<sup>80</sup> In this context, ‘decision-making’ is referred to using information provided and rules given that, thanks to the machine reasoning task, allow to reach approximate or definite conclusions and decision. These AI technologies have the ability to replace human decision-makers, and where they do so they give rise to liability questions. C Reed, E Kennedy, SN Silva, ‘Responsibility, Autonomy and Accountability: legal liability for machine learning’ (n 45) 3 f.

<sup>81</sup> McCarthy an American computer scientist was the first who coined the term ‘artificial intelligence’. In 1956, McCarthy invited a group of researchers from a variety of disciplines (including language simulation, neuron nets, complexity theory and more) to the workshop organised at Stanford University and called ‘Dartmouth Summer Research Project on Artificial Intelligence’. The aim of the initiative was to discuss what AI would become and in the workshop the invited researchers tried to clarify the concepts of ‘thinking machines’ which had been an unclear concept with different meanings. In the proposal for the conference McCarthy said: «The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it». See J McCarthy, ML Minsky, N Rochester, and others, ‘A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence’ *AI Magazine* Volume (2006) 27 (4), 12 ff..

<sup>82</sup> The English Oxford Living Dictionary gives this definition: «The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages». See Oxford Living Dictionary, voice ‘artificial intelligence’ (accessed 15<sup>th</sup> September 2018). Italian Treccani Dictionary defines AI in cybernetics as the partial reproduction of man's own intellectual activity (with particular regard to the processes of learning, recognition and choice) achieved through the elaboration of ideal models or with the development of machines equipped with computers (for this reason electronic brains). See Italian Treccani Dictionary (online edn), voice ‘intelligenza’, sub-voice ‘intelligenza artificiale’ (accessed 15<sup>th</sup> September 2018).

AI such as sub-field of computer science, emphasising how machines can simulate human intelligence.

There are different classification of AI. One of the best known classification<sup>83</sup> divides AI in 'strong AI' and 'wake AI'. Strong AI (also known as 'artificial general intelligence') is proper of machine with consciousness, sentience, and mind, which allows it to decide freely. It is an AI system with generalized human cognitive abilities so that when presented with an unfamiliar task, it has enough intelligence to find a solution. Instead, the second type of AI, also called narrow AI,<sup>84</sup> is based on one narrow task; it can intelligently interact without supervision, with the surrounding environment but it cannot make decisions independently.

With regard to strong AI, it is appropriate to quote the Turing Test<sup>85</sup> (developed by mathematician Alan Turing in 1950) which aims to determine if a computer can

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<sup>83</sup> There are several authors who use this classification, *see* S Bringsjord, B Schimanski, 'What is Artificial Intelligence? Psychometric AI as an Answer'. The distinction between strong AI and wake AI is also recoverable in 'Objection from Consciousness' in Turing's 1950 defence of Turing Test. The objection is famously incorporated in Professor Jefferson's Lister Oration, delivered at the Royal College of Surgeons of England on 9 June 1949 from: «Not until a machine can write a sonnet or compose a concert because of thoughts and emotions felt, and not by the chance fall of symbols, could we agree that machine equals brain — that is, not only write it, but know that it had written it. No mechanism could feel (and not merely artificially signal, an easy contrivance) pleasure at its successes, grief when its valves fuse, be warmed by flattery, be made miserable by mistakes, be charmed by sex, be angry or depressed when it cannot get what it wants». *See* G Jefferson, 'The mind of mechanical man', (1949) 1 British Medical Journal, 15.

<sup>84</sup> Siri, the apple's virtual assistant installed on all iPhone models, is a good example of narrow intelligence. Siri operates within a limited pre-defined range of functions. As a matter of fact, Siri virtual assistant has not genuine intelligence or self-awareness. Some authors think weak AI could be dangerous because of this brittleness which brings to fail in unpredictable ways. Weak AI could cause global economic problems or, for example, misdirect autonomous vehicles. In this sense R Carlo, 'The sorcerer's apprentice, or: why weak AI is interesting enough' 2011 Center of Internet and Society post, Stanford University (accessed 15<sup>th</sup> September 2018) says that software controls many facets of daily life but this control presents real issues.

<sup>85</sup> The Turing test, developed by Alan Turing in 1950, is a test of a machine's ability to exhibit intelligent behaviour equivalent to human being, or indistinguishable from that of a human. The test was published for the first time in AM Turing, 'Computing machinery and intelligence (1950) 59 Mind, 433 ff. In the article Turing is inspired by a game, called 'game of imitation', composed by three participants: a man A, a woman B, and a third person C. The person C is kept separate from the other two and through a series of questions must determine which is the man and which the woman. For their part also A and B have tasks: A must deceive C and bring him to make an incorrect identification, while B must help him. In order for C to have no clue (such as spelling or voice analysis), the answers to C questions must be typescript or similarly transmitted. The Turing test is based on the assumption that a machine replaces A. If the percentage of times in which C guesses

actually think like a human or not and, in the first case, it would be proper to identify the machine's artificial intelligence as strong AI. If the machine is not able to think like a human being, it would not strong AI but weak AI.

An example of Strong AI is machine learning, i.e. the science of getting a machine to act without default programming, but learning it self on the basis of the algorithms already set by the programmer. Machine learning is a field of computer science which uses statistical techniques and algorithm to give machine the ability to 'learn', which means progressively improve performance on a specific task thanks to data collected, without being explicitly programmed to do it. The immediately following degree of machine learning is represented by so-called deep learning, that can be thought of as the automation of predictive analytics.<sup>86</sup> Both, machine learning and even more deep learning, are characterised by the unforeseeability of the machine which acts on the basis of what it has learned and not of algorithms. It implies an increase of the unpredictable damage and the consequent difficulty in identifying the person responsible.

Other AI classification<sup>87</sup> categorizes AI into four types, from the kind of AI systems that already exist today to sentient systems, which do not yet exist. The four categories are: (1) Reactive machines, (2) Limited memory, (3) Theory of mind, (4) Self-awareness. 'Reactive machines' (1) is a type of machine make predictions, but it has no memory and cannot use past experiences to inform future

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who the man is and who the woman is are similar before and after replacing A with the machine, the machine should be considered intelligent, since it would be indistinguishable from a human being.

<sup>86</sup> According to the data reported in the last Report of the Organization for Economic Cooperation and Development (OECD) on Digital Transformation, Italy is in 5th place worldwide for the production of the most cited scientific documents on machine learning after the United States, China, India and Great Britain. *See* 'The Digital Transformation: Italy' [2017] Highlights from the OECD Science, Technology and Industry Scoreboard 1 ff.

<sup>87</sup> This classification comes from Arend Hintze, assistant Professor of integrative biology, computer science and engineering at Michigan State University. *See* A Hintze, 'Understanding the four types of AI, from reactive robots to self-aware beings the conversation post (accessed 15th September 2018).

ones.<sup>88</sup> Second type of AI is ‘Limited memory’ (2), these AI systems, that can use past experiences to inform future decisions, is applied for some of the decision-making functions in self-driving cars. Here observations inform actions, such as a car changing lanes. At any rate, these observations are not stored permanently. Then there is ‘Theory of mind’ (3), that does not yet exist. This term, which came from psychology, refers to the understanding of own beliefs, desires and intentions that impact the decisions ones make. Finally, we find ‘Self-awareness’ (4). In this category, AI systems have a sense of themselves, and they have consciousness. Machines with self-awareness understand their current state and can use the information to infer what others are feeling. Since there is not even the type 3 of AI, it is clear that there is no type 4 either.

Nowadays, there is not a specific regulation for AI, even though this topic is the object of many legislative initiatives. In this context, the European Parliament has already moved with the resolution of 2017. In the text of the EU Resolution, indeed, the European Parliament request, on the basis of Article 225 TFEU, the Commission to submit, on the basis of Article 114 TFEU, a proposal for a directive on civil law rules on robotics and AI.<sup>89</sup> This regulatory framework, moreover, should mainly deal with certain sectors, such as the civil liability of machines, the impact on the labour market, data protection and cybersecurity issue, environmental impact, and ethical implications. The European Parliament also ask to the European Commission to define robot and to establish certain criteria for the

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<sup>88</sup> Example of reactive machine are Deep Blue and Google's AlphaGO. Anyway, they were designed for narrow purposes and cannot easily be applied to another situation. Deep Blue was a chess-playing computer developed by International Business Machines Corporation (IBM) and it is known for being the first computer chess-playing system to win a chess match against a different world champions. Instead, AlphaGo, developed by Alphabet Inc.'s Google DeepMind in London, is a computer program that plays the board game Go. It was the first software to defeat a professional (human) in the Go game. For further information, see the definitions of Wikipedia.

<sup>89</sup> European Parliament resolution of 2017 (n 13), rec 65.

classification of robots in subcategories in order to identify those to be registered,<sup>90</sup> and it also hypothesizes the establishment, among other possible legal solution, of legal personality for the most advanced robots (so-called ‘robot electronic personality’).<sup>91</sup> Furthermore, the EU Parliament proposes a ‘Charter on robotics’ (soft law) composed by: 1) Code of ethical conduct for robotics engineers, 2) Code for research ethics committees (REC) for their work on reviewing robotics protocols, 3) licence for designers and licence users.<sup>92</sup> At the same time EU Parliament ask for the creation of an European Agency for the robotics and artificial intelligence in order to provide the technical, ethical and regulatory skills necessary to support public actors at both European and national level.<sup>93</sup>

Another EU initiative is the European Commission communication on Artificial Intelligence for Europe of 2018.<sup>94</sup> EU Commission compares AI to the impact of steam engine or electricity in our society, explaining how AI is transforming our world.<sup>95</sup> Thanks to the growth in computing power, availability of data and

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<sup>90</sup> A common European definition for smart autonomous robots should be established, including definitions of its subcategories, taking into consideration the following criteria: «the capacity to acquire autonomy through sensors and/or by exchanging data with its environment (inter-connectivity) and the analysis of those data; the capacity to learn through experience and interaction; the form of the robot’s physical support; the capacity to adapt its behaviour and actions to the environment». In addition to these criteria to be used both in the definition and in the classification of the robots, then, there is another, which obviously must be placed first, necessary for the definition of robots: «ence of life in the biological sense».

For those robots that need to a registration, the register should be Union-wide, and could be managed by a designated EU Agency for Robotics and Artificial Intelligence, if an Agency is created. See European Parliament resolution of 2017 (n 13), Annex to the Resolution and n.1 of the Resolution.

<sup>91</sup> European Parliament resolution of 2017 (n 13), rec 59, lett f). The electronic personality, could be applicable to cases where robots make autonomous decisions or otherwise interact with third parties independently.

<sup>92</sup> European Parliament resolution of 2017 (n 13), Annex to the Resolution.

<sup>93</sup> European Parliament resolution of 2017 (n 13), rec 15, 16 and 17.

<sup>94</sup> European Commission Communication to the European parliament, the European council, the Council, the European economic and social committee and the Committee of the regions, of 25 April 2018, on Artificial Intelligence for Europe (COM(2018) 237 final).

<sup>95</sup> In particular, AI will affect the industrial sector. Indeed, AI is part of the Commission’s strategy to digitise industry (COM(2016) 180 final) and a renewed EU Industrial Policy Strategy (COM(2017) 479 final).

progress in algorithms, AI is undoubtedly one of the most strategic technologies of this century and the way we will approach AI will define the world we live in. More precisely, the EU Commission communication aims to maximise the benefits of AI by: boosting the technological and industrial capacity of the European Union and adopting AI in all economic sectors; preparing for socio-economic changes brought about by AI by; ensuring an appropriate ethical and legal framework, based on the Union's values and in line with the Charter of Fundamental Rights of the EU.

As a matter of fact, also at national level there are legislative initiatives of soft law. In particular, in Italy the Agency for Digital Italy (so-called AGID), published in 2018 the White Paper on Artificial Intelligence at the service of the citizen. The White Paper identifies some main areas in which AI can improve our society: health, education and justice systems, public employment and security, underlining how the development and promotion of AI must be a European project, not just a national one.<sup>96</sup>

In the same direction is also moving the Italian Parliament. More precisely, in the motion on robotics and artificial intelligence of 2017,<sup>97</sup> the Italian Parliament has emphasised how technology offers increasingly innovative solutions while lawmakers can not keep up with the times. In particular, Parliament makes explicit reference to issues relating to non-contractual civil liability in cases of damage

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<sup>96</sup> The White Paper provides a positive look at how Governments, their Agencies and Public Administrations can better serve both people and businesses by improving public services and citizen satisfaction. A large part of the White Paper objectives, that can be achieved thanks to a good use of AI in Public Administration, coincides with the work that the European Commission is doing to promote the development of e-government and the digitization of public services as part of Digital Single Market project: save time and public money by providing better public services; making services interoperable between Member States by increasing efficiency and improving transparency; and bring people closer to their governments, involving them more in the decision-making process. Agency for Digital Italy (AGID), White book on Artificial Intelligence at the service of the citizen (2018).

<sup>97</sup> Italian Parliament, Motion on Robotics and Artificial Intelligence of 09 May 2017, n 792.

caused by technological devices possibly equipped with a form of artificial intelligence. Therefore the Italian Parliament commits the Government to favour a common line between the Government Authorities in the approach to the sustainable development of robotics, artificial intelligence and information security. At the same time, Parliament promotes training activities, research and development of such technologies in Italian schools, universities and research centres and supports applications related to industrial production (both in consolidated companies and in innovative start-ups).<sup>98</sup>

Last but not least Italian initiatives in the field of self-driving cars is represented to the Ministerial Decree on smart road, which introduces the role of the supervisor, starting from the assumption that in the highest automation level<sup>99</sup> there is not a driver on board the building but only a supervisor who must be able to summarize the control of the vehicle. which introduces the role of the supervisor, starting from the assumption that in the highest automation level there is not a driver on-board but only a supervisor who must be able to resume the control of the vehicle if requested. The D.M. it has a dual purpose: on the one hand, to promote technological adaptation of the infrastructures according to the 'Smart Roads rules', in line with the European and International requirements and, on the other hand, to guarantee and promote the autonomous and connected vehicles tests, in consideration of the possibility that autonomous vehicles will soon be introduced into the market. Given the inapplicability of the rules of the Italian Traffic Code, that does not allow self-driving cars circulation, the decree constitutes the

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<sup>98</sup> The Italian Parliament highlights the strong impact of the AI: AI continually creates new digital markets; significant investments in artificial intelligence technologies are already underway over the next three years; the impact of digital and new technologies in the most disparate fields is constantly increasing: training, home automation, medicine, defence and transport (both public and private). Italian Parliament, Motion on Robotics and Artificial Intelligence of 09 May 2017, n 792.

<sup>99</sup> Also the D.M. refers to the automation level of the SAE standard J3016.

normative reference for the driverless car test on Italian roads and public areas, which can only take place in the presence of the conditions and the precautions foreseen therein.

Finally, other countries are also moving towards a regulatory framework for artificial intelligence. These include South Korea, Germany and Singapore,<sup>100</sup> but also UK is working on this.<sup>101</sup>

## **2.2. Artificial Intelligence embodied in robotics: self-driving car as artificial intelligent.**

AI can be purely software-based or embodied in hardware devices.<sup>102</sup> A significant example is represented by robotics. In this sense, AI is what makes a robot autonomous. For example, robotic process automation (RPA) can be programmed to perform high volume and repeatable tasks that humans normally performed. In robotics field, the most relevant application of AI for this work is self-driving car, which is a specific development of Artificial Intelligent robotics. Consequently, it seems appropriate to investigate how AI affects robotics and, in particular, autonomous vehicles. But let's start with defining robots.

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<sup>100</sup> 'Who is ready for the coming wave of automation?' [2018] The Economist, Intelligence Unit Study 5 ff..

<sup>101</sup> UK Select Committee of 10 October 2017 on Artificial Intelligence (Uncorrected oral evidence: Artificial Intelligence) [2017].

<sup>102</sup> AI affect different sectors of the economy and society. The main sectors were individuated and categorised by Stanford University in a report of 2016 on AI, with particular regard to the ways in which AI is already beginning to transform everyday life, and how those transformations are likely to quickly grow up in fifteen years. The sectors were divided in eight domains: transportation, home/service robotics, healthcare, education, low-resource communities, public safety and security, employment and workplace, and entertainment. 'Artificial Intelligence and life in 2030. One hundred year study on Artificial Intelligence' [2016] Stanford University Report 18 ff..



The term robot comes from the Czech ‘robota’, which literally means work (forced) and was first used by Karel Apek in his science fiction drama ‘Rossum’s Universal Robots’ (abbreviated as RUR) of 1920. In this drama the term was used with reference to the automaton that worked in place of the workman. Anyway, from a research carried out on the main encyclopaedias and dictionaries in Europe, it emerged that there is no general consensus on the definition of robots,<sup>103</sup> and it could generate problems for their legal regulation.<sup>104</sup> According to the initial idea, robot was a machine with human (human-like) appearance. Today, on the contrary, the notion of robot is not related to human appearance and is so much extended that even autonomous vehicles fall peacefully in this notion.<sup>105</sup>

Thus, nowadays self-driving cars are included in the category of robots and, as they are equipped with AI, they are included in the category of artificial intelligent robots. More precisely, the semi-autonomous vehicles (i.e. level 1 from level 4 of automation) are characterised by different degrees of wake AI which increases with

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<sup>103</sup> For example, the Encyclopaedia Britannica, in a quite current definition, considers robot as «any automatically operated machine that replaces human effort, though it may not resemble human beings in appearance or perform functions in humanlike ways». See Encyclopaedia Britannica (online edn), voice ‘robot’ (accessed 17<sup>th</sup> September 2018). The Oxford University Dictionary, which also introduces the aspect of programming, define robot as: «a machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer». See Oxford University Dictionary (online edn), voice ‘robot’ (accessed 17<sup>th</sup> September 2018). In the same sense, the Treccani online Dictionary defines it as a programmable mechanical and electronic device, used in industry, to replace man, to automatically and autonomously perform repetitive or complex activities, heavy and dangerous. See Treccani dictionary (online edn), voice ‘robot’ (accessed 17<sup>th</sup> September 2018).

<sup>104</sup> A Bertolini, ‘Robots as Products: The Case for a Realistic Analysis of Robotic Applications and Liability Rules’ (n 12) 215.

<sup>105</sup> In this sense A Santosuoso, C Boscarato, F Caroleo, ‘Robot e diritto: una prima ricognizione’ [2012] *Pluris* 1 ff., which suggest considering the robot as a machine that performs a job independently. C Perlingieri, ‘L’incidenza dell’utilizzazione della tecnologia robotica nei rapporti civilistici’ (2015) 4 *Rass. dir. civ.* 1236 and 1243, on the other hand, wonders about the possibility to consider robots in the category of legal subjects rather than in that of the things (in Latin ‘res’), but concludes in a negative sense, emphasizing the value of the human person enclosed in the constitutional principles as well as in the norms of positive law. Then, after declaring the importance of developing a European definition of robots, the European Parliament considers the opportunity to divide robots into sub-categories, taking into account some robots’ characteristics: the capacity to learn through experience and interaction; the form of the robot’s physical support; the capacity to adapt its behaviour and actions to the environment.. See Annex to European Parliament Resolution (n 13).

the increasing automation level; completely autonomous vehicle, contrariwise, are equipped by strong AI.

Driverless car uses AI, for example a combination of computer vision, image recognition, and deep learning, to build automated skill at piloting a vehicle while, the vehicle is staying in a given lane or is driving itself, avoiding unexpected obstructions, such as pedestrians, other vehicles or animals.

## **CHAPTER III – THE FUNCTION OF TORT LAW: HOW AUTONOMOUS VEHICLE COULD CHANGE TRADITIONAL LIABILITY RULES.**

**Summary:** **1.** Legal analysis of car accident liability rules in a comparative perspective with particular regard to their function ('ratio legis'). **1.1.** Private comparative law analysis of the function of car liability: similitudes and differences. **1.2.** The tortfeasor in the road vehicle accident under article 2054 of the Italian Civil Code and the other main national regulations in the European and American legal systems. **2.** The self-driving car ingoing in this scenario: the choice between traditional liability rules and other body of rules such as product liability. **2.1.** German legal system: The amendment of German Road Traffic Act. **2.2.** The other legal systems in Europe with specific reference to United Kingdom Automated and Electric Vehicles Act of 2018. **2.3.** European Union initiatives in the field of Robotics and AI, including autonomous vehicles. **3.** Legal analysis of car insurance law under a comparative point of view. **3.1.** The possible car insurance schemes: third part insurance and first party insurance. **3.2.** Focus on the Italian car insurance in relation with the other already identified legal systems. **3.3.** Case study: Trinity Lane Driverless Car Policy.

### **1. Legal analysis of car accident liability rules in a comparative perspective with particular regard to their function ('ratio legis').**

#### **1.1. Private comparative law analysis of the function of car liability: similitudes and differences.**

In order to verify if and how autonomous vehicles can affect the rules of non-contractual civil liability in road traffic, it is first of all necessary to carry out a comparative analysis of the rules themselves. As a matter of fact, it seems appropriate to analyse the essential elements of civil liability and its function in civil law (Italian, France and Germany) and in common law (the United Kingdom and the United States of America). In this way, it will be possible to check whether the current rules on civil liability is functional to the protection of the party injured

because of a driverless car. In the affirmative case, then, it will see if civil liability rules are sufficient for the regulation of autonomous vehicles (possibly extensively interpreted or applicable by analogy), or whether it is necessary to modify the existing legislation or introduce an *ad hoc* framework of rules.

Assuming the perspective of Italian law as a starting point for the analysis of the phenomenon, we will start with a brief reconstruction of the Italian tort law and then move on to that of the other main legal systems of civil and of common law.

In Italy, the current rules governing non-contractual civil liability, indeed, can be arranged around written rules, general principles<sup>106</sup> and case law.<sup>107</sup> The written rules plan is made up of the Constitution (in particular articles 2, 3 and 32),<sup>108</sup> the Civil Code (articles 2043 and following) and the special laws (first of all, Private

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<sup>106</sup> As for the general principles, we are dealing with legal provisions of general content which express values to which other legal provisions, called rules are conformed. While the rules directly influence the behaviour or attribute regulatory powers, the general principles indirectly influence the behaviour, i.e. influencing the exercise of regulatory powers. Among the most important general principles in the field of civil liability, we must remember that of accountability, about the assumption of the consequences of one's own actions towards third parties and also towards oneself. In this field, other fundamental principle is the principle of 'neminem leadere', which contains in itself the provisions of Article 2043 of the Italian Civil Code regarding the obligation compensate damages, but also arises just as a general principle consisting in the prohibition of unlawful acts. See G Alpa, *La responsabilità civile. Principi* (Utet 2010), 37 ff..

<sup>107</sup> Finally, case law is characterized by a series of judgments to which Courts refer in deciding the specific case. In our legal system, unlike what happens in the common law system (which is founded on the well known 'stare decisis' principle), the case law is not binding. However, the judicial decisions taken are often used by other judges who at a later date find themselves having to decide similar cases. We refer in particular to cases of motor vehicle accidents (including those relating to new automations) in which most of the time the judges attribute responsibility to the driver, thus constituting precedents for judges who must then decide on similar cases. See *ibid*, 41 ff..

<sup>108</sup> The article 2 of the Italian Constitution, on the fundamental rights, which is usually applied in connection with article 3 of the Constitution which regulates the principle of equality in order to decide on the compensation for the biological damage suffered (a type of non-material damage). Article 32 of the Constitution, on the other hand, protects physical integrity, that is, health intended as an asset and, consequently, any injury to it must be compensated. An authoritative doctrine, dealing with the overall picture that has been outlined in the matter of non-material damage after the change of address of the Italian Supreme Court judgment no. 1361/2014 (which has established that, if the damage affects a person's right to constitutional relief, for itself it is a cause of compensation) believes that non-material damage returns to being, as in the past, the instrument to compensate for the infringement of non-pecuniary rights. See M Franzoni, 'Il danno risarcibile', in *Trattato della responsabilità civile*, II, (2<sup>nd</sup> edn, Giuffrè 2010); Italian Supreme Court, civil section III, judgment 23 January 2014, no. 1361, he recognized for the first time, explicitly, the right to compensation for the damage to life or the damage from death of the victim that is transmissible to his heirs.

insurance code and Consumer code).<sup>109</sup> With regard to the civil code - a source of law subordinated to the Constitution - article 2043, which is the basis for the codified extra-contractual civil liability of 1942, is very relevant. In particular, the provision of article 2043 identifies the basis of non-contractual liability in «any fault or negligent act, which causes unjust harm to others». Given the generality of the expression, the aforementioned provision is considered by the literature a general clause of the legal system, realized through the so-called 'atypicality' of the civil tort. In fact, it will be the Judge to decide whether (given the development of society, with its changing scales of values and needs) a given behaviour can be considered unlawful act, also verifying the existence of all the structural elements identified by article 2043.<sup>110</sup>

In fact, from the literal dictate of the rule, the fundamental elements emerge to give rise to extra-contractual liability are objective and subjective. The objective one are: unlawful act, unjust damage, causal link between the fact and the damage; instead, the subjective are the guilt of the agent (for intentional fault or misconduct) and the imputability of the tortfeasor (that means the lack of natural incapacity under article 2046 Italian Civil Code).

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<sup>109</sup> It is useful to highlight in this regard three important differences between the Civil Code and the special legislation of the Consumer Code elaborated by Professor Castronovo. Firstly, art 125 of the Consumer Code provides that the right to compensation for damages is prescribed in three years from the day on which the injured person was aware of the damage or the identity of the tortfeasor, or could have had it using the normal diligence; the civil code, on the other hand, provides for a five-year prescription period in the case of non-contractual civil liability (art 2947 Civil Code) and, in the case of contractual civil liability, the ordinary 10-year limitation period (art 2946 Civil Code). Secondly, art 126 of the Consumer code prohibits the bringing of a claim ten years after the product has been put into circulation; this is not provided in Civil Code. Finally, Consumer Code, in art 121, introduces a novelty with respect to the civil code (in particular art 2055 of the civil code) regarding the right of claims based on joint and several liability, because Consumer Code provides that action against the others who are jointly and severally obliged has to be exercised only in proportion to the size of the risk attributable to each one. C Castronovo, *La nuova responsabilità civile*, (3rd edn, Giuffrè 2006), 732

<sup>110</sup> When resorting to any legal requirement, it will always be up to the judge to quantify the amount of the compensation, given that the article 2059 of the Italian Civil Code legitimates the injured to claim compensation for the negative consequences, including non-patrimonial ones.

Civil liability, in the Italian legal system, has mainly a compensative function, prearranged to repair the damage done, in compliance with the duties of solidarity imposed by the Italian Constitution. The subject that today is at the centre of the liability regulation is the injured party, who deserves an appropriate balance of his position, taking into account, in particular, the actual extent of the damage suffered that have to be compensated. However, the current function of non-contractual liability is beginning to change. In fact, currently the function of civil liability can be not only compensative but also sanctioning, intended as punishment for the unlawful act of the tortfeasor and not mere reparation for the damage suffered by the damaged restoring the 'status quo ante'.

Furthermore, the Italian legislator contemplates, alongside the traditional responsibility based on the fault of the agent (as per Article 2043 of the Italian Civil Code), other types of civil liability. Therefore, there are, on the one hand and as opposed to the hypothesis of direct responsibility, hypotheses of indirect liability (e.g. vicarious liability),<sup>111</sup> whenever it is required to compensate who has not materially committed the offense and, on the other hand, a hypothesis of strict liability, when it is required to compensate those who do not has the fault of the

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<sup>111</sup> Vicarious liability is the responsibility of any third party that had the right, ability or duty to control the activities of someone else. A typical example is the liability of the employer for the acts of his employees. As he had achieved a return from employing individuals who contribute to the running of his business activity, he is also called to bear the costs of the damage that those persons produced to third parties when operating in his interest. As a matter of fact, the fault of selecting the given collaborator (i.e. the so-called 'culpa in eligendo'), which imply a direct liability is a thesis outdated. Another example of vicarious liability could be the liability of parents or teachers for the acts of children or students, which came from the social risk of the role they play. However, other part of the literature believes that parents' liability or teachers' liability is a type of direct liability, as they have to supervise (not at any time) and educate their children/students and so influence their behaviour (i.e. the so-called 'culpa in vigilando' or 'culpa in educando'). It is undoubtedly to be included in the category of vicarious liability, instead, the responsibility of the supervisor for damage caused by subject with lacking mental capacity, since it is not a legally responsible subject.

See F Bocchini, E Quadri, *Diritto privato* (n 31) 1308 ff.

harmful event (e.g. product liability).<sup>112</sup> Finally, the Italian legal system contemplates the hypotheses of so-called semi-objective liability in which there is an inversion of the burden of proof, for which the damaging person is presumed to be liable unless otherwise proven, but there is someone who brought about the harmful event, and this is the main distinction with the strict liability (e.g. driver liability pursuant to article 2054 of the Italian Civil Code which will be discussed in the next subsection).

About French legal system, civil liability is regulated by article 1240 and following of French Civil Code<sup>113</sup> and the function of tort law is mainly compensative.<sup>114</sup> The French legal system has implemented, the teachings of natural law (in Latin ‘ius naturale’ or ‘lex naturalis’) summarized in the general principle of ‘neminem laedere’,<sup>115</sup> i.e. the thought of authors such as Grotius, who was the first to state the principle that any harm (both contractual and non-contractual) must be compensated. This principle has been transposed to the Italian Civil Code, which it goes back to the French Code civil of 1804, with the only difference that in French any harm, not only unjust harm have to be compensated.

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<sup>112</sup> On product liability see the paragraph 3 but for now see Recinto G, Porcelli M, ‘La responsabilità per danno da prodotti difettosi’, Chapter 14, in Recinto G, Mezzasoma L., Cherti S. (ed), *Diritti e tutele dei consumatori* (ESI 2014); G Alpa, M Bin, P Cendon (eds.), ‘La responsabilità del produttore’, in F Galgano (ed) *Trattato di diritto commerciale e diritto pubblico dell’economia*, vol. XIII, (Cedam 1989), 56 ff; R Mazzon, *La responsabilità oggettiva e semioggettiva* (UTET 2012), 1063 ff..

<sup>113</sup> Art 1240, French Civil Code, L. 3 August 1803 (entered in force on 21 March 1804) as amended by art 2, Ordinance 10 February 2016, no 131. About the role of Napoleon in the French Civil Code and its main characters see B Portale, *Lezioni di diritto privato comparato* (2nd edn, Giappichelli 2011), 79 ff.

<sup>114</sup> V Zeno –Zencovich, ‘La responsabilità civile’, in G Alpa and others, *Diritto privato comparato. Istituti e problemi* (2nd edn, Editori Laterza 2016), 373 ff.

<sup>115</sup> The French liability system is based on fault. In the event that, however, there is no fault, the injured person can take action against an *ad hoc* patrimonial fund, incremented in part by the contribution of private bodies and individuals and, in other part, by public taxation.

While in Italy the offense is non-typical, but it is characterized by limited non-typicality, the French model opts for the maximum non-typicality of the unlawful act, innovating with respect to the Roman law.<sup>116</sup>

From the Roman law system, revisited by the Pandectists of 1800, derives the German Civil Code of 1896 (*Bürgerliches Gesetzbuch*, commonly known as BGB).<sup>117</sup> According to the German liability model, not the harm of any interest is sanctioned but only those acts that correspond to a specific case mentioned in article 823, par 1 BGB.<sup>118</sup> It means that in Germany the unlawful act is typical.<sup>119</sup> Also in German legal system, as in the others civil law systems, the main function of the liability is to repair the damage occurred.

Once the general overview of the civil law systems is concluded, attention must be focused (even briefly) on the common law legal systems (UK and USA).

In the United Kingdom, liability originates from the well known ‘action of trespass’. Originally, it was a criminal action indicating the unlawful interference with the other person or property. This action gives rise, towards the middle of the fourteenth century, to the ‘action of trespass on the case’,<sup>120</sup> of a civil nature with a

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<sup>116</sup> F Ferrari, ‘I contrapposti modelli francese e tedesco’, Galgano F (ed.), *Atlante di diritto privato comparato* (5th edn, Zanichelli 2011), 156 f.. represents the typicality and non-typicality of the unlawful act in a table which different colour, one for every level of typicality. In light blue is indicated the maximum non-typicality of the unlawful act which force to compensate every kind of damage committed with fault.

<sup>117</sup> German Civil Code of 1896. To in-depth German codification see B Portale, *Lezioni di diritto privato comparato* (n 114), 104 ff..

<sup>118</sup> The main criteria and requirements, according to the German law, are three: a) damage is unlawful, with the obligation of compensation, only what damages some of the rights of primary importance or contrasts with an imperative rule aimed at the protection of individuals; b) damage is unjust: the act or fact must be contrary to the law; c) there is the fault or the negligence of the tortfeasor. However, if the offense is based on fault and not only negligence and, moreover, is contrary to public order, the requirement of the typicality of the protected offense is ignored (Romanesque principle of the ‘*actio generalis doli*’, art. 826 BGB).

<sup>119</sup> The second paragraph of article 823, instead, is an exception of the typicality of the unlawful act. See V Zeno –Zencovich, ‘La responsabilità civile’ (n 115) 378 ff.; F Ferrari, ‘I contrapposti modelli francese e tedesco’ (n 108) 156 f.

<sup>120</sup> The action of trespass on the case was consolidated in the nineteenth century. See V Zeno – Zencovich, ‘La responsabilità civile’ (n 115) 381 ff.



compensatory function, for which the offended is obliged to prove, at least, the tortfeasor's fault and usually also the unjust damage.

Also the UK liability system is founded on the typicality of the unlawful act. More precisely, there are an intentional tort (i.e. assault, battery, false imprisonment, malicious prosecution, libel) and unintentional tort (tort of negligence). The tort of negligence is based on the following four requirements:<sup>121</sup> duty of care, breach of the duty of care, damage and remoteness of the damage. The duty of care<sup>122</sup> occurs in case of the violation of an obligation by a commissive act or a failure to act, and only if the damage is predictable (so-called 'foreseeability'); in this sense, the predictability of the damage aims to perimeter the area of compensable damage. Furthermore, the breach of the duty of care<sup>123</sup> occurs only when the tortfeasor fails to comply with the standard of care (considering his behaviour as that of a reasonable man, in Latin 'bonus pater familiae').<sup>124</sup> The failure to comply with mandatory behavioural criteria determines the existence of the offense ('res ipsa loquitur'); it means that unless otherwise proven, the failure to comply with the standard of care is presumed. In fact, except for the express wish of the legislator, civil liability in UK is not based on the violation of a statute but on case-law.<sup>125</sup>

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<sup>121</sup> In *Donoghue v Stevenson* [1932] UKHL 100 [1932] AC 562 the duty of care and the breach of care coincide. It means that there is a tripartition of the requirements instead of a quadripartition. About the constitutive elements of the tort of negligence see Galgano F (ed.), *Atlante di diritto privato comparato* (5th edn, Zanichelli 2011), 166 ff..

<sup>122</sup> C Reed, E Kennedy, SN Silva, 'Responsibility, Autonomy and Accountability: legal liability for machine learning (n 45) 7.

<sup>123</sup> Ibid. 8.

<sup>124</sup> It refers only to the statutes and the judge in the specific case must assess whether the standard of care has been respected (Judicial self-restraint).

<sup>125</sup> B Portale, *Lezioni di diritto privato comparato* (n 114), 63 ff., analyses the principle of 'stare decisis' the first difference between common law and civil law systems.

A fundamental difference with the Italian legal system is that the UK law of damage is applicable to both contractual and non-contractual liability. Moreover, unlike the continental systems, the Anglo-Saxon model does not distinguish between objective and subjective elements.

Finally, the USA legal system is the other well known common-law system. The primary purpose of USA tort law is to compensate individuals or entities that suffer personal or property damage because of another's wrongful conduct. The specific causes of actions comprising tort law in the USA are too numerous to list, but they include, as main examples, liability arising out of: intentional misconduct; unreasonable conduct; defects in the design, manufacturing, or marketing of products sold (product liability); and one's relationship to the tortfeasor.

The biggest difference between the USA liability system and the other one resides in the function of the tort law. Indeed, the USA compensation aims to sanction the tortfeasor for the damage caused.<sup>126</sup> Based on US experience, in Italy, the civil liability function is changing. Indeed, currently in the Italian legal system is admitted also a sanctioning function for damages deriving from an unlawful act, in addition to the compensatory one. This happened as an effect of the Italian Supreme Court Judgment no. 1660/2017, which admitted the so-called 'punitive damages' in Italy in the context of the exequatur of foreign judgments.<sup>127</sup>

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<sup>126</sup> V Zeno – Zencovich, 'La responsabilità civile' (n 115) 388.

<sup>127</sup> The exequatur is the judicial procedure that serves to recognize, in a given country, a provision issued by the judicial authority of another country. Several Author have analysed the Italian Supreme Court, United sections, Judgment, 5 July 2017, no. 16601. TO in-depth the punitive damages see F Benatti, 'I Danni punitivi nel panorama attuale' [2017] Giust civ 1 ff.; N Brutti, 'Oltre i punitive damages: rilievi su una funzione "espressiva" del rimedio' (2017) 3 Contr e Impr 840 ff.; M Grondona, 'Il problema dei danni punitivi e la funzione degli istituti giuridici, ovvero: il giurista e la politica del diritto' [2017] Giust civ. 1 ff.; B Siciliano, 'Le sezioni unite aprono la strada al riconoscimento in italia di sentenze straniere che contengano risarcimenti punitivi' (2017) 118 Dir. & giust. 7 ff.; C De Menech, 'Verso il riconoscimento dei danni punitivi?' (2017) 6 Juscivile 608 ff.; C De Menech, 'Il problema della riconoscibilità di sentenze comminatorie di punitive damages: alcuni spunti ricostruttivi' (2016) 6 Riv dir civ 1644 ff.; C Scognamiglio, 'I danni punitivi e le funzioni della responsabilità civile' (2016) 7 Corriere Giur. 909 ff.; PG Monateri, 'I danni punitivi al vaglio delle

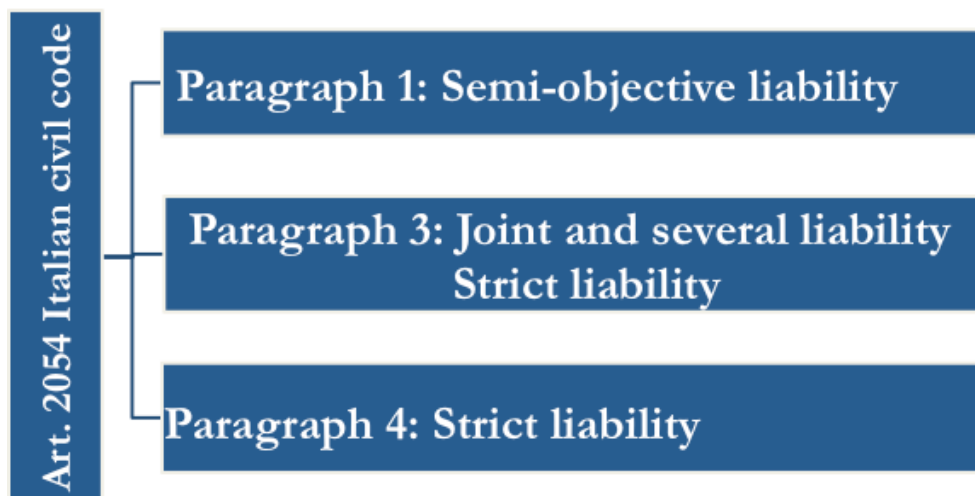
## **1.2. The tortfeasor in the road vehicle accident under article 2054 of the Italian Civil Code and the other main national regulations in the European and American legal systems.**

The new damage scenarios testify to the progressive transformation of the rules of responsibility. In this scenario is placed the article 2054 of the Italian civil code, which is the basic provision for non-contractual civil liability for damages resulting from road traffic. However, one wonders if this disposition is sufficient to regulate the new cases of civil liability in light of the rapid development of on-board vehicle technology. For this reason, it is necessary a brief *de iure condendo* analysis of the Italian legislation on motor vehicle liability starting from the driver's liability regulated by 2054 as outlined below in the figure no. 2.

### **Figure no. 2 – Driver's liability in the Italian legal systems (article 2054, Italian Civil Code)**

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sezioni unite' [2017] (1) Il Foro It 2648 ff.; M Schirripa, 'I Danni punitivi nel panorama internazionale e nella situazione italiana: verso il loro riconoscimento?' [2017] Comparazione diritto civile 1 ff.; PG Monateri, G Ponzanelli, 'La delibabilità delle sentenze straniere comminatorie di danni punitivi finalmente al vaglio delle Sezioni Unite' (2016) 8-9 Danno e resp. 827 ff.; A Nervi, 'Danni punitivi e controllo sulla circolazione della ricchezza' (2016) 1 Res. civ. e prev. 323 ff.; GE Lucchini, 'La compatibilità dei danni punitivi con l'ordine pubblico alla luce della funzione sanzionatoria di alcune disposizioni normative processualcivilistiche' (2016) 5 Resp. civ. e prev. 1474 ff.; C Granelli, 'In tema di «danni punitivi»' (2014) 6 Resp. civ. e prev. 1 ff.; G Ponzanelli, 'I danni punitivi sempre più controllati: la decisione Philip Morris della Corte suprema americana' [2008] (4) Foro It. 179 ff.; E D'Alessandro, 'Pronunce americane di condanna al pagamento dei punitive damages e problemi di riconoscimento in Italia' (2007) 1 Riv dir civ 383 ff.; P Fava, 'Punitive damages e ordine pubblico: la cassazione blocca lo sbarco' (2007) 4 Corr giur 498 ff.; G Carbone, "'Punitive Damages" all'italiana' (1992) 4 Corriere giur 416 ff.; MS Romano, 'Danni punitive ed eccesso di deterrenza: gli (incerti) argini costituzionali' [1990] (4) Foro It 175 ff.; V Zeno-Zencovic, 'Il problema della pena privata nell'ordinamento giuridico italiano: un approccio comparatistico ai punitive damages di common law' [1985] (4) Giur. it 12 ff.; G Ponzanelli, 'I punitive damages nell'esperienza nord americana' (1983) 1 Riv. dir. civ. 435 ff.



Paragraph 1 of article 2054 of the Italian Civil Code establishes that the driver is responsible for the damage caused by the movement of the vehicle without a rail guide, unless he proves that he has done everything in his power to prevent the occurrence of the same.<sup>128</sup> This is a particular type of civil liability, so-called semi-objective liability, which provides for an inversion of the burden of proof with respect to the ordinary regime of non-contractual civil liability established by Article 2697 of the Italian Civil Code. In fact, pursuant to article 2054, paragraph 1, it is a task of the damaging proving that he has done everything possible to avoid the damage.<sup>129</sup>

It should be noted that the burden of proof of the driver having acted diligently is valid only for damages caused to things or third parties unrelated to road traffic, however, in the case of collision between two or more vehicles (article 2054, paragraph 2, Italian Civil Code)<sup>130</sup> Therefore, in this case, the driver must prove

<sup>128</sup> G Buffone (ed.), *Responsabilità civile automobilistica* (n 8) 95, ss.

<sup>129</sup> CM Bianca 'La responsabilità', in *Diritto civile*, V (2nd edn, Giuffrè 2012) 256 ss..

<sup>130</sup> It is emphasized that the Italian Constitutional Court, with sentence n 205/1972, declared the constitutional illegitimacy of para 2 of art 2054 of Italian Civil Code, limited to the part where it excludes that the presumption of equal competition of drivers operates even if one of the vehicles has not reported damage.

the fault of the other driver or of the other drivers.<sup>131</sup> Moreover, in order to overcome the presumption of equal co-responsibility, it is also necessary to provide proof of the unpredictability of the conduct of the other driver.<sup>132</sup>

Regarding the special responsibility of the driver, it is first necessary to define his role. An authoritative doctrine<sup>133</sup> considers the driver who physically controls the vehicle at the time of the occurrence of the damage. To have control means to have the controls of the vehicle, even if at the moment when the damage occurred they were not used; therefore the driver will answer for damages caused by the vehicle even if this has been, for example, parked without handbrake on a sloping road or has been parked in the middle of a roadway.<sup>134</sup> On the contrary, it is no longer considered as a driver who has given the commands to others, even if temporarily and under his control. Between the case in which the vehicle is considered under the control of the driver and the one in which it is not under driver control, there is the case of semi-autonomous cars where there is a driver driving the vehicle, but control is can be exercised by an ADAS that replaces in whole or in part to the driver, carrying out more or less important tasks depending on which it can also be limited or excluded the liability of the driver.<sup>135</sup> In the case of completely autonomous vehicles,<sup>136</sup> however, it seems logical to compare the person transported by the vehicle to a passenger of a train or an airplane: as for the

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<sup>131</sup> G Buffone (ed.), 'Dinamica del sinistro stradale e responsabilità civile', in *Circolazione stradale. Danni e responsabilità I* (Cedam 2012)56 ss.

<sup>132</sup> Italian Supreme Court, section III, Judgment, 14 October 2015, no 20618.

<sup>133</sup> D MÁ Dios De Dios, 'Inérvalo o distancia de seguridad entre vehículos y colisión por alcance' [2013] Noticias Jurídicas, 6.

<sup>134</sup> Italian Supreme Court, section III, Judgment, 13 January 2015, no. 281.

<sup>135</sup> A Bertolini, 'Robots as Products: The Case for a Realistic Analysis of Robotic Applications and Liability Rules' (n 12), 277 ff.

<sup>136</sup> Ibid 235 ss. specifies that even fully autonomous vehicles are object and not subject of law. Precisely these are products created by the work of man in order to satisfy certain human needs and, therefore, in the event of a defect, the responsibility would be attributed to the producer of the same.

passenger of the train or plane there is no liability in case of an accident, so the passenger of the driverless car will not be held liable in the event of a claim.<sup>137</sup>

Define within which area the liability of the driver can be circumscribed and beyond which limit the liability switch to the automatic system (and therefore on the producer of the same system) it is not a small matter.

It should also be considered, pursuant to Article 2054, paragraph 3 of the Italian Civil Code, the joint and several liability with the driver of the owner of the vehicle, or, in his stead, of the ‘usufructuary’ (that in the common law systems does not exist) or purchaser with the agreement for retention of title, unless they give proof that the circulation took place against their will. This is a joint liability, strict and indirect of the owner and on the other subjects abovementioned until proven otherwise. In fact, these subjects respond not by virtue of a negligent behaviour, but on the basis of a legal imputation of a wrongdoing committed by others. The ‘ratio’ of this kind of liability of such subjects must be recognized in the fact that the damage depends on the circulation of the vehicle, which it falls within the sphere of freedom of action of the owner and of the other mentioned subjects who, moreover, are those who can bear the economic loss of the road accident. Anyways, the driver, the owner, and the other subjects similar to him, have a right of recourse against the producer if the vehicle accident depended on a vehicle defect.

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<sup>137</sup> A Bertolini, E Palmerini, ‘Regulating robotics: A challenge for Europe’ (n 46) 112 ff., they clarify that the problem of liability in road traffic is perhaps the most relevant issue in relation to driverless cars, as it could have a strong technology-chilling effect, delaying their placing on the market. The authors point out that a series of factors must be taken into consideration that affect the choice of the person to whom responsibility should be assigned, such as road traffic regulations, other vehicles on the road, pedestrians and, in general, all that has to do with the complex environment in which the vehicle circulates. Therefore, while it is conceivable the responsibility of the producer once the technology is so advanced as to arrive at the commercialization of completely autonomous vehicles, before reaching this level of development it is not conceivable to assign the liability to the producer in an exclusive way, as the development of these technologies would be discouraged; during this transition phase, which is characterized by semi-autonomous vehicles, it is necessary to share responsibility between the driver and the producer on the basis of safety standards.

Also for the owner and the other subjects similar to him will not be held liable if the circulation of the vehicle took into account their will (article 2054, paragraph 3, of the Italian Civil Code). According to the prevailing Italian jurisprudence, this circumstance would occur only in the case in which these subjects have concretely adopted the appropriate protections aimed at preventing the use of the vehicle by others. In practice, the owner or the other subjects who take his place can not just providing proof that the vehicle has circulated without their consent (without 'invito domino'), but must be able to demonstrate that the circulation took place against their will ('prohibente domino'), which must be expressed in a concrete behaviour specifically designed to prohibit and prevent the circulation of the vehicle.<sup>138</sup>

Another hypothesis of strict responsibility is shown in paragraph 4 of the same article 2054 which provides, in fact, the objective responsibility of the driver and of the other persons indicated in the same article, in case of construction defect or maintenance defect.<sup>139</sup> The legislator defines a boundary within which the objective liability of the driver characterized by the risk can be identified,<sup>140</sup> outside of this perimeter, the principle of presumed guilt operates. The Italian Supreme Cassation has shown that the strict liability of the driver and of the owner (as well as of the other mentioned subjects) competes with the product liability determining, according to article 2055 of Italian Civil Code (even if the sources of

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<sup>138</sup> G Buffone (ed.), 'Dinamica del sinistro stradale e responsabilità civile' (n 131) 57; G Calabresi, *Costo degli incidenti e responsabilità civile Analisi economico-giuridica*, (2nd edn, Giuffrè 2015), 43; G Buffone (ed.), *Responsabilità civile automobilistica* (n. 8), 142.

<sup>139</sup> The Italian Supreme Court, not distinguishing between maintenance defect and construction defect, qualifies the liability that derives from it in terms of strict liability, while admitting that the causal link between the defect of construction or the lack of maintenance, on the one hand, and the unjust damage, on the other hand, can be interrupted if an external factor occurs that involves the occurrence of the damage (Italian Supreme Court, Judgment, 9 March 2004, no. 4754). For more information see FD Busnelli, S Patti, *Danno e responsabilità civile* (3rd edn, Giappichelli 2013).159 ss.,

<sup>140</sup> In this sense Italian Supreme Court, section III, Judgment, 29 April 2006, no. 10031.

liability are different)<sup>141</sup>. With regard to the burden of proof, the Supreme Court has made it clear that it is task of the damaged party, the burden of proving the existence of the construction defect or maintenance defect and the related causal link with the damaging event, while the driver and the owner to get free must prove that the damage was due to a different cause from those listed in the last paragraph of the article 2054.<sup>142</sup>

Notwithstanding the provisions of article 2054, the perspective that interests us most here is that of the damages caused by the defects of the electronic devices of the vehicle and paragraph 4 regulates only a minimal part of this case. Concretely, the rule leaves in the shadows the problem of damage suffered by the driver himself due to a defect that can be as much of construction as design or even information defect. In such cases, a liability of the producer of the defective device should be established.<sup>143</sup> On the contrary, in the opposite hypothesis, namely that of the damages caused by the drive to third parties, due to a defect of the on-board technology, a joint liability of the driver with the producer should be configured, in the case of semi-autonomous vehicle (if the driver should have avoid the damage using a normal diligence), and an exclusive liability of the producer where the vehicle was completely autonomous.

A specific regulation of non-contractual civil liability from road traffic is also foreseen in the other legal systems already mentioned and analysed in the previous

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<sup>141</sup> Italian Supreme Court, section III, Judgment, 9 March 2004, no. 4754; Italian Supreme Court, section III, 6 August 2004, Judgment, no. 15179; U Carnevali, *La responsabilità del produttore* (Giuffrè 1974), 42, specifies that, although the prediction of the responsibility of the driver, the owner, and of the other subject mentioned in the third paragraph of the article 2054 has the purpose of facilitating the injured in obtaining compensation, it is not possible to exclude any liability of the producer for vehicle defects..

<sup>142</sup> Italian Supreme Court, section III, Judgment, 19 February 1981, no. 1019.

<sup>143</sup> E Al Mureden, 'Sicurezza "ragionevole" degli autoveicoli e responsabilità del produttore nell'ordinamento giuridico italiano e negli Stati Uniti' (2012) 6 Contr. impr. 1506 ff.



subsection, with particular regard to the main elements and the function (*ratio legis*). More precisely, in Germany there is the Road Traffic Act (RTA),<sup>144</sup> in France, on the other hand, this form of responsibility is regulated in the French Road Code,<sup>145</sup> in the UK there is no organic regulation of road traffic but there are many normative texts of reference<sup>146</sup> and, finally, in the USA there are the Federal Motor Vehicle Safety Standards (FMVSS)<sup>147</sup>

These disciplines reflect the principles and the *ratio* already described, but what is relevant for identifying the tortfeasor in the event of an accident caused by an autonomous vehicle is that in Europe only Germany has modified the road traffic regulations, explicitly providing autonomous vehicles. The United Kingdom, at the same time, has drawn up a draft law on automation<sup>148</sup> which however has not been approved and than the Automated and Electric Vehicles Act of 2018<sup>149</sup> which is currently in force. In the USA, instead, today are more than thirty the State which have introduced a legislation for autonomous vehicles.<sup>150</sup>

In the next section we will analyse the German legislation and the UK law (*see* this chapter, subsection 2.1. e 2.2.) and then we will move on to different European legislation and initiatives (*see* this chapter, subsection 2.3.) in order to verify whether the driver's liability rules provided in each Member states are sufficient to

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<sup>144</sup> German Road Traffic Act, 3 May 1909.

<sup>145</sup> French Road Code, Ordonnance 22 September 2000, no 930, OJ 222.

<sup>146</sup> Road Traffic Act 1988; Road Traffic Regulation Act 1984; Road Traffic Offenders Act 1988; Traffic Signs Regulations and General Directions (SRGD) 1965; Highway Code 1931

<sup>147</sup> Federal Motor Vehicle Safety Standards (FMVSS), currently codified at Title 49 (Part 571) of the United States Code of Federal Regulations (CFR) 1967.

<sup>148</sup> Vehicle Technology and Aviation HC Bill (2016-17) [143].

<sup>149</sup> Automated and Electric Vehicles Act f 2018.

<sup>150</sup> The National Conference of State Legislatures (NCSL) works to keep real-time information about autonomous vehicle legislations and bills that have been introduced in USA. See the link at the NCSL autonomous vehicle legislations database: <http://www.ncsl.org/research/transportation/autonomous-vehicles-legislative-database.aspx> (accessed 5 October 2018).

protect the new interests at stake or it would be appropriate to provide other (perhaps new) civil liability rules at European level that better protect the interests of the parties involved.

## **2. The self-driving car ingoing in this scenario: the choice between traditional liability rules and other body of rules such as product liability.**

### **2.1. German legal system: The amendment of German Road Traffic Act.**

In 2017 the Upper House of the German Federal Parliament ('Bundesrat') approved the bill on autonomous driving which amended the Road Traffic Act (RTA). The framework of rules set legal requirements for automated driving and has been studied for an intermediate automation level.

The revised Road Traffic Act (RTA), in German *Straßenverkehrsgesetz* (StVG), does not follow the SAE standard J301, although it is commonly used in the international context. The reason is that the German Federal Highway Research Institute (in German *Bundesanstalt für Strassenwesen* abbreviated in 'BASt')<sup>151</sup> decided to adopt BASt Label levels of automation, which in part are different from those of SAE standard J3016 (*see* chapter II, subsection 1.1). BASt Label levels of automation are: 'Driver only' (L0), 'Assisted' (L1), 'Partially automated' (L2), 'Highly automated' (L3), 'Fully automated' (L4) and 'Driverless' (L5).

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<sup>151</sup> BASt is a technical-scientific research institute of the Federal Ministry of Transport and Digital Infrastructure. For more details *see* [www.bast.de](http://www.bast.de).

The amended RTA regulates road traffic up to L3 and L4 of automation. As already said (and for BAST Label levels of automation is the same) in L3 of automation the driver does not need to monitor the vehicle's driving task but he should be able to resume the control if there is a danger that the autonomous driving cannot face. L4 of automation follow the same division of driving tasks between the driving system and the driver, but the driver has to intervene only in anomalous cases.

First of all in the RTA is introduced, in paragraph 1 (2), the definition of vehicles high or totally automated to which the law is intended to regulate. They are all vehicles that are able to control, at the moment of activation of the driving system, all (or the main) vehicles functions related to vehicle's driving. Furthermore, it is states that the vehicle equipment must allow manual activation of the automated driving system by the driver, i.e. hand-hover system (para 1 (2), no 3 - 6 RTA).

The RTA states that the driver remains legally in control of the vehicle, even when L3 or L4 of automation is engaged. However, with those automation levels, the driver is free to turn away from the traffic environment and vehicle control, provided he maintain a sufficient level of alertness so that he can resume control before the system goes beyond its performance limits (Paragraph 1b RTA). All cars with L3 and L4 of automation will be fitted with a black box that will record the data of each journey (par 63a RTA). In the event of an accident, the data will be used to established who is liable.<sup>152</sup>

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<sup>152</sup> This generates the issues of the unlawful processing of personal data. Indeed, under art 6 GDPR, the processing of personal data must be carry out in compliance with one of the lawful basis for the processing listed in the same article and it should be verified if this kind of processing respect one of the legal bases. Other similar case is that of eCall, electronic device installed on the vehicle, which provides a free public service that can automatically make an emergency call to alert emergency services in the event of a traffic accident. It is clear that the eCall, as mandatory service provided by art 4 of the Reg (UE) 758/2015, carries out a processing of personal data without user's consent.

The law will be reviewed in or after 2019 in order to keep up with any technological changes, as well as to allow for a possible rethink of the liability rules. Currently, the Paragraph 7 of the German RTA provides strict liability on the keeper of the vehicle (i.e. the owner or the lessee) unless he can prove that the vehicle accident was caused by force majeure. In addition to owner's strict liability, is established the driver's liability on the basis of a presumption of fault (driver, in semi-autonomous mode, is who is able to activate and deactivate the autonomous driving mode).<sup>153</sup> However, in the next years, strict liability could be extended to the producer of vehicles equipped with L3 and L4 as the Upper House of the German Parliament hypothesized.<sup>154</sup>

The German law has been the first in Europe to provide a set of rules for the use of automated vehicles, even though just amending the existent legislation on road traffic and without modifying the criteria of the allocation of liability between the driver and the owner in the event of a road accident. This choice leaves a little dissatisfied, considering that the owner of the vehicle is playing the role of

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However, data subject's protection is represented by the fact that the data is used for the sole purpose of dealing with emergency situations and the call made only provides the minimum information for the rescue (such as the type of vehicle, the fuel used, the time of the accident, the exact localisation and the number of passengers on-board) which are deleted as soon as they are no longer needed (Art 6, Reg (UE) 758/2015). Furthermore, according to art 6, para I, lett. d of GDPR, the processing of personal data is lawful, even without the data subject's consent, when processing is necessary in order to protect the vital interests of the data subject or of another natural person, among which security may be included. Finally, it should be noted that data will not be disclosed to third parties without the consent of the data subject, and detailed technical regulation (including the so-called privacy by design) will prevent the exchange of personal data between the eCall system and third parties. Regulation 758/2015/EU of the European parliament and of the Council of 29 April 2015 concerning type-approval requirements for the deployment of the eCall in vehicle system based on the 112 service and amending directive 2007/46/EC [2015] OJ L123. In contrast *see* Art 29 WP, Working document of 26 September 2006 on data protection and privacy implications in eCall initiative [2006] 5 ff., where the Art 29 WP, took into consideration two options for implementation of eCall (voluntary service or mandatory service) and the first option does evoked consent to the processing of user personal data for a eCall service.

<sup>153</sup> Par 12 RTA, on the other hand, specifies the threshold for compensation, which has increased due to the fact that there is almost a total absence of data relating to accidents caused by self-driving cars. More precisely, is provided a threshold of 10 million euro for damages to persons and 2 million for damage to property.

<sup>154</sup> MN Schubert, *Autonomous Cars, Initial Thoughts About Reforming the Liability Regime* [2015] GenRe Study 4 f..

‘scapegoat’ in case of malfunction of a system on which he does not have any influence.<sup>155</sup>

## **2.2. The other legal systems in Europe with specific reference to United Kingdom Automated and Electric Vehicles Act of 2018.**

As already highlighted, at European level only in the German legal system there is a regulation for driverless car accidents, even though not satisfactory at all. In Italy and in France, otherwise, there was no legislative intervention in order to regulate autonomous vehicles or at least the liability profiles related to them. The United Kingdom, instead, has drawn up a draft law on vehicle technology and aviation, which arrived in March 2017 at the Debate Committee at the House of Commons. However, the approval procedure of the proposed law was interrupted due to the dissolution of the parliamentary chambers on May 3, 2017. Subsequently, a new Automated and Electric Vehicles Act of 2018, with the same structure and principles of the previous bill, has been proposed as Bill and, following agreement by both Houses received Royal Assent on 19 July 2018, is now an Act of Parliament. It is an interesting regulation that needs to be briefly analysed below.

The UK Automated and Electric Vehicles would seem to appeal to the insurer’s liability or the owner’s liability in the event of a self-driving car accident. As a matter of fact, the Act provides the civil liability to the insurance company or to the vehicle owner in the event of a car accident while the vehicle is ‘driving itself’. More precisely, the section 2 states (perhaps improperly) to the liability of the

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<sup>155</sup> A Davola, R Pardolesi, ‘In viaggio col robot: verso nuovi orizzonti della r.c. auto (“driverless”)?’ (n 12) 622 f..

insurance company, probably considering that the damages are compensated by the insurance company, in the hypothesis in which the accident was brought about by autonomous vehicle causing damage to third parties and of course the vehicle was assured at the time of the event (so the owner of the vehicle is also the 'holder' of the car policy) (section 2(1)). Otherwise, in the hypothesis in which the driverless car was not assured, the owner is responsible (section 2 (2)).

Furthermore, Section 3 regulates the contest of the contributory negligence of the injured party or of the driver with the insurer/owner of the vehicle. In the first case (contributory negligence of the injured with the insurer/owner), if the behaviour of the injured has contributed to the occurrence of the accident, the amount of the compensation is reduced under the Law reform Act 1945. In the second case (contributory negligence of the driver with the insurer/owner), on the contrary, the insurer or the owner of the vehicle are not liable, if the driver has negligently allowed the activation of the autonomous driving system 'when it was not appropriate to do so'.

Section 4, then, provides expressly two cases of exclusion of liability for the insurance company: (a) in the case of alteration of the vehicle operating system carried out directly by the insured party or when he was in any case aware, or (b) if the driving software has not been updated by the insured person who was responsible for providing it.

Finally, under the section 5, in the event that the accident was produced by a third party, both the insurer and the owner of the vehicle have the right to claim against the third party responsible for the accident.

Even the UK legislator seems to keep the owner's liability of the vehicle, if the vehicle is uninsured, according with the logic of the 'deep pocket', if he does not

comply with the obligation to ensure the vehicle or act diligently ensuring the correct operation of the vehicle. In this sense, the perplexities previously raised regarding the German regulation are again proposed. On the one hand, because it does not provide the driver with incentives for diligent behaviour and on the other hand, it does not positively affect the reliability of automated driving technologies, given that the risk is not borne by the one who is responsible for the design and functioning of the driving software.<sup>156</sup>

### **2.3. European Union initiatives in the field of Robotics and AI, including autonomous vehicles.**

The question of the immutability of the damage coming from road traffic it is not easy to solve, as we are trying to show. Furthermore, there is not a specific regulation for Robotics and AI, even though this topic is the object of many legislative initiatives. At national level we have already analysed the German and the United Kingdom legislation. About the European Context we have seen the European Parliament resolution of 2017, which call on the Commission to submit a directive proposal for civil law rules on robotics and AI.<sup>157</sup>

The EU Parliament resolution underlines that the definition of autonomous transport include every kind of remotely, automated and connected road transport, although the vehicles are the sector that urgent need of efficient European and

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<sup>156</sup> A Davola, R Pardolesi, 'In viaggio col robot: verso nuovi orizzonti della r.c. auto ("driverless")?' (n 12) 621 f. , underline how the normative proposal was born already old as it provide only the role of the driver and not also that of the passenger, as with the achievement of the completely autonomous driving it will no longer be possible to speak of a driver. On the on the transition from the role of the driver to that of the passenger *see* MC Gaeta, 'Automazione e responsabilità civile automobilistica' (n 12) 169.

<sup>157</sup> The Resolution of the European Parliament was inspired also and above all by the Robolaw Project. See E Palmerini and others, 'Guidelines on Regulating Robotics' (n 12) 43 ; N Busto, 'Carta europea sulla robotica: una proposta di roboethics per le self-driving car (n 54).

International regulation to ensure cross-border (and lawful) development of driverless cars.<sup>158</sup> The Parliament specifies that is crucial to regulate security and liability issue and so ask to the stakeholders to provide realistic about this aspects.<sup>159</sup> Regarding to liability rules, EU Parliament calls on the Commission consider all possible legal solutions, without inclining for one of them.<sup>160</sup> Below we report these legal solutions, applying them to autonomous vehicles that are one of the categories of robots which the EU Parliament is responsible for.

The first one hypothesizes a compulsory insurance (similarly to what already happens with vehicles insurance) for with producer or owner of the driverless car would be required to take out insurance that cover for the damage caused by their vehicle (Legal solution A). Furthermore, is imagined the possibility to create a compensation fund in order to guarantee compensation if the damage caused by the vehicle was not covered by insurance but not only for that (Legal solution B). Than a limited liability is provided for producers, programmers, and owners or the user (depending on who is identified as tortfeasor) if they contribute to the compensation fund or if they jointly (but also separately whether will be establish that only one of them is liable)<sup>161</sup> take out insurance to guarantee compensation where damage is caused by their self-driving car (Legal solution C). The next legal

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<sup>158</sup> EU Parliament Resolution of 2017, rec 24.

<sup>159</sup> About the aspect in which self-driving cars will have a strong impact, EU Palriament lists: «[...] civil responsibility (liability and insurance), road safety, all topics related to environment (e.g. energy efficiency, use of renewable technologies and energy sources), issues related to data (e.g. access to data, protection of data, privacy and sharing of data), issues related to ICT infrastructure (e.g. high density of efficient and reliable communication) and employment (e.g. creation and losses of jobs, training of heavy goods vehicles drivers for the use of automated vehicles) [...] ». EU Parliament Resolution of 2017, rec 26 and 27.

<sup>160</sup> EU PARliament Resolution of 2017, n. 59, and Annex to the Resolution.

<sup>161</sup> In fact, in the annex to the resolution, EU Parliament introduces the hypothesis that it is the producer, and therefore only one of the possible liable subjects, who has to take out an insurance policy. Precisely it is said: «An obligatory insurance scheme, which could be based on the obligation of the producer to take out insurance for the autonomous robots it produces, should be established». EU Parliament Resolution, annex to the resolution.



solution is closely linked with the previous because, it require to decide whether to create a general fund for all smart autonomous robots or an individual fund for each robot category (autonomous vehicle should be one of them), and whether the contribution should be paid as a one-off fee, when placing the robot on the market, or periodically during the lifetime of the robot (Legal solution D). Finally the last two legal solutions are related because the solution E provide a registration number appearing in a specific Union register, which would allow anyone interacting with the robot to be informed about its relevant details,<sup>162</sup> ensuring that the link between the vehicle and its fund; the solution 'F' ask for a specific legal status for robots (so- called electronic persons) in the long run, so that at least the most autonomous vehicles could be held liable e for making damages<sup>163</sup>. Finally, EU Parliament highlight the need for a suitable instrument for consumers who wish to collectively claim compensation for damages deriving from the malfunction of a driverless car from the manufacturing companies responsible for that (Legal solution G).

Other EU initiative is the European Commission communication on Artificial Intelligence for Europe of 2018. EU Commission highlights the importance of AI saying that AI is undoubtedly one of the most strategic technologies of our century and the way we will approach AI will define the world we live in.

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<sup>162</sup> In particular the interested party would be aware of « the nature of the fund, the limits of its liability in case of damage to property, the names and the functions of the contributors and all other relevant details». EU Parliament Resolution of 2017, rec 59, E.

<sup>163</sup> In any case it is premature to talk about robots as subject of law, as they are still object. In this sense *see* A Bertolini, 'Robots as Products: The Case for a Realistic Analysis of Robotic Applications and Liability Rules' (n 12) 235: «It has been shown that so long as robots do not achieve self consciousness they cannot be deemed moral agents or autonomous - in a strong sense - beings. Short of that capacity there is no logical, moral or philosophical - and thus not even legal - necessity to consider them subjects of law and bestow individual rights on them. Therefore, all existing robots up to that point are to be deemed objects - more precisely, artefacts created by human design and labour, for the purpose of serving identifiable human needs, otherwise known as products». On the controversial issue of robots' personhood see L Gatt, IA Caggiano, MC Gaeta, 'Italian Tort Law and Self-Driving Cars: State of the Art and Open Issues' (n 14) 30.

Anyways, about driverless car, there is not a regulation, but only initiative that need to be concretized. In this scenario, it is discussed whether it is possible to apply to self-driving cars traditional liability rules or other body of rules such as product liability. In particular, EU Parliament, made reference to the product liability, regulated by Directive 85/374/CEE, and it is trying to verify if it can be applied (extensively or by legal analogy) to driverless cars accidents. Indeed, it is about checking whether, according to the current product liability framework, where the producer is liable for a malfunction of his product, and rules governing liability for harmful actions, where the user of a product is liable for a behaviour that leads to harm, are applicable to damages caused by robots or AI.<sup>164</sup> Anyways PLD and its possible application to self-driving cars will be in-depth in the next chapter (*see* chapter IV).

### **3. Legal analysis of car insurance law under a comparative point of view.**

#### **3.1. The possible car insurance schemes: third part insurance and first party insurance.**

Insurance law models can be divided into two main schemes, to which, as has been authoritatively observed,<sup>165</sup> we can refer, even for driverless vehicles. But let's proceed with order.

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<sup>164</sup> EU Parliament resolution, rec AE.

<sup>165</sup> A Bertolini, E Palmerini, 'Regulating robotics: A challenge for Europe' (n 46) 113 f..

In this section we will analyse both insurance schemes, focusing, then, on the Italian one that is based on the third party insurance scheme.

In the third party insurance, liability insurance purchased by an insured (the first party) from an insurer (the second party) for protection against the claims of another (the third party). The first party is responsible for its own damages or losses whether caused by itself or the third party. Therefore, the insurance company of the owner of the vehicle (traditional or autonomous), in the event of an accident, should bear the economic consequences of any damage to property or persons due to the accident. In this case it is clear that the obligation to purchase an insurance contract is of the owner of the vehicle, who must ensure his vehicle from any damage caused by the road circulation, both in case the accident is caused by a human error, both in the case the accident is due to the malfunction of the vehicle or a device. In this second case, the insurance company, then, can claim against the producer by proving its responsibility.<sup>166</sup>

In the second type of insurance, instead, fall the first-party insurance or no-fault scheme, which have the same insurance scheme. In the first-party insurance (or no-fault scheme), the victim of the accident may ask compensation for damages caused directly to his insurer or to an *ad hoc* fund, proving that he or she has suffered damage resulting from the circulation of the vehicle (manual or autonomous driving).

In the first-party insurance the policyholder does not bother to provide cover for the non-pecuniary damage because it would not affect the income capacity of the injured party, and this implies that it has lower cost than the third party insurance.

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<sup>166</sup> This model has been criticised by Guido Calabresi, with specific regard to road traffic, as it would be more burdensome for the poor and the elderly and young people who, if they were insured with a first party system, would pay a premium compared to the reduced life expectancy of the elderly and the low income of the poor and young. On the contrary, with the third party insurance they pay with reference to the income and life expectancy of the average citizen.

However, liability insurance must be concerned with non-pecuniary damage, which is a major component in the liquidation of damage.

Furthermore, the first-party insurance takes into account any other sources of repair of damage, and correlatively reduces the insurance premium. Therefore, first-party policies often has excess which, by limiting compensation, imply a lower cost of insurance premium. However, even here we must point out a negative aspect: the first-party insurance will cost less in relation to the lower economic burden of the insurer, but the problem of compensation for further damage remains.

### **3.2. Focus on the Italian car insurance in relation with the other already identified legal systems.**

With regard to the civil liability for damages deriving from the circulation of vehicles, the so-called compulsory insurance<sup>167</sup> is provided at both European and national level. This means that vehicles can only circulate if insured. At the European level, the reference legislation is the Directive 2009/103/EC,<sup>168</sup> which, in article 3, expressly provides that each Member State shall take all appropriate measures to ensure that civil liability relating to the circulation of vehicles normally based in its territory is covered by car insurance. In particular, the insurance policy must cover the damage caused in the territory of a Member States

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<sup>167</sup> A Bertolini and others, 'On Robots and Insurance' (n 46) 2 ff., explains that normally, the parties are left free to decide whether to enter an insurance contract or not, in order to manage a risk they are exposed to. However, in some cases, the legislator deeming that the risk associated to a certain activity is too high, or that moral behaviour may negatively affect the spreading of the damages that arise, and for this impose a duty to purchase insurance (normally third party insurance). The traffic insurance, as well as the professional liability insurance, are examples of compulsory insurance.

<sup>168</sup> Directive of the European Parliament and of the Council 2009/103/EC 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 [2009] OJ L 263/11.

according to the legislation in force in those states and the damage, which may be suffered by the citizens of a Member States. Therefore the European legislation defers to the national legislation for the regulation of the concrete national case, even if it contains general principles that must be transposed in the Member States law.<sup>169</sup> First of all, it highlights the principle that the injured party must claim for compensation to the insurance company undertaking of the person who caused the accident or to its claims representative.<sup>170</sup> This principle is important because implies that the insurance scheme adopted in Europe and in the member states is that of the third party insurance, with the provision also of direct compensation in specific circumstances which will be discussed below, in reference to the Italian legal system but are provided at European level. Therefore, in France, in Germany, and in Italy, as well as in the UK<sup>171</sup> and especially in the US,<sup>172</sup> compulsory insurance follows the rules of the third party insurance. Anyways, let's analyse the third party insurance in the Italian legal system, considering that Italian law is the starting point of this work.

In Italy, the mandatory insurance had already been established by article 1 of the law 990/1969,<sup>173</sup> for which every vehicle in public areas had to be protected by an insurance policy such as to cover the damages caused to third parties involved in

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<sup>169</sup> To this general principle of compulsory insurance there is a derogation provided for in Article 5 Dir 2009/103 / EC in favor of certain natural or legal persons, public or private, included in a list that the Member State must notify to other States and to the EU Commission. However, the Member State must take the appropriate measures to indemnify the persons for the damage caused in their own state or in that of the other Member States by vehicles belonging to the aforementioned persons exempt from compulsory insurance. To this end, it shall also draw up a list of the authorities or bodies responsible for the indemnification to be communicated to the Commission.

<sup>170</sup> Art 22, Dir 2009/103/EC.

<sup>171</sup> Section 2 and ff., Automated and Electric Vehicles Act of 2018.

<sup>172</sup> Chapter 344, Wisconsin Statutes Database of 2008, in [www.wisconsin.gov](http://www.wisconsin.gov) (accessed 11 October 2019); Virginia Insurance Requirements of Virginia Department of Motor Vehicles, in [www.dmv.virginia.gov](http://www.dmv.virginia.gov) (accessed 11 October 2019)

<sup>173</sup> Law 24 December 1969, n. 990, civil liability insurance for road accidents (not in force).

a possible claim, up to a certain threshold. The compulsory insurance coverage fell only when the vehicle was demolished, with consequent radiation from the Public Automotive Registry.

The 1969 law has undergone various updates and modifications and has been definitively replaced by the current Italian Private insurance code, repeatedly modified. The Italian Private insurance code, in confirming the compulsory insurance, has also introduced a series of innovations, among which one of the most important is the direct compensation (article 149, Italian Private insurance code).<sup>174</sup> It provides that, in specific cases, the injured person can go directly to his insurance company to get compensation for damages in case of accident caused by the other party, without having to request the payment of damages to the company of the damaging party.<sup>175</sup> This direct compensation procedure operates only if: (1) the motor vehicle accident occurred in Italy, in the Republic of San Marino or in the Vatican State;<sup>176</sup> (2) it involved only two vehicles, both identified, insured and registered in Italy; (3) and if there has been damage to property and/or persons, but minor value.<sup>177</sup> It seems clear, therefore, that this is an exception to the third party scheme, and that, when applicable, operates according to the scheme of the first-party insurance, even if the requirements are different and far more specific for the direct compensation than the first-party insurance.

In addition, can take advantage of the direct compensation only ones who are insured with an insurance company belonging to the Direct Compensation

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<sup>174</sup> Art. 18, Dir 2009/103/EC.

<sup>175</sup> G Buffone (ed.), *Responsabilità civile automobilistica* (n 8) 157 s.

<sup>176</sup> Art 34, par 1, CARD.

<sup>177</sup> Article. 149 Italian Private insurance code refers to the physical damage suffered by the non-responsible driver if it is contained within the limit set by article 139 Italian Private insurance.

Agreement (DCA, in Italian CARD), pursuant to art. 13 of the D.P.R. n. 254/2006.<sup>178 179</sup>

For damages caused by the insured to third parties, the insurance company, after collecting the insurance premium,<sup>180</sup> it replaces the insured by paying the damages caused by him. The damages of which the driver is liable, and possibly also the other subjects expressly provided for in article 2054 of the Italian civil code, are those caused «to people or things». In the formula adopted, no distinction is made between people and things transported or not, but contemporary case-law also includes people and things transported.<sup>181</sup> Moreover, in the event that the damage derives from the collision with another vehicle, the person transported may also act against the other driver assuming an equal responsibility of the parties pursuant to article 2054, paragraph 2, Italian Civil Code. In addition, the third party is entitled, in the presence of a transport contract, to act against the driver for damages stemming from contractual civil liability, even in the absence of a tort claim.<sup>182</sup>

There is a threshold, i.e. a minimum that insurance companies must necessarily guarantee as compensation. This threshold can be raised by increasing the

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<sup>178</sup> D.P.R., 18 July 2006, n. 254 regulations governing the direct compensation for damages arising from road traffic, OJ 199.

<sup>179</sup> In other words, these companies must establish a specific office, Company Service Reference Conventions Reference (SARC), for the management of the reports relating to the CARD between the member companies. The SARC also manages the relationships that derive from other agreements related to motor vehicle dealings, such as the Third Party Transports Convention (CTT). Foreign insurance companies, on the other hand, must apply for membership of ANIA (Italian National Association of Insurance Companies) pursuant to Article 2 CARD.

<sup>180</sup> The insurance premium is the amount that the insured corresponds to the insurance company to obtain insurance coverage.

<sup>181</sup> In the past, on the contrary, a restrictive interpretation of the norm was preferred, for which people and goods transported as unrelated to vehicle circulation.

<sup>182</sup> In Italy, the transport contract is governed by articles 1678 ff., Italian Civil code. To in-depth the compensation of contractual and non-contractual obligations, see CM Bianca 'La responsabilità', in *Diritto civile* (n 130) 760.

insurance premium.<sup>183</sup> The law also provides that the policy is no longer in force from the sixteenth day following its expiry.<sup>184</sup>

Briefly stated the principles of Italian civil liability in road traffic, and the rules applicable in other civil law and common law States, an open question concerns the way in which autonomous vehicles affect compulsory insurance: Who should be the insured? It should be an increase or a decrease in the insurance premium?<sup>185</sup>

In the next chapter we will try to explain the possible solutions applicable in the case of an accident caused by an autonomous vehicle, both in terms of liability and insurance system (*see* chapter IV). Meanwhile, however, the following subsection will analyse an insurance policy for driverless cars (*see* this chapter, subsection 3.3.).

### 3.3. Case study: Trinity Lane Driverless Car Policy

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<sup>183</sup> Historically, insurance companies have always been inclined to recognize the benefits of road safety from automotive technologies and have encouraged their policyholders to invest in them (eg. Black box). *See* art. 132 ter, lett b) Italian Private Insurance Code; *see* also M Caprino M, 'Sconti obbligatori per la scatola nera [2017] Il Sole 24 Ore online.

<sup>184</sup> For further information, refer to the Circular of the Italian Ministry of the Intern, Department of Public Security, 14 February 2013, on the tacit postponement of insurance policies. The circular, underline that the art. 22 of D.Lgs. no 179/2012 introduced the art. 170-bis in the Italian insurance code, establishing the prohibition of tacit renewal of insurance policies car; at the same time, however, this rule expressly provides for the extension of the insurance coverage to the annual expiry for a limited period of fifteen days from the expiration day. So, during that period the insured, pending the signing of another contract in good time, can continue to circulate using the expired car policy.

<sup>185</sup> C Perlingieri, 'L'incidenza dell'utilizzazione della tecnologia robotica nei rapporti civilistici' (n 105) 1241 ss., wonders about new forms of compulsory insurance required by the development of robotics, assuming the use of a criterion based on the level of learning and adaptation of the robot: a greater ability to learn of the robot would result in less responsibility for the producer (taking account of its power to give instructions to the robot), while it would entail less responsibility for the user. The author starts from the assumption that the robot can not be recognized civil liability as it does not seem necessary to completely overcome the concept of a robot as a legal good (in Latin '*res*'). This reconstruction reflects the legislation currently in force in the different legal system and in the European one, but there is a strong impulse of innovation that could also lead to the recognition of the legal personality to the robot.



At this point, it seems opportune to dwell on the analysis of a UK car policy for driverless vehicle to verify if this contract is sufficient to protect the new interests at stake. It is the Trinity Lane Driverless Car Policy, in particular the second version of 2015, which is the last one available to the public.

The policy, in the definition part, defines the car as: «Car Passenger vehicle unladen weight higher than 450 kg but lower than 3500 kg, not designed for the carriage of goods (van) and is designed to carry no more than 6 passengers».<sup>186</sup> So it does not mention the automation and less than that the self-driving car.

Furthermore, in the part on risks covered,<sup>187</sup> the policy, like all the common policy, provides different types of policy including, at the number 3, the coverage for death of or injury to third people, or damaging other people's property, and any passenger in the vehicle. It suggests that the policy takes over the third-party scheme (*see* this chapter, subsection 3.1).

Then, explaining the use cases, it is stated that: «Your vehicle will only be covered if you are using it in the way agreed on your certificate of motor insurance, or any endorsements».<sup>188</sup> With the term 'using' it should be supposed that it is referred to the use of the vehicle in general, including the vehicle in autonomous mode, where there is no driver on-board but only passenger. Anyways, this is only a deduction that can not be proven, rather it is possible that it is just an improper term that does not intend to include even autonomous vehicles.

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<sup>186</sup> Driverless Car Policy of Trinity Lane, Definition, 5.

<sup>187</sup> Driverless Car Policy of Trinity Lane, Cover, 7.

<sup>188</sup> Driverless Car Policy of Trinity Lane, Use, 8.

This policy is applicable both if it is the driver to drive the vehicle or if the vehicle is driven by another person with the owner's permission,<sup>189</sup> and it is clear that no mention is made to autonomous driving.

It is also provided a quite limited part on driverless mode, which is included in section 1.<sup>190</sup> More precisely, the following loss or damage brought about by the self-driving car are covered by the driverless car policy: «(1) loss or damage caused if a security patch, firewall or operating system update has not been successfully installed in the vehicle within 24 hours of the owner being notified by the manufacturer or software provider; (2) loss or damage caused if updates to electronic mapping and journey planning software have not been successfully installed within 24 hours of the owner being notified by the manufacturer or software provider; (3) loss or damage caused by satellite failure/outages that affect navigation systems; (4) loss or damage caused by manufacturer's operating system failure or authorised software failure; (5) loss or damage caused by failing when able to use manual override to avoid a collision or accident». Here a consideration must be given to the role that seems to be up to the user of the vehicle. The operation of the insurance coverage is limited to cases of malfunctioning of the authorized software and of the related updates, also authorized, which is an extreme import aspect for the average consumer, which in fact seems to be asked to be able to recognize on the market which is the update to be installed, otherwise the insurance coverage will not be operational.

Another important reference to the autonomous drive is made with reference to the valid license for a driverless vehicle, which is needed in order to benefit from

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<sup>189</sup> Driverless Car Policy of Trinity Lane, Section 1, Liability to others, 9.

<sup>190</sup> Ibid. However, there is an additional excess of £250 for the first two cases mentioned in the text.

the policy.<sup>191</sup> This shows that the driving license rules will change as a result of the change of driving, until it will arrive at the completely autonomous driving where it should be asked if a driving license will be still necessary.

Moreover, in section 6, named ‘fire and other cover’,<sup>192</sup> the policy takes into account the qualities of driverless vehicles by offering insurance coverage in the event of loss or damage to the vehicle caused, as well as by fire, theft or attempted theft, including the attempted hacking or hacking of the driving system, authorized software or of the navigation system.

Finally, the absence of coverage for personal data, suffered by the insured person/driver in the event of a claim due to malfunctioning of autonomous driving systems, it is not a matter of little importance. By way of example, we can consider the possibility in which, by hacking the operating system of the vehicle, some personal or sensitive data (e.g. bank data) are stolen. What is founded in this insurance policy is that does not ensure economic damage that could result from the hacking, neither in terms of data protection nor in terms of cybersecurity. In fact, the damages or losses that may be insured by the policy are in fact those suffered by third parties (referred to in section 1 on third party insurance) or by the vehicle, if section 6 on fire and theft is included or also death or injury of the insured or his spouse/partner, provided in section 9, if is a comprehensive insurance.<sup>193</sup> Obviously, more damages are covered and higher is the insurance premium. Anyway, the policy document in question does not provide for the extension of insurance coverage to damage coming from the unlawful processing of the personal data of the insured person, which is instead reserved only for

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<sup>191</sup> Driverless Car Policy of Trinity Lane, Exceptions to section 1,10.

<sup>192</sup> Driverless Car Policy of Trinity Lane, Section 6, Fire and theft cover, 15.

<sup>193</sup> Driverless Car Policy of Trinity Lane, Section 9, Personal accident benefit, 21.

his/her personal belongings in the vehicle, if it is chosen the comprehensive policy.<sup>194</sup>

In conclusion, on one hand, we look favourably at this (though early) driverless car policy, which is in compliance with the Road Traffic Act of 1988. However, on the other hand, as it is foreseeable considering that the driverless car policy is previous to the entered in to force of the Automated and Electric Vehicles Act of 2018, this car policy resumes only a small part of the Act and it needs to be revised.

It appears clear that there are very good purposes and the UK is one of the pioneers in the field of driver policy, but the road ahead is still long.

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<sup>194</sup> Driverless Car Policy of Trinity Lane, Section 10, Personal belongings, 22.

## **Annex: Extract of the Driverless Car Policy of Trinity Lane.**

### **Section 1 – Liability to others**

#### **What we cover**

##### **Using your vehicle**

We will cover any payments that have to be made by law for:

- death of or injury to another person; or
- damage to other people's property;  
as a result of an accident arising from your vehicle being used.

##### **Others using your vehicle**

##### **We will cover you for the following**

- Another person riding in your vehicle with your permission,
- They will be covered for death of or injury to other people, or damaging other people's property. Any passenger in your vehicle will also be given this cover, including while they are getting into or out of the vehicle.
- If we think it is necessary, we will arrange for a solicitor to represent anyone covered under this section.

##### **Business use**

- If your certificate of motor insurance includes business use, we will cover your employer if an accident happens when your vehicle is being used on business.

##### **Legal personal representatives**

- If anyone covered by this insurance dies, we will deal with any claim made against their estate as long as the claim is covered by this insurance.

##### **Driverless mode**

- loss or damage caused if a security patch, firewall or operating system update has not been successfully installed in the vehicle within 24 hours of the owner being notified by the manufacturer or software provider;
- loss or damage caused if updates to electronic mapping and journey planning software have not been successfully installed within 24 hours of the owner being notified by the manufacturer or software provider;
- loss or damage caused by satellite failure/outages that affect navigation systems;

(continued)

- loss or damage caused by manufacturer's operating system failure or authorised software failure.
- loss or damage caused by failing when able to use manual override to avoid a collision or accident in the event of operating system, navigation system or mechanical failure;

## Exceptions to section 1

### What we do not cover

- a Anyone who is not driving, but who makes a claim, if they knew the driver did not hold a valid licence for a driverless vehicle.
- b Anyone who is covered by other insurance.
- c Damage to, loss of use of, or any other loss to:
  - any motor vehicle which is covered under this insurance;
  - any property you or anyone else using the vehicle owns or is looking after; and
  - any trailer, caravan or vehicle towed by or attached to your vehicle.
- d Death of or injury to any person during the course of their employment, except for the cover we must provide under the Road Traffic Acts or any other laws which apply to motor insurance.
- e Payment of more than £20 million (including legal costs) for damage to other people's property arising from any one claim or series of claims arising from one cause.
- f When the vehicle is in driverless mode:
  - there is an additional excess of £250 for loss or damage if a security patch, firewall or operating system update has not been successfully installed in the vehicle within 24 hours of the owner being notified by the manufacturer or software provider;
  - there is an additional excess of £250 for loss or damage if updates to electronic mapping and journey planning software have not been successfully installed in the vehicle within 24 hours of the owner being notified by the manufacturer or software provider.

## Section 6 - Fire and theft cover

### Loss or damage to your vehicle by fire or theft

#### What we cover

This section applies to your vehicle only.

We will cover you under this section if the loss or damage to your vehicle is caused by fire, theft or attempted theft, hacking or attempted hacking of an operating system, authorised software or navigation system (less any excess which applies). We will also provide cover for damage to accessories while fitted to your vehicle or while they are in your locked private garage. We will not pay more than £500 (less any excess which applies) for damage to accessories while they are in your locked private garage. The value of the accessories must be within the maximum amount we pay.

We will not pay under this section for loss or damage more specifically covered under section 7 of this insurance.

#### We will either:

- repair or replace your vehicle; or
- refund you for the amount of loss or damage.

#### Theft of keys

If the keys or key fob for your vehicle are stolen, we will pay the cost of replacing:

- the keys or key fob;
- the door locks or boot lock (or both); or
- the ignition and steering lock.

We will also pay the cost of recoding or, if necessary, replacing any alarm system your vehicle has.

The most we will pay as a result of theft of keys or key fob (including recoding and replacing the alarm system) is £500 for any one incident.

#### The most we will pay

If your vehicle is insured on an agreed-value basis, an endorsement will apply and the most we will pay will be the value shown on your schedule. If we have not agreed the value of your vehicle before the loss or damage, the most we will pay will be the market value of your vehicle immediately before the loss or damage (including its spare parts and accessories), or the value shown on the schedule, whichever is lower.

## CHAPTER IV – A POSSIBLE FRAMEWORK OF RULES FOR AUTONOMOUS VEHICLES

**Summary:** 1. *A de iure condendo* legal proposal for driverless car. 1.1. Product liability directive and its legal understanding in consideration of the European Commission Report and Evaluation. 1.2. Imputability of damage caused by an autonomous vehicle. 1.3. Extensively application of existing legislation versus the need of an ad hoc framework of rules for self-driving cars. 2. The need of an effective insurance policy for autonomous vehicle. 2.1. Principles of insurance that guarantee a high level of protection in the ‘autonomous’ traffic flow. 2.2. What should concretely provide an efficient automobile insurance policy.

### 1. *A de iure condendo* legal proposal for driverless car.

#### 1.1. Product liability directive and its legal understanding in consideration of the European Commission Report and Evaluation.

It is necessary to in-depth the Product liability directive (PLD) before exploring the possible solutions to regulate autonomous vehicles, with particular regard to the case of autonomous vehicle accidents (*see* this chapter, subsection 1.2.).

With the development of industrial civilization, the damage from defective products was one of the main legal issues and was first treated by the doctrine and case law and, in a second time, governed by the legislator. The latter intervened regulating the producer’s liability with the Directive 85/374/EEC.<sup>195</sup> The directive aimed to harmonize the laws of the Member States of the European Union by

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<sup>195</sup> 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 [1985] OJ L 210/29.



introducing a rule of favor for the damaged by defective products (the so-called consumer). This directive was implemented in Italy by the d.P.R. n. 224/1988<sup>196</sup> and then transfused into the Italian Consumer Code in the articles 114 and following. In particular, the change in the forms of production and the structure of the market (now based on the subdivision of production into several phases), has created the need to regulate the relationship between producer and consumer. The EU Directive and the Italian Consumer Code has managed to regulate this relationship even in the cases in which there is one or more intermediary between the liable producer for the damage and the consumer, and the function of this regulation is balancing opposite interests: having safe products and distributing them in the market for profit. The open question concerns, instead, the defects of products characterized by a high level of technology and, in particular, autonomous vehicles. Indeed, in the contemporary era technology is developing much more quickly than the related legislation and, consequently, there are many cases in which it is difficult to identify the tortfeasor for the damage caused by the electronic device. But let's proceed with order.

The article 2 PLD<sup>197</sup> defines as a product every movable, even if it is incorporated into another movables or immovables; therefore fall within this category both the vehicles and the automatic devices installed on them. A product, as defined, is to be considered defective if the safety feature is not present.<sup>198</sup>

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<sup>196</sup> The d.P.R. May 24, 1988, n. 224, which governed the approximation of the laws, regulations and administrative provisions of the Member States on liability for damage caused by defective products, was repealed by d.lgs. 6 September 2005, n 206, OJ 235. (Italian Consumer Code).

<sup>197</sup> Article 115, Italian Consumer Code.

<sup>198</sup> The general product safety regulation is contained in the Directive of the European Parliament and of the Council 2001/95/EC of 3 December 2001 on general product safety [2001] OJ L11/4, currently merged into articles 102 ff., Italian Consumer Code. In particular, according to the provisions of art 104, para 1, Italian Consumer Code, producers can only place safe products on the market.

Indeed, article 6 PLD,<sup>199</sup> establishes that a product is defective when it does not offer the security that a person is entitled to expect in view of certain circumstances. In fact, the assessment, to be carried out on a case-by-case basis, will take into account certain parameters which include those indicated by the article: «(a) the presentation of the product; (b) the use to which it could reasonably be expected that the product would be put;<sup>200</sup> (c) the time when the product was put into circulation». In this regard, three fundamental aspects can be identified. Firstly, the provision implicitly refers to the technical and scientific knowledge, therefore it is necessary that the affirmation of the defect is made by one or more experts in the sector; however, it is not necessary that this declaration is certain, but only sufficiently reliable. Secondly, and as a corollary of the previous point, it is required that the respect of the existing technical rules (written or not) in force when the product was introduced on the market. Thirdly, as has been argued, with regard to the producer's strict liability, a product can be considered defective if this fact has been scientifically proven anywhere in the world and not necessarily in the place where the damage occurred.<sup>201</sup> Finally, a product is defective if it does not offer the security normally offered by other products of the same series, even if a product should not be considered defective for the sole reason that a better product is (subsequently) put into circulation.

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<sup>199</sup> Article 117, Italian Consumer Code.

<sup>200</sup> In relation to this circumstance, the Italian Supreme Court, already with the Judgment n. 4004 of 21 October 1957, has states, in a case involving damage resulting from the abnormal use of a product, by declaring the liability of its producer, as he could have taken appropriate measures to avoid the abnormal use of the asset.

<sup>201</sup> G Alpa, M Bin, P Cendon (eds.), 'La responsabilità del produttore', in *Trattato di diritto commerciale e diritto pubblico dell'economia*, directed by Galgano F, vol. XIII, (Cedam 1989), 56 ss.

As can be seen from the definition of a defective product, the concept of defect is strictly connected to the concepts of safety<sup>202</sup> and of danger for the person who uses it and for third parties who are in contact with it. The notion of defect is based on the concept of safety. Therefore, it can be considered as an additional reference parameter, in order to assess the existence of the defect, the notion of safe product contained in the general product safety regulation, reported in article 2, Directive 2001/95/EC.<sup>203</sup> On the basis of this provision, the product is safe which, under normal or reasonably foreseeable conditions (including duration and, where appropriate, commissioning, installation and maintenance), presents no risk or presents only minimum risks, compatible with the use of the product and considered acceptable in compliance with a high level of protection of health and safety of persons.<sup>204</sup> Therefore the safety of the product is defined as the general absence of risks even if the existence of some minimum risks is configurable. This is a general clause on the basis of which the scope of risks posed to the consumer is quantitatively determined (which in any case are minimal risks). In this context, the Italian legislator, on the model of European protection of health and safety, has

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<sup>202</sup> The concept of security is referred to, inter alia, in art. 41, paragraph 2, Italian Constitution, which imposes the limit on the protection of physical security to private economic initiative. The concept, then, has assumed particular importance in the Directive 85/374 / EEC implemented in our legal system.

<sup>203</sup> Art 2 of the Directive of the European Parliament and of the Council 2001/95/EC of 3 December 2001 on general product safety [2001] OJ L11/4, which correspond to art 103 of Italian Consumer Code. Other fundamental regulation in the field of safety product is the Directive of the European Parliament and of the Council 2006/42/EC of 17 May 2006 on machinery, and amending Directive 95/16/EC [2006] OJ L 157/24.

<sup>204</sup> The elements according to which the art 103, Italian Consumer Code, assesses the level of protection of the health and safety of the person are: the characteristics of the product, in particular its composition, its packaging, the modalities of its assembly and, if appropriate, its installation and maintenance; the effect of the product on other products, if the use of the first with the latter is reasonably foreseeable; the presentation of the product, its labeling, any warnings and instructions for its use and disposal, as well as any other indication or information related to the product; the categories of consumers who are at risk of using the product, in particular children and the elderly.

identified standards that allow only possible minimum risks or even the absence of any type of risk.<sup>205</sup>

Having defined the notion of product and the notion of defect, it is now necessary to understand what is meant by producer. About that, article 3 PDL<sup>206</sup>, defines the manufacturer of the finished product, that of a component part and also the producer of the raw material. Therefore, in the light of the existing EU legislation, a producer of an electronic device on-board or a vehicle is also a producer, be it a traditional vehicle or a self-driving car. On the contrary, it is not specified whether by producer it is meant anyone who produces a good and puts it on the market or only the person who carries out this activity as a professional activity. According to authoritative doctrine<sup>207</sup> only the professional producer should be considered as a producer, on the basis of the fact that it is opposed to the protected consumer as a weak part of the relationship, which acts just like a non-professional.

The division of the producer's category into three sub-categories (as represented in the figure n 3 below) should also be considered.<sup>208</sup> These sub-categories were

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<sup>205</sup> Article 105, Italian Consumer Code, then, it explicitly regulates the rules of presumption of safety of the product, establishing that a product is presumed to be safe in the case in which it complies with European legislation or, failing that, complies with the national legislation of the Member State in which the product is marketed. Furthermore, a product is safe if it complies with the non-binding national regulations that implement European legislation. To this it is necessary to add that, if the European (or national) legislation is absent, a product is presumed to be safe, inter alia, if it respects the level of safety that consumers can reasonably expect (consumer expectations). Therefore, if a product, and in particular an autonomous vehicle, is below consumer expectations, the producer's liability appears configurable. For further information on the consumer expectation, refer to E Palmerini and others, 'Guidelines on Regulating Robotics' (n 12). In this sense also A Bertolini, in Summer School 'The regulation of robotics in Europe: legal, ethical and economic implications', which stresses that, on the basis of the consumer expectation test, the seller of a product is responsible if the product is unreasonably dangerous, taking into account the expectations of the average consumer.

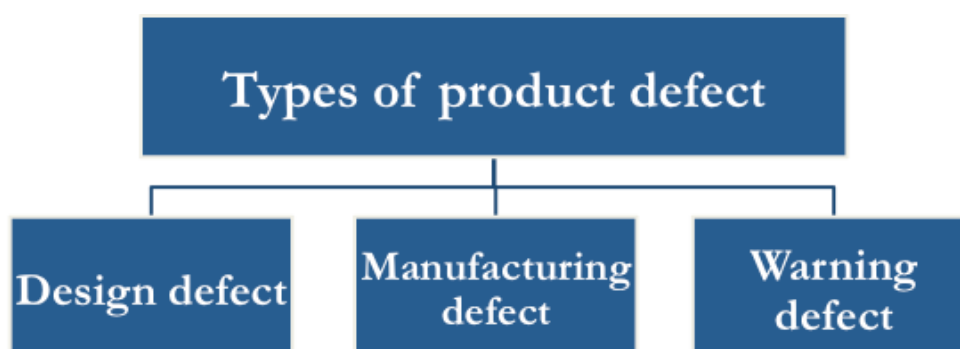
<sup>206</sup> Article 3, Italian Consumer Code.

<sup>207</sup> C Castronovo, *La nuova responsabilità civile* (n 109), 687 ss. says that the producer is only who carries on the activity of producer at a professional level. In this sense had suggested the history of producer's liability. However, also who is engaged in a commercial activity and imports the product to put it into circulation is professional. Similarly, the supplier is a professional who can always be held responsible in the place of the producer.

<sup>208</sup> Restatement of the Law Third, Tort, Products Liability, American Law Institute, 1998, § 2,

developed in US law and subsequently introduced into our legal system, though only at the doctrinal and non-normative level.<sup>209</sup> They are: the designer who is responsible for designing the product, the manufacturer who is responsible for making it and the informant who is responsible for providing the consumer with the necessary warnings about the product. The three sub-categories reflect three different moments of the productive activity and can be proper of distinct subjects, as well as of only one. It is noted that traditionally the terms ‘producer’ and ‘manufacturer’ are used as synonyms, implying the disappearance of the tripartition of the figure of the producer.

**Figure no. 3 – Types of product defect**



Under article 1 PLD,<sup>210</sup> the producer is liable for damages caused by his defective products (so-called strict liability or no-fault liability).<sup>211</sup> The choice for the producer’s strict liability is related to the possibility for the producer to transfer partially (or integrally) the production costs to the end user through the product’s

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<sup>209</sup> U Carnevali, ‘Nuovi prodotti dannosi’, Treccani G (ed.) *Enciclopedia Giuridica* (online edn. 2009); A Bertolini, ‘Robots as Products: The Case for a Realistic Analysis of Robotic Applications and Liability Rules’ (n 12) 239.

<sup>210</sup> Article 114, Italian Consumer Code.

<sup>211</sup> In USA, strict liability rule for the producer is affirmed by section 402A of the Restatement of the Law, Second, Tort, American Law Institute, 1965.

price. As a matter of fact, the product's price is increased because the fact that the producer is required to buy insurance for harm arising from the normal use of its product. The justification to increase the product's safety does not fully explain this strict liability.<sup>212</sup>

To the same liability is subject the supplier (subject distinct from the producer)<sup>213</sup> when the producer is not identified; therefore it is the supplier's liability to communicate the identity of the producer to the injured party.<sup>214</sup> Furthermore, the Directive applies only to producers, not to service providers that may use products which result to be defective. However, the PLD does not prevent Member States from establishing strict liability for service providers, as long as they do not in any way limit the producers' strict liability.<sup>215</sup>

With regard to the burden of proof, the article 4 PLD<sup>216</sup> provides that the same is on the damaged party,<sup>217</sup> which must prove the defect, the damage and the causal

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<sup>212</sup> R Posner, *Economic Analysis of Law* (7th edn, Wolters Kluwer 2007) 182 f.

<sup>213</sup> CM Bianca 'La responsabilità', in *Diritto civile* (n 130) 746.

<sup>214</sup> Regarding the compensable damage, the art 123 of the Italian Consumer Code, taking over the art 9 PLD, states that there are two categories of compensable damages: personal injury and property damage. The first is that caused by death or by personal injury, compensable without limitation. The second, on the contrary, is that deriving from damage or destruction of any items of property other than the defective product itself, provided that the damaged good is normally destined for private use or consumption (therefore not professional) and has been used by the injured party mainly for this purpose; furthermore, the material damage can only be refunded if it exceeds the amount of 387.00 Euros, whereas the 9 PLD article expressly provides a lower threshold of 500 Euros for compensation for material damage. The normative provision solves only in part the problem of establishing the limit within which the damage is relevant for compensation purposes, an aspect that is discussed by P Trimarchi, *Causalità e danno* (Giuffrè 1967), 19 ff., that considers necessary starting from general regulatory provision to be applied on a practical case, solving the question of the limit of the compensable damage on a case-by-case analysis.

<sup>215</sup> In this sense, see CJEU, Judgment 21.12.2011, Centre hospitalier universitaire de Besançon, C-495/1, EU:C:2011: 869, where a hospital bed had burned a patient during surgery.

<sup>216</sup> Article 120, Italian Consumer Code.

<sup>217</sup> The most difficult stepping stone to receiving compensation for damages is the burden of proof on the injured person, who has to demonstrate the damage occurred, the product defect and the causal relationship between the defect and the damage (under art 4 PLD). The Court of Justice of the European Union (EJEU) has made doing this considerably easier by accepting national rules that help the injured person to establish this proof, but this must not undermine the PLD's placing of the burden of proof on the injured person. For example, the EJEU indicated that national rules, granting consumers the right to require the producer to provide them with information on the adverse effects of that product, can be accepted as they fall outside the scope of the PLD. See CJEU, Judgment 20

link between the defect and the damage, while the producer must prove the exemption of liability. As a matter of fact, the article 7 PLD<sup>218</sup> establishes a catalogue of defences or circumstances that could exclude producer's liability.<sup>219</sup> In particular, the producer shall not be liable if he proves some circumstances of exemptions of liability, including: (a) did not put the product into the market, (b) that did not exist at the time when the product was put into circulation,<sup>220</sup> (c) the product was not manufactured for the sale, (d) the defect is due to compliance of the product with mandatory regulations,<sup>221</sup> (e) the state of scientific and technical knowledge at the time when the product was put into the market do not allow to classify the product as defective,<sup>222</sup> (f) if the defect is attributable to the

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November 2014, *Novo Nordisk Pharma GmbH*, C-310/13, EU:C:2014:2385. Moreover, the EJEU accepted national rules under which a national court may consider certain factual evidence to constitute serious, specific and consistent evidence of a defect of a product and to constitute the causal relationship with the damage, even if there is no conclusive scientific evidence on this. In this sense CJEU, Judgment 21 June 2017, *Sanofi Pasteur MSD SNC*, C-621/15, EU:C:2017:484. Finally, the EJEU indicated that products of one group or of the same production series with a potential defect may be considered as defective without the need to establish the actual defect of the individual product (CJEU, Judgment 5 March 2015, *Boston Scientific Medizintechnik GmbH*, C-503/13 e C-504/13, EU:C:2015:148).

<sup>218</sup> Article 118, Italian Consumer Code.

<sup>219</sup> In the United States of America, four product liability defenses have been developed for the producer's exemption of liability: (1) comparative negligence, (2) misuse, (3) state of the art and (4) assumption of risk by the driver. *See* JK Gurney, 'Sue My Car Not Me. Products Liability and Accidents Involving Autonomous Vehicles' (n 11) 266 ss.. About the comparative negligence theory is concerned, the producer could defend himself by claiming that he was not fully responsible or not at all, as the driver's negligence. In our view, comparative negligence also includes the hypotheses in which the responsibility is not to be attributed to the driver through negligence, but rather to unforeseeable circumstances or force majeure. These are the hypotheses of fortuitous event or force majeure that exclude the fault of the producer by not realizing the provision of art. 1 PLD. For a more in-depth analysis, *see* Fagnant DJ, Kockelman K, 'Preparing a nation for autonomous vehicles: Opportunities, barriers and policy recommendations' (2015) 77 *Transportation Research, Part A: Policy and Practice* 167-181.

<sup>220</sup> Regarding the case where the defect did not exist when the product was put into circulation, it is sufficient for the producer to provide proof of the propability of the non-existence of the defect, as well as, by *par condicio*, it is sufficient for the injured to provide proof of the probability of its existence.

<sup>221</sup> The hypothesis in which the product defect depends on compliance with binding rules, occurs only in very exceptional cases since, as a rule, the legislator's intervention takes place not with mandatory rules but with standards.

<sup>222</sup> In relation to the case in which the state of scientific and technical knowledge does not allow the product to be considered as defective, it is necessary to clarify that this is referred to a so-called 'risk of development', that is a compromise between the need to boost innovative business activities and to

manufacturer of a part of the product, he has to prove the liability of the manufacturer of the finished product or of the informant.<sup>223</sup>

The *ratio* of this rule limiting the liability of the producer is probably the indefectible need to protect also the strong party of the relationship, as it depends on him the innovation in the industrial sector and in particular that of new technologies. In fact, if the responsibility of the producer was even greater of that provided by the EU regulation, he would not choose to introduce new technologies into the market as the same could result in excessive responsibility for the producer.

Taking up again the abovementioned tripartition of the producer types, it is worth highlighting that producer's liability can be objective liability (also known as strict liability) or semi-objective liability.<sup>224</sup> There is an objective liability for damages resulting from manufacturing defects.<sup>225</sup> In fact, the producer will be considered responsible for the manufacturing defect independently of the fault, for the mere fact of having put in circulation a defective product, unless he proves the non-imputability.<sup>226</sup> This hypothesis, as the majority doctrine maintains,<sup>227</sup> does not

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protect the interests of consumers. Therefore, in cases where the product has not yet been considered defective, since technological innovation is extremely important for the development of contemporary society, it is preferable to place the device on the market rather than wait to evaluate in more detail that it can not be dangerous. C Castronovo, *La nuova responsabilità civile* (n 109) 701 ss.

<sup>223</sup> See R Mazzon, *La responsabilità oggettiva e semioggettiva* (n 107) 1063 ss. The introduction of the above mentioned hypothesis of exemptions of liability implies that producer's liability is not an absolute liability (P Trimarchi, *La responsabilità civile: atti illeciti, rischio, danno* (Giuffrè 2017), 453 ff.

<sup>224</sup> G Alpa, 'La responsabilità oggettiva' (2005) Contr. impr, 959 ff., it deals with the problems related to the criteria of imputation of liability, both civil and criminal, with particular reference to the strict responsibility of the producer, opposing it to that based on the fault.

<sup>225</sup> Directive 85/374/CEE. In this sense F Bocchini, E Quadri, *Diritto privato* (n 31) 1263 s.

<sup>226</sup> It is therefore a matter of proving the existence of one of the cases referred to in Art 118 Italian Consumer Code.

<sup>227</sup> G Calabresi, *Costo degli incidenti e responsabilità civile Analisi economico-giuridica* (n 138), 32, highlights how all the subject matter of the torts, and mainly that of product liability, is based on strict liability. P Sirena (Sirena P (ed.), *La funzione deterrente della responsabilità civile. Alla luce delle riforme straniere e dei Principles of European Tort Law* (Giuffrè 2011), 155 ff., says that the



take into account the element of guilt, since it does be an element of the objective liability, but that of the causal link between the behaviour of the damaging subject and the damage occurred. The introduction of this form of strict liability for defective products is essentially based on the usefulness that the producer derives from their marketing, which justifies, with a view to the efficient allocation of risk, the attribution to him of the risk that the products themselves can cause damage to things or people.<sup>228</sup>

Despite the PLD statement on producer's responsibility, many issues arise on the producer's strict liability. More precisely, the European Group of Tort Law project provides as a general rule liability with fault<sup>229</sup>, providing a form of strict liability only in relation to the exercise of dangerous activities,<sup>230</sup> and establishing, however, that such liability remains excluded in case of unforeseeable cause of force majeure or conduct of a third party.<sup>231</sup> Likewise, the project by the Von Bar group, founded by the German Professor Christian Von Bar,<sup>232</sup> argues that civil liability is founded on fault and introduces an injunctive protection (i.e. 'right to prevention') which strongly contradicts the strict liability, since it is a preventive protection that can not be experienced outside the hypotheses of fault.

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case-laws affirming the objective character of responsibility related to things, takes for granted that our code has sanctioned this liability as liability without fault and explains that the proof of the unforeseeable circumstances granted to the injuring party by art 2051 of the Italian Civil Code, it would not be possible to exclude fault but the causal link.

<sup>228</sup> FD Busnelli, S Patti, *Danno e responsabilità civile* (n 139) 152, starting from the economic theory of the distribution of costs and profits, the authors foresee an autonomous system of strict liability that involves the allocation of the risk to the party who obtains more profits and, therefore, can bear it. In this sense also G Calabresi, *Costo degli incidenti e responsabilità civile Analisi economico-giuridica* (n 138) 38 f.; A Bertolini, 'Insurance and Risk Management for Robotic Devices: Identifying the Problems' [2016] GJ, 34 ff..

<sup>229</sup> Principles of European Group on Tort Law, art 4:101.

<sup>230</sup> Principles of European Group on Tort Law, art 5:101.

<sup>231</sup> Principles of European Group on Tort Law, art 7:102.

<sup>232</sup> C Von Bar, *The Common European Law of Torts* (Oxford University Press, 1998).

The other type of producer's liability is the aggravated one,<sup>233</sup> provided for damages resulting from a design defect or a lack of information.<sup>234</sup> Thus, the producer will be liable until proven otherwise, due to the defect of design or information.<sup>235</sup> In particular, in the case of the designer, the starting point are the expectations of the user (the so-called consumer expectations), i.e. the absence of design defects that make the product unreasonably dangerous, as it is presumed that the product has been designed in compliance with the safety standards that will be discussed below. Furthermore, about the informer, it is necessary that he has correctly informed<sup>236</sup> the user about the risks associated with the use of the product.<sup>237 238</sup>

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<sup>233</sup> Italian Supreme Court, civil section III, Judgment, 25 May 1964, no. 1270, starting from the liability with fault, recognizes the semi-objective liability after a careful assessment of the circumstances and in the absence of clear evidence of the negligence of the producer.

<sup>234</sup> CM Bianca 'La responsabilità', in *Diritto civile* (n 130) 753, considers that the law established a differentiated rule that imposes a strict liability on the producer in relation to damage caused by manufacturing defects and an semi-objective liability in relation to damage caused by design defects or warning defect. In the same sense also F Bocchini, E Quadri, *Diritto privato* (n 31) 1264.

<sup>235</sup> Therefore, in this case a reversal of the burden of proof can be configured, as in the case of strict liability due to manufacturing defects.

<sup>236</sup> The duties of information are foreseen by art 5, Dir 2001/95/CE, and after art 104 Italian Consumer Code, regulate the information obligations of the informant.

<sup>237</sup> With regard to the relations between producer and supplier, it should also be noted that the supplier is liable jointly with the producer in case of manufacturing defect. Furthermore, as mentioned above, the supplier will be liable in place of the producer if the latter is not identifiable. As far as the internal relations between the producers of the different production phases are concerned, however, the final producer also is held liable when the producer of a component part of the defective product is the real tortfeasor. On the other hand, the producer of a single component or of the raw material, identified as liable, can excuse himself by proving that the defect is caused by the incorporation of the component in the finished product or by incorrect instructions given by the final producer. C Castronovo, *La nuova responsabilità civile* (n 109) 657 ff.. In this regard, the national legislator, in article 121 Italian Consumer Code has expressly established the joint and several liability of persons, who for various reason intervene during the production phase (whether they belong to the same production phase or to different production phases). For this reason it is expected that, if several people are liable for the same damage, they are all jointly and severally liable for compensation. Obviously, there is a right of claim against in favor of the person who has compensated the whole damage for all the other tortfeasor, to the extent determined by the size of the risk to each one of them, by the seriousness of the behavior and by the extent of the consequences that come from it. In case of doubt, the distribution takes place in equal parts.

<sup>238</sup> Finally, the last hypothesis of producer's liability is the professional liability with fault, that derives from negligent design, manufacture or warnings, as well as from the inertia of the producer who does not immediately remove a defective product from the market after having ascertained the dangerousness of the same. In this case the Latin brocardo 'onus probandi incumbit ei qui dicit' is applied, and, therefore, the damaged party will have to provide proof of the producer's fault. This is

As widely reiterated, the responsibility of the producer is closely connected to the concept of safety.<sup>239</sup> Taking into account the public regulations of vehicle safety standards, two questions may be asked: (1) how to integrate the public regulations of vehicle safety standards with civil law rules on product liability? (2) The safety standards represent a minimum or a maximum threshold of producer's liability?

First of all it, is necessary to specify that the safety elements that vehicles and their component parts must have in order to be considered 'reasonably safe' are legally defined.<sup>240</sup> In particular, with regard to vehicles, in the European Union, the adoption of safety standards has been a consequence of the entry into force of Council Directive 70/157/EEC on the permissible sound level and the exhaust system of motor vehicles,<sup>241</sup> then amended by Commission Directive 96/20/EC.<sup>242</sup>

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the traditional principle of burden of proof that in the Italian legal system is governed by the art 2697 Italian Civil Code.

<sup>239</sup> Dari-Mattiacci G, Franzoni L, 'Innovative Negligence Rules' [2013] Amsterdam Law School Research Paper, 1: «We study how due-care standards can be conditioned on the technology adopted by the parties. We demonstrate that standards should be biased up or downwards, depending on the impact of the new technology on expected harm. Strict liability should be applied if new technologies that are able to reduce expected harm are available to the injurer; negligence should be selected if they are available to the victim. Finally, the negligence standard should be primarily based on safety (outcome) rather than precautionary expenditures (effort), so as to allow the benefits of innovation to be appropriated by the party bearing its cost».

<sup>240</sup> E Al Mureden, 'Sicurezza "ragionevole" degli autoveicoli e responsabilità del produttore nell'ordinamento giuridico italiano e negli Stati Uniti' (n. 143) 1508 ff.: The complex regulatory systems set up in the various systems to guarantee the safety of motor vehicles are the result of an extremely complex process. At first, at least up to the years 40, the problem of the safety of vehicles and their components was not considered exhaustively by the public legislation, which, in principle, did not provide particular quality standards, nor specific provisions regarding the characteristics of products and their safety. Only between the end of the 50s and the beginning of the 60s emerged the requirements that still underlie the legislation on the safety of motor vehicles, that is to impose structural features suitable to ensure a reasonable level of safety and to identify quality standards uniform functionalities to allow producers to easily market motor vehicles in different government systems.

<sup>241</sup> Council Directive 70/157/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the permissible sound level and the exhaust system of motor vehicles [1970] OJ L 42/16.

<sup>242</sup> Commission Directive 96/20/EC of 27 March 1996 adapting to technical progress Council Directive 70/157/EEC relating to the permissible sound level and the exhaust system of motor vehicles [1996] OJ L 92/23.

Suddenly, the European Union, with the Council Decision 97/836/EC<sup>243</sup> has joined the agreement of United Nations Economic Commission for Europe (UNECE)<sup>244</sup> and, subsequently, the Directive of the European Parliament and of the Council 46/2007,<sup>245</sup> outlined the general framework within which are provided more detailed technical rules elaborated by the UNECE. Thanks to harmonization, the UNECE Member States have conventionally adopted mutually recognized uniform standards, allowing producers to operate in a homogeneous context.

About the first question, i.e. the relationship between safety standards and civil law regulation on producer's liability, it is important that the public safety standards are established for each specific subcategory of producer (designer, manufacturer, and informant). According to this, producer's liability has a relative character. It means that the responsibility must be evaluated concretely on the basis of the applicable standards.

The second issue is to establish whether compliance with safety standards represents only a minimum or maximum producer's liability threshold. In general, safety standards are intended as minimal requirements, which merely allow the distribution of the product on the market. Indeed, as settled in the article 7, letter d) of the PLD, the liability is excluded only if the damage occurred because of the specific feature set by a legal rule.<sup>246</sup> Furthermore, the existence of a higher level of

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<sup>243</sup> Council Decision 97/836/EC of 27 November 1997 with a view to accession by the European Community to the Agreement of the United Nations Economic Commission for Europe concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted to and/or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions [1997] OJ L 346/78.

<sup>244</sup> United Nations Economic Commission for Europe (UNECE) ratified in Geneva in 1958.

<sup>245</sup> Directive of the European Parliament and of the Council 2007/46/EC of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles [2007] OJ L 263/1.

<sup>246</sup> E. Al Mureden, 'Sicurezza "ragionevole" degli autoveicoli e responsabilità del produttore nell'ordinamento giuridico italiano e negli Stati Uniti' (n. 135)1524 f., believes that, if the producer's liability is configured only in case of non-compliance with the legal standards, his responsibility

safety standard, which has actually been achieved by other producers (c.d. alternative design),<sup>247</sup> may be suitable for configuring producer's liability even though he had respected the safety standards.<sup>248</sup>

After analysing the PLD, we now need to specify how the European Commission intervenes and what it has foreseen with the last quinquennial report (the fifth for precision) on the PLD<sup>249</sup> which is complemented by an evaluation of the directive.<sup>250</sup>

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should be excluded in the hypothesis of failure to pass the much stricter tests carried out by consumer associations or independent bodies, such as the European New Car Assessment Program (Euro NCAP), which deals with defining the methods for assessing the passive safety of new vehicles by means of specific test protocols. A Bertolini, E Palmerini, 'Regulating robotics: A challenge for Europe' (n 46) 107 ss., instead, they underline that the most appropriate approach is to carry out an analysis on a case-by-case basis, verifying compliance with the European Convention for the Protection of Human Rights and Fundamental Freedoms (ECHR) and the applicable principles. The authors also examine the ESOS (Energy Savings Opportunity Scheme) and ISO (International Organization for Standardization) standards to evaluate the existence of producer's liability. Furthermore, for the analysis of the concrete case, many other factors must be taken into account and, as example, in addition to the technical aspects, the competitive market and its trend, the impact of technology on the production system and so on.

<sup>247</sup> In the United States of America, compliance with legal standards is only a necessary condition for obtaining vehicle type approval, but not sufficient to exclude producer responsibility, which would persist if so-called alternative design could be configured. However, in order to avoid excessive producer responsibility, the legislator has introduced explicit or implicit preemption clauses for which the producer's liability for damages resulting from the defective product that complies with legal standards is excluded.

<sup>248</sup> U Carnevali, 'Il difetto di progettazione negli autoveicoli' (2011) 10 Resp. civ. e prev, 2110, comments the decision of the Italian Court of Pisa, Judgment, 16 March 2011 concerning the case of a moped that, burning after the impact with a wall, had caused serious damage to the driver of the same. The author states that the Judge had found that in other vehicles of the same category there was no such defect. He points out how the comparison with similar vehicles is of particular importance as it can be deduced from the fact that the judgment did not attribute to the producer the fact that he had not adopted merely theoretical design choices, but the fact that he had not adapted to design choices concretely adopted by from competitors.

<sup>249</sup> European Commission Report to the European parliament, the Council and the European economic and social committee, of 7 May 2018, on the application of the Council Directive on the approximation of the laws, regulations, and administrative provisions of the Member States concerning liability for defective products (85/374/EEC) (COM(2018)246 final). The reporting period is 2011- 2017 during which the EU Commission declares that did not receive any complaints or launch any infringement proceedings. At the same time, though, the EU Commission mean PLD does not cover all aspects of product liability. Indeed, there is space for different national approaches (e.g. on systems to settle claims for damages, or on how to bring proof of damage). Member State may also introduce or maintain other national instruments for the product liability based on fault and not on strict liability.

<sup>250</sup> European Commission Staff Working Document, of 7 May 2018, on the evaluation of 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 SWD(2018) 157 final. The evaluation aims to assess the «functioning and the performance» of the PLD for the period 2000-2016 and it covers the EU-28 Member States.

In the Report, EU Commission highlight that the PLD was one of the first pieces of EU legislation that explicitly aimed to protect consumers and that introduced the concept of strict liability which has been already explained. The PLD complements EU product safety legislation and the so-called ‘New Approach’ to product safety, that aims to prevent damages by setting common safety rules. Those safety rules cover the majority of products available on EU markets. What is observed by the EU Commission, and this is the most important point for the interpretation of the PLD, is that from 1985 many years have passed. Many products available today on the market have characteristics that were considered science fiction in the past century and our society has to face new challenges related to digitisation, the Internet of Things, artificial intelligence (included Robotics) and cybersecurity.<sup>251</sup> Which specific reference to AI, the Communication of the European Commission, as already said, defined it as one of the most important technologies of the 21st century and focused in maximising the benefits of AI.<sup>252</sup> In this context, product safety and liability is a fundamental aspect in finding of a policy response that enables European societies, businesses, and consumers to benefit from artificial intelligence and also to addresses legal challenges.

Respecting the EU Commission evaluation of the PLD, it has been carried out an evaluation of the PLD to assess its performance, as the directive has never been evaluated since its entry into force. The Commission started from the ‘intervention

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<sup>251</sup> European Commission Report on the application of the Council Directive concerning liability for defective products (COM(2018) 246 final, 1 f.

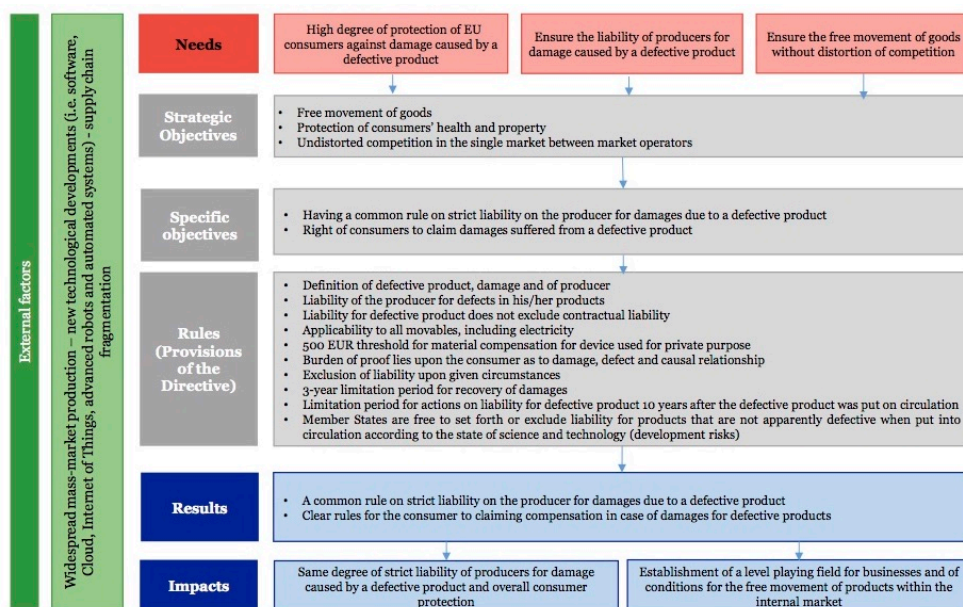
<sup>252</sup> European Commission Communication on Artificial Intelligence for Europe (COM(2018) 237 final), 18 f..

logic of the Directive', that is summarised below in the figure no 4.<sup>253</sup> The figure represents three main needs which the PLD should satisfy: consumer protection against damage caused by a defective product, producer's liability for the damage caused by a defective product, and the free movement of good in the single market without distortion of competition. These needs led to the definition of three strategic objectives, namely the free movement of goods, the protection of consumer's health and property, and an undistorted competition among market operators in the single market. Finally, the three strategic objectives are translated into two specific objectives: common rules on strict liability for producers and the right for consumers to claim damages, which represents the operational orientations of the PLD. These strategic and specific objectives are achieved through the set of rules listed in the figure. Applying the text of the PLD to date, in the intervention logic are also considered external factors which may influence the performance of the Directive: Widespread mass-market production and new technological developments. This second factor is the one on which we will focus.

**Figure no. 4 – Intervention logic of the directive**

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<sup>253</sup> Commission Staff Working Document, Evaluation of Council Directive 85/374/EEC, (SWD(2018)157), 7.



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Study for the evaluation of the Directive.

In the light of the latest technological developments, EU Commission has considered necessary to verify the following aspects. First of all, (1) the effectiveness of the PLD in achieving its original objectives, i.e. product liability in the double sense of protection of competition in the single market and protection of the damaged party.<sup>254</sup> In this perspective, on one hand, the industry seems to be dissatisfied with the Directive criteria on product liability. On the other hand, consumer organisations criticise that it is difficult for injured persons to prove the link between damage and defect, particularly because they have to advance any cost related to bringing this proof and because they have not sufficient technical information about the product. Anyways, with specific reference to new technologies, the lack of information about specific case-law or consumer compliant it does not allow to make a final decision on the effectiveness of the PLD.

<sup>254</sup> Ibid, 21 ff.



The second aspect is (2) the efficiency of the PLD in protecting the interests of the producers and of the consumers, which are direct trade-off: what is to the benefit of the injured persons (i.e. the burden of proof, the 500,00 euro threshold and time limitation) is the producers' cost (strict liability) and vice versa.<sup>255</sup> From this point of view, the balance between these mentioned costs and benefits is not uniform across Member States, sectors or product types; so it is not easy to decide about the efficiency of the directive. However, the EU Commission believes that the Directive is efficient in delivering a stable legal framework for the single market and for harmonising consumer protection. Then, it is essential to ensure (3) the coherence of the PLD with the EU relevant rules which regulates the single market, promotes the innovation, with specific regard to new technology and protect the consumer's interests (safety and well-being).<sup>256</sup> On the base of the evaluation, the PLD seems to be consistent with the overall EU mentioned rules. In fact, it appears that there are no problems concerning the collocation of the PLD in the context of the existing European regulation (the one relating to safety above all) but the issues are related to (4) the PLD relevance by embracing recent technological changes, which have a considerable impact on the legal terms used<sup>257</sup> (e.g. the definition of producer, product, defect or damage)<sup>258</sup>. Thirty years have passed since the PLD came into force and so it seems logical that, in light of the

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<sup>255</sup> Ibid, 37 ff..

<sup>256</sup> Ibid, 43 ff..

<sup>257</sup> Ibid, 49 ff..

<sup>258</sup> European Commission Report on the application of the Council Directive 85/374/EEC (COM(2018)246 final), 10: «Some of the concepts that were clear-cut in 1985, such as 'product' and 'producer' or 'defect' and 'damage' are less so today. Industry is increasingly integrated into dispersed multi-actor and global value chains with strong service components<sup>28</sup>. Products can increasingly be changed, adapted and refurbished beyond the producer's control. They will also have increasing degrees of autonomy. Emerging business models disrupt traditional markets. The impact of these developments on product liability needs further reflection. At the end of the day, a producer is and needs to be responsible for the product it puts into circulation, while injured persons need to be able to prove that damage has been caused by a defect. Both producers and consumers need to know what to expect from products in terms of safety through a clear safety framework».

rapid development of new technologies, at least the legal interpretation of some concepts and terms therein must be reviewed in order to include new product such as self-driving cars. Last but not least, is (5) the EU added value to businesses and injured persons.<sup>259</sup> About this last point EU Commission's goal is to ensure that the EU continues to have a product liability regulation that promotes innovation, safe products placed on the EU market, and injured party because of defective products are able to claim compensation. It is not clear how the EU Commission states that the PLD provides uniform consumer protection, as it does not consider new product characterised by AI and the consequent consumer safety. Contemporary, though, we agree with the affirmation that repealing the Directive would lead to fragmentation of consumer protection, as would be in force only apply national rules on contract or tort law.

In conclusion, it is important to underline that, with the advent of the emerging digital technologies, the Commission will open a public consultation with all stakeholders<sup>260</sup> and will reach a common understanding and to draw up comprehensive guidance on how to apply the PLD today. This guidance should help to provide a product liability framework fit for the digital technologies industrial revolution. In mid-2019 the EU Commission will issue this guidance on the PLD and, at the same time, will issue a report on the broader implications for, and potential gaps in the liability and safety frameworks for AI, Internet of Things and robotics.<sup>261</sup> If necessary, the Commission will also update certain concept and terms of the Directive in order to adapt the Directive to the digital age.<sup>262</sup>

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<sup>259</sup> Commission Staff Working Document, Evaluation of Council Directive 85/374/EEC, (SWD(2018)157), 57 ff..

<sup>260</sup> Ibid., 2.

<sup>261</sup> Already in 2016, in the Digitising Industry Communication and in the related SWD, the EU Commission indicated that it would be examined the emerging issues of data ownership, access, and

## 1.2. Imputability of damage caused by an autonomous vehicle.

The question of the imputability of the damage deriving from road traffic, as has been shown, is not easy to solve at all. In this sub-section, we will try to identify the hypotheses in which driver's liability is configurable and those in which the liability is to be attributed to the producer.

As demonstrated by the DEKRA study as early as 2011,<sup>263</sup> more than ninety percent of road accidents are due to incorrect driver behaviour, while less than ten percent is a consequence of defects in semi-autonomous vehicles. The DEKRA scholars have pointed out that the main causes of motor accidents caused by the driver's fault are due to failure to comply with speed limits, immediately followed by cases of alcohol intake, overtaking and incorrect use of the road (motor racing in urban streets, cars parked on second and third row, etc.).

Furthermore, technology is at the service of man and, as the DEKRA study of 2015 demonstrates,<sup>264</sup> increases the level of road safety. However, incorrect use of technological devices can negatively affect it. This is the case of distractions due,

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processing of personal data, as well as safety and liability related to IoT, robotics and automated systems (e.g. driverless cars). *See* Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, of 19 April 2016, on Digitising European Industry Reaping the full benefits of a Digital Single Market (COM(2016) 180 final); European Commission Staff Working Document, of 19 April 2016, on the advancing the Internet of Things in Europe, accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Digitising European Industry Reaping the full benefits of a Digital Single Market (SWD(2016) 110/2).

<sup>262</sup> European Commission Report on the application of the Council Directive 85/374/EEC (COM(2018)246 final), 11.

<sup>263</sup> DEKRA study 2011 (n 41) 2010.

<sup>264</sup> DEKRA, study 2015 (n 42) 2015.

for example, to the use of the navigator to set a place to be reached or the radio to select a music channel, while the driver is already on the march, or, again, of distractions due to the use of mobile phone in direct mode, instead of using voice commands after connecting the mobile phone to the vehicle via Bluetooth (technology that owns all new generations of cars). In the same way, the excessive amount of attention signals of the technological devices on-board the vehicle could cause confusion in the driver, who would not know how to intervene. Finally, the more a vehicle drives autonomously, the more the driver's attention to the driving environment tends to decrease (the driver could, in fact, be induced to take care of other things and not be able to promptly resume the vehicle controls in case of emergency).

In this regard, it has been found that the attentive driver should be held in autonomous vehicles accident.<sup>265</sup> This conclusion was reached after analysing the profiles of four different types of drivers: (1) the distracted driver, (2) the diminished capabilities driver, (3) the disabled driver and (4) the attentive driver.

The distracted driver (1) is that subject who does not pay attention to the road or to the surrounding environment. In the case of vehicles equipped with a low level of

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<sup>265</sup> JK Gurney, 'Sue My Car Not Me. Products Liability and Accidents Involving Autonomous Vehicles' (n 11) 255 ff.: «The Distracted Driver is the autonomous car user who is not paying attention; it could be someone reading a book like Sarah, using a cell phone, eating a snack, or any other situation. Essentially, the Distracted Driver purposefully engages in a task other than driving, thus relying on the autonomous vehicle completely. [...] The Diminished Capabilities Driver is the person whose driving capabilities are diminished for some reason; it could be an elderly person like Richard, an intoxicated person, or a minor. This person typically would not be driving because of his or her diminished capabilities and would have to rely on others. Thus, the Diminished Capabilities Driver could benefit greatly from the convenience and independence an autonomous vehicle provides. [...] The Disabled Driver is the person who cannot drive a traditional vehicle because of a physical disability, such as blindness or an amputated limb. Thus, the Disabled Driver relies entirely on the autonomous nature of the car in that he or she can take control - just not safely - of the autonomous car in the event of a computer malfunction. [...] The Attentive Driver, like Tucker, is the user who watches the road and surroundings in the same way he or she would while driving a traditional vehicle. The Attentive Driver may not trust the autonomous ability of the vehicle such that he or she constantly checks that the car is driving correctly, or the Attentive Driver may simply not have any other tasks to address while in the vehicle. The key is that the Attentive Driver has the potential to foresee and prevent accidents, unlike the Distracted, Diminished Capabilities, and Disabled Drivers».

automation<sup>266</sup> where the driver is driving (i.e. until level 2 of automation of the SAE J3016 standard), the driver is considered distracted if, while driving the vehicle, performs other activities which are not compatible with the driving tasks. In the case of vehicles with a high level of automation, but on completely autonomous, (i.e. levels 3 and 4 of automation of the SAE J3016 standard) the distracted driver is the one who performs activities totally incompatible with the driving tasks not being able to resume vehicle control when necessary.

The distracted driver is held liable for most car accidents caused by a vehicle with a lower or higher level of automation. On the contrary, when the vehicle is completely autonomous, the driver is not required to take any driving activity, neither in the event of a malfunction of one of the technological devices, and the producer of the same will be responsible.

For diminished capabilities drivers (2) it is referred, for example, to the elderly, minors and individuals who use alcohol or drugs. Instead, the expression disabled driver (3) concerns, as indicated by the same term, subjects with disabilities. For these two categories of subjects (the diminished capabilities driver and the disabled driver) there will be the obligation to compensate the damage to the injured party in case they drive the vehicle equipped with ADAS in a distracted or negligent manner, but these categories of subjects are expected to have higher protections, required precisely for their particular physical and/or psychic conditions. Indeed, an elderly person or a disabled person can not have the same alertness and capacity for action as a driver of average age and without health or mental problem. Finally, there is the attentive driver (4), that is the driver who drives the vehicle and supervises the ADAS, paying attention to the road and everything related to it

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<sup>266</sup> At a low level of automation corresponds to a moderate level of AI, with the increase of automation, the level of AI also clearly increases.

(automotive signals, weather conditions, information provided by other the automatic devices, etc.). In this regard, it was considered that the attentive driver has the possibility to prevent or even avoid the vehicle accident, unlike the other types of driver examined above and, therefore, should be held liable in case of failure to intervene, if the vehicle it was not completely autonomous.

The percentage of cases in which the semiautonomous vehicle producer is liable, as we have said, would appear to be considerably lower than that in which the driver or the owner of the vehicle are responsible, even if the joint and several liability of the producer with the driver or the exclusive liability of the producer can be configurable in the event of a vehicle defect (cases that increase proportionally as the level of automation increases). However, the producer of a completely autonomous vehicle appears to be the only one responsible for collisions, as these would be caused by a malfunction of the vehicle's operating system or a component part.

The aforementioned article 1 of the PLD provides that 'The producer shall be liable for damage caused by a defect in his product', in any case, the exception is the hypothesis in which the producer is acting respecting the product safety standards (which, as repeatedly said, delimits the minimum threshold of producer's liability which also the limit of the alternative design).<sup>267</sup> Moreover, the rules that the producer must comply with regard to the design phase, the manufacturing phase, and information phase; for each phase, different rules are set. Failure to comply with these rules entails the obligation, on one or more producer types, to compensate the damage suffered as a result of a defective product; a product that,

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<sup>267</sup> N Kalra, J Anderson, M Wachs, 'Liability and Regulation of Autonomous Vehicle Technologies' (n 49) 22 ff.

in the cases we deal with, will be an ADAS or the on-board computer of the autonomous vehicle.<sup>268</sup>

On the basis of the legislation examined (in particular the PLD) there are some fundamental aspects that the designer should take into consideration, in order to not be held liable of the damage caused by the defective vehicle. First of all the designer should evaluate the actual need for information provided to the driver by the ADAS, inserting only those necessary to make the driver understand what to do and not the extra ones that would only risk confusing him.<sup>269</sup> Secondly, the designer should conduct an ergonomic analysis of the same electronic devices, i.e. a study on the interaction between the ADAS and the function for which they are designed, in order to improve the overall performance of the system and the driver's satisfaction. The analysis of the acceptance by the driver of the automatic systems, based on the Human-Machine Interface analysis (HMI), is also extremely important, with particular regard to the behavioural changes of the driver who interacts with these new technologies. In addition, assistance systems must be included in vehicle approvals and therefore the designer who designed the

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<sup>268</sup> In this regard, the so-called Machinery Directive 2006/42/EC intervened to harmonize the health and safety requirements that machinery must have and to allow the free circulation of products conforming to it within the European market. Autonomous vehicles would fall under the category of 'machines' provided by article 1, letter a) of the Directive and explained in its art 2. It regulates the obligations that producers must respect in order to be able to place the product on the market (Article 5, Directive 2006/42/EC). In particular, the producer must ensure that the machinery meets the essential health and safety requirements and, in addition, must provide the consumer with all the necessary warnings. Before being placed on the market, the product must positively pass the procedures for assessing the conformity of machinery provided in article 12 of the Directive. At the end of these procedures, according to Article 16 of the Directive, the manufacturer can issue the EC marking as declaration of conformity. Regulation of the European Parliament and of the Council 765/2008/EC of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93 [2008] OJ L 218/30, regulates the marking procedure, by which the producer assumes responsibility for the conformity of the product with the EU rules. Further obligations on producers are provided by the Directive of the European Parliament and of the Council 1999/44/EC of 25 May 1999 on certain aspects of the sale of consumer goods and associated guarantees [1999] OJ L 171/12.

<sup>269</sup> With regard to the drive of an autonomous vehicle, it should also change the requirements of the driving license, including the understanding and interaction with the ADAS and the on-board computer, characterised by a more or less high level of AI.

automatic devices approved together with the approval of the vehicle on which they are installed can not be held responsible for any damage caused by the same product. With respect to the instructions, on the other hand, it is essential that they are clear and easily understood by the category of the average consumer, that is, by subjects who are not professionals in the automotive sector but who have, in any case, a minimum level of general knowledge.

According to an economic analysis of the principles of non-contractual civil liability, the risk of the accident and of the consequent damages compensation should weigh on the person who can economically bear it.<sup>270</sup> In a logic of the correct allocation of risk, it is evident that the owner of the vehicle, that is the person who purchased it, is economically stronger than the driver of the vehicle. With the achieving of a high level of automation, then, the responsibility progressively passes to the producer,<sup>271</sup> but the driver's liability remains if the accident is due to his negligent behaviour. In this scenario, it is clear that the producer can bear the economic risk of damage, even better than the owner of the vehicle, in particular by providing an *ad hoc* professional insurance.<sup>272</sup>

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<sup>270</sup> G Calabresi and DA Melamed, 'Property Rules, Liability Rules, and Inalienability: One View of the Cathedral' (1972) 85 Harvard Law Review, 1096 f., state that the ability of the tortfeasor to prevent a given damage is taken into account, together with other conditions such as the ability of the same party to lower transaction costs.

<sup>271</sup> The choice of producer's liability could be justified based on the ability of the producer to (better) insure himself and therefore handle costs associated with the production and distribution of the product (including transaction costs). C Castronovo, *La nuova responsabilità civile* (n 109), 687.

<sup>272</sup> According to an authoritative literature we could even talk about 'absolute liability' (which came from the common law legal system) that is even stricter than the objective liability, as there is the only proof that the fact was not unlawful.



### **1.3. Extensively application of existing legislation versus the need of an *ad hoc* framework of rules for self-driving cars.**

This work started from a *de jure condito analysis* and has tried to demonstrate that current civil liability regulation in road traffic (in-depth in chapter III) is not a functional regulatory tool for to the protection of the injured person in the event of a self-driving car accident. More precisely, the liability rules in road traffic regulates the liability of the driver or of the owner (and the subject similar to him) in the circulation of traditional vehicles, and could be applied only to human-driven vehicles and, at most, to semi-autonomous vehicle until the most important driving commands are in the power of the human driver, who have to monitor the environment (i.e. until level 2 of automation of the SAE J3016 standard). Undoubtedly, also in these cases, if the accident was caused by a product defect the driver/owner of vehicle, condemned to the compensation for damages, has the right of recourse against the producer of the vehicle or of its defective component part. Alternatively, in the litigation phase (and therefore before the condemnation) the examination of the specific case will allow to ascertaining whether it is a hypothesis of joint and several liability of the driver/owner and the producer or whether it can instead be considered exclusively liable one of them. In this light, the importance, supported by many parties, of the introduction of Data Sharing or Data Record systems, which make it possible to check whether at the time of the accident the vehicle was in autonomous or manual driving mode, emerges.

With higher automation (i.e. levels 3, 4 and 5 of automation of the SAE J3016 standard), instead, the role of the driver is progressively lost because the vehicle drives itself and all the on-board users are considered passengers, to whom the liability in road traffic is not applicable. In this case, as the vehicle was concluded

by a person, who is the owner of the vehicle, for the mere fact of having purchased the vehicle it is on the owner that bears the risk of a possible accident and the consequent compensation for the damage. At the same time, however, the autonomous vehicle is a product and as a product falls within the scope of the PLD which, it seems to be the more functional regulation to protect the interests of the parties.<sup>273</sup> Nevertheless a few doubts also arise regarding the PLD because it does not take into account the impact that new technology had in terms of new damages and the new party involved, since the directive came into force more than thirty years ago, as already highlight, and so is not keep up with times. For this reason, PLD does not appear sufficient for a complete and systematic regulation of autonomous vehicles and it is necessary to carry out a *de iure condedno* analysis in order to verify: (1) if the PLD could be applicable by legal analogy or extensively or (2) whether it is necessary to modify the existing regulation or introduce an *ad hoc* one.

The EU Commission reported the PLD seems to be an adequate regulatory tool, even though today products are much more complex. However, the same Commission observed that it is necessary to clarify the legal understanding of certain concepts applied to new technologies (such as product, producer, defect, and damage) and look closely at certain products such as autonomous vehicle, which may pose a challenge to the performance of the Directive.

As explained in chapter II, the autonomous vehicle is a robot, precisely an artificial intelligent robot. It falls within the product category but the problem concerns the

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<sup>273</sup> C Reed, E Kennedy, SN Silva, 'Responsibility, Autonomy and Accountability: legal liability for machine learning (n 45) 5 explain that the product liability could be a good option for regulating machine learning damage (included that coming from self-driving cars) but, because it is a new technologies no laws have yet in force.

link between the product and the autonomous vehicle, as the latter is a product that has considerable peculiarities, first and foremost that of the AI.

One wonders, therefore: Can the producer be liable for an accident brought about by a self-driving car? The answer is yes and the PLD could be applied, as the EU Commission states. As a matter of fact, even the abilities to intelligently interact with the surrounding environment and, in the higher automation level, the ability to learn, it is not enough to identify the robot (and so the self-driving car) as a subject whose actions could be considered the consequence of self-determination and awareness. Even if the robot can, in some cases, be autonomous and not predetermined in its interaction, from a legal point of view it is an object and, more precisely, a product.<sup>274</sup>

It remains to be determined whether to apply the PLD by legal analogy or extensively.

Every national legal system is endowed with the character of completeness:<sup>275</sup> it can not admit to have a regulatory gap, but it must be able to give a solution to every possible conflict that is generated among those who are subjected to that legal system. However, the legislator can not foresee all possible conflicts, establishing as a rule for every possible case. Therefore, to fill the inevitable gaps the art. 12, section 2, of the preliminary provision to the Italian Civil Code,

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<sup>274</sup> See A Bertolini, 'Robots as Products: The Case for a Realistic Analysis of Robotic Applications and Liability Rules' (n 12) 235 ff., who also affirm that the issues of liability involving robotic applications fall within the product liability rules.

<sup>275</sup> The only binding interpretation is the so-called authentic one, which is the interpretation that comes from the same organ that issued the rule. This interpretation has the function of clarifying the doubts raised by the relative application, through the preceptive indication of the meaning to be attributed to the standard retroactively (through the so-called interpretative rules). When this does not occur, the method of interpretation referred to in the first paragraph of article 12 of the preliminary provisions of the Italian Civil Code, which makes express reference to the literal interpretation and to the logical-systematic one. Even if not expressly foreseen, it is common ground that a third criterion of interpretation is that of the extensive interpretation. Finally, when neither type of these interpretations is suitable, the analogical interpretation is applied.

requires to provide for the analogical application of the law. If a dispute can not be decided by a specific provision, the provisions regulating similar cases or similar matters have to be applied (so-called '*analogia legis*').<sup>276</sup>

It may happen that the judge not only does not find a law that provides for the case to be solved but also does not find rules relating to similar cases to similar matters, of which to make analogical application. In this case, he will have to decide according to the general principles of the legal system (so-called '*analogia iuris*', provided by same article 12, section 2).<sup>277</sup>

In the case under our investigation, i.e. the case of the law applicable to autonomous vehicles, a regulation already exists. In particular, there are two regulations: that of the law on road traffic (applicable up to level 2 of automation and then less and less with the increase of automation) and that of product liability (fully applicable from level 3 of automation). Already existing a normative regulation of the product liability and re-entering the autonomous vehicles in the concept of product, one does not see why has been applicable the PLD by analogy. On the contrary, the issue of the application of the PLD to the driverless cars is a question of adequacy of the product liability rules.<sup>278</sup> The PLD, under for some concepts and certain terms already individuated, it is ineffective to regulate autonomous vehicles organically. In this context, the possible solution could be the

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<sup>276</sup> The analogical application, however, encounters a double limit, that are two cases where interpretation by analogy can no be applied, and are regulated under art 14, preliminary provision to the Italian Civil Code: the criminal rules (as also provided by art 1 of the Italian Criminal Code) and the exceptional norms, i.e. those that make exceptions to the general rules.

<sup>277</sup> These are not principles enshrined in textual laws (otherwise the judge would have a legal provision to be applied directly), but they are unwritten principles that are derived by induction from a plurality of rules and which represent the basic principles that appear to have been inspired by the legislator.

<sup>278</sup> See A Bertolini, 'Robots as Products: The Case for a Realistic Analysis of Robotic Applications and Liability Rules' (n 12) 235 ff..

extensively interpretation<sup>279</sup> of the existing legislation on product liability in order to fully re-enter in the scope also the driverless car.

At the same time, however, in a scenario characterized by legislation that does not keep up with the technological era, it seems extremely important the intervention of the European legislator, in order to regulate the new liability profiles deriving from accidents caused by an autonomous vehicle. For this reason, we need sector-specific laws for self-driving cars: the differences between the different robotics applications are too significant to allow for a single ‘law of robotics’.<sup>280</sup> As there is a specific normative discipline for traditional vehicles, so is needed one for autonomous vehicles, which will favour the development and diffusion of full autonomous vehicles. This desirable legislative reform should be composed by hard law, i.e. a specific binding legislation such as a directive (which is immediately applicable in all the European Member States), soft law as, for example, Ethical code, and techno-regulation, which is the ability of the technology to make law and not only to be the object of law.<sup>281</sup>

In order to develop an effective approach for the automotive industry, the European Commission established the High Level Group (HLG) GEAR 2030 in October 2015. The group brought together European Member States’ authorities and stakeholders who represent the industry, services and consumers. The HLG stresses that Europe needs a strong strategy on automated and connected vehicles

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<sup>279</sup> The interpretation according to the intention of the legislator can give rise to the so-called extensive interpretation of the law, with which the words of the law are given a broader meaning than the literal one.

<sup>280</sup> U Pagallo, *The Law of Robots: Crimini, Contratti e Tors* (Springer 2013), inaugura il campo della legge dei robot, dal punto di vista dei filosofi legali e degli esperti di diritto positivo. In particolare, i filosofi legali sottolineano tre livelli di robot responsabili, cioè persone giuridiche, agenti appropriati e fonti di responsabilità per altri agenti sistemici; l'esperto di diritto positivo, invece, approfondisce i tre campi legali del diritto, cioè le leggi penali, contrattuali e illecite.

<sup>281</sup> A typical example of techno-regulation is represented by the data protection by design, introduced by the art 25 of the GDPR, which expressly provide that the product itself, thanks to the way it has been designed, has to guarantee the protection of the personal data of the data subject.

in the run-up to 2030 and beyond, as already underlined in the Amsterdam Declaration of 2016. These technologies are already coming to the EU single market in line with a global trend and represent challenges and opportunities for the EU policies and competitiveness. In the report, the HLG affirmed that there is a need to develop rules on data recording (i.e. through black boxes) and associated data access rules, as well as traffic rules and vehicle rules in a coherent manner within the respective responsibilities at European and national levels. This also calls for an EU legal framework, which should encourage the necessary investment in autonomous vehicles and in connected infrastructure.<sup>282</sup>

## **2. The need of an effective insurance policy for autonomous vehicle.**

### **2.1. Principles of insurance that guarantee a high level of protection in the ‘autonomous’ traffic flow.**

The convergence between technology and automotive innovation is revolutionizing the way we drive and move, and this will certainly have a significant impact on the insurance market. A white paper published by KPMG, in 2015,<sup>283</sup> already affirmed that the transition to autonomous vehicles could lead to one of the most significant changes ever in car insurance. The white paper analysed the feedback from senior insurance managers, whose companies provide a total of

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<sup>282</sup> ‘Ensuring that Europe has the most competitive, innovative and sustainable automotive industry of the 2030s and beyond [2017] GEAR 2030, High Level Group on the Competitiveness and Sustainable Growth of the Automotive Industry in the European Union final report.

<sup>283</sup> ‘Marketplace of change: automobile insurance in the era of autonomous vehicle [2015] KPMG white paper.

85 billion of dollars in insurance policies for commercial and private vehicles. Specifically, the KPMG document outlines eight key elements that will give rise to a new standard for the insurance industry: (1) Integrity of technology, (2) Capability accessibility, (3) infrastructure availability, (4) regulatory permission, (5) legal responsibility, (6) Consumer adoption, (7) Mobility service, (8) Data management.<sup>284</sup>

The paper also highlights a significant point: only 29% of the insurance managers interviewed believe they possess the necessary understanding and knowledge related to autonomous vehicles and only 10% said they have already started to develop a strategic plan to deal with the impact of the innovation in the transport sector.<sup>285</sup>

This gradual adoption of increasingly intelligent and autonomous vehicles, implies that there will be an evident car accidents reduction, especially considering that 90% of them are the result of human errors.<sup>286</sup> At the same time, however, eliminating human error from the equation could lead to a scenario in which the insurance market would lose 40% of incomes in 2040, compared to those of 2013.<sup>287</sup> This, in turn, will strongly influence the car market, modifying its business models.

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<sup>284</sup> Ibid, 3 ff. In particular, as exposed in the KPMG white paper: (1) the integrity of technology for the autonomy in part already exist, and in the next future there will be an exponential development of it; (2) the capability accessibility is the vehicles connection through the Internet; (3) infrastructure availability is the initial technology embodied in the vehicles which will be developed in the infrastructure too, expected to become increasingly smart; (4) regulatory permission for test and drive autonomous vehicles; (5) legal responsibility and insurance policy, (6) consumer willing use self-driving cars, one have understood its benefit;, (7) Mobility service, as convenience and reduced cost for the user; (8) management of the data required and generated by the mobility.

<sup>285</sup> Ibid, 23.

<sup>286</sup> Ibid, 25.

<sup>287</sup> Ibid 27.

Nonetheless, the evaluation of a risk management placed at the basis of the definition of the insurance premium, is based on the definition of its frequency and its severity. These aspect are difficult to analyse due to (a) the technical complexity of robotic devices (included driverless cars), (b) the lack of sufficient data with respect to the potential risks and the accidents they may cause, (c) the uncertainties with respect to liabilities that producers and users may face (as already explained).<sup>288</sup>

However, despite the difficulties of the case and considering the strong impact that autonomous vehicles will have on the insurance system, it is necessary trying to focus the principles that can ensure a high level of protection for the parties involved.

In the case of autonomous vehicles, the aspect that in practice really affects the injured party is to obtain compensation for damage. Therefore, even more than identifying the tortfeasor, it is important to establish who should compensate the damage, given that the tortfeasor and the other subjects called to compensate the damage may not coincide. This happens in all cases of a car accident in which compensation is paid not by the person held liable (driver and/or owner of the vehicle), but by the insurance company of the injured party, if the direct compensation scheme is applied, otherwise from t insurance company of the tortfeasor.

Secondly, it is necessary that the injured person can always obtain compensation for the damage suffered. For this reason it is essential to maintain the current system of compulsory insurance, in the sense that, in the case in which the duty of mandatory insurance bears on the owner, the vehicle can not be put into

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<sup>288</sup> A Bertolini and others, 'On Robots and Insurance' (n 45) 6.



circulation if the owner is not insured or, on the contrary, the case in which the duty of mandatory insurance bears on the producer, the vehicle can not be placed on the market if the producer is not insured. At the same time, an *ad hoc* fund should be provided for cases in which the injured party does not have an insurance company to claim. It happens, for example, when the owner or producer of the vehicle is not insured or the owner of the vehicle that caused the accident is unknown.

Finally, an assessment should be made on the amount of the insurance premium, evaluating its variations based on the development of artificial intelligence in vehicles. A possible solution could be to evaluate the increase or decrease of the insurance premium in relation to the percentage of car accidents involving vehicles equipped with ADAS and, in an evolutionary way, autonomous vehicles. In our opinion, the new on-board technologies imply a reduction in accidents and therefore a consequent reduction in the insurance premium.<sup>289</sup> This solution would seem to be consistent with the two cornerstones on compulsory insurance. The first point<sup>290</sup> concerns the exceeding of the limit of fault as the sole criterion for imputation of liability, as already widely analysed, both in the responsibility of the driver and in that of the producer.<sup>291</sup> The second point, instead,

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<sup>289</sup> In this context, in Italy the art 132 ter, letter b), Italian Private Insurance Code, provides the duty for the insurer to apply a compulsory discount in the event that on-board the vehicle are installed or are already preexisting electronic mechanisms that record the activity of the vehicle, called 'black box' or equivalent. After this first phase, as the vehicles become more and more autonomous and, at the same time, the driver will be denied the possibility of intervention during the driving phase, the responsibility will pass entirely to the producer, since there is no longer any subject qualifying as a driver. This will correspond to a new allocation of risk, which will probably result in an insurance system parametrised no longer on the driver but on the characteristics of the vehicle itself.

<sup>290</sup> M Franzoni, 'Il danno risarcibile', in *Trattato della responsabilità civile*, 1 ff..

<sup>291</sup> In fact, as already explained, there is the semi-objective liability of the designer or the informer, and the strict liability of the manufacturer. Likewise, to the semi-objective liability of the driver is added the strict liability in certain cases expressly provided by the law.

concerns the development of a formula that always guarantees compensation for the damage occurred.

Those mentioned above are only some of the possible problems related to the insurance of assisted and autonomous vehicles. The insurance challenge imposed by the phenomenon of self-driving cars is precisely that of relating to a broader and series of insurance scheme, which requires the rethinking of the current automobile insurance model.

## **2.2. What should concretely provide an efficient automobile insurance policy.**

Having analysed the evolution of civil responsibility in the light of new technologies, and autonomous vehicles in particular, the objective of this subsection is to verify how the insurance profiles of the compulsory insurance change with the modification of those relating to civil liability. The logical choice is to make sure that the insurance duties fall on the subject who is identified as tortfeasor. However, since there is not a legislation which has solved the problem of establishing who should be held liable when damage arises from the use of a driverless car, it is not even plausible to conceive a one fits all solution. We will try to formulate a rational solution, starting from the state of the art, as it was done for the identification of the tortfeasor.

In figure no. 5, shown below, the levels of automation of the SAE standard have been taken up, identifying the tortfeasor for the accident produced by the vehicle with a more or less high level of automation and, consequently, the person who bears the duty of purchase the mandatory insurance contract. Nonetheless, the real

issue of the identification of the tortfeasor and of the policy holder will only exist once driverless vehicles achieve a high level of automation, and even more, the full automation, becoming completely independent from human control. Otherwise, for the moment, existing liability (driver/owner's liability or producer's liability) and insurance schemes (first of all third-party insurance) may be rather adequate.<sup>292</sup> However, we will try to rebuild below the possible scenarios.

Up to level 3 of automation, would operate the traditional insurance scheme, which foresees the insurance policy of the owner of the vehicle. Obviously, all producers have their own professional insurance that is used to compensate the damage, if this derives from a defect of an ADAS or the software of the vehicle (as already happens for the defects of traditional vehicles). With the increasing of automation level and, therefore, of artificial intelligence, liability is transferred to the producer. This is the case of automation level 4, where, however, the joint and several liability or the exclusive liability of the owner of the vehicle, called to compensate the damage with his own insurance, can be invoked.

Finally, in level 5 of automation, which is that of fully autonomous vehicles, the driver's liability is not configurable because, as repeatedly stated, a driver no longer exists. On the contrary, the responsibility should be of the producer, called to compensate the damage with his professional insurance.<sup>293</sup> Both in the case of

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<sup>292</sup> L Gatt, IA Caggiano, MC Gaeta, 'Italian Tort Law and Self-Driving Cars: State of the Art and Open Issues' (n 14) 25.

<sup>293</sup> In this sense A Bertolini and others, 'On Robots and Insurance' (n 45) 5 f.: Finally, in case the device is autonomous - like a driverless vehicle - the current legal duty to acquire insurance - as currently is the case for the owners of cars under EU Motor Insurance Directive 2009/103/EC - may be plainly unjustified. Indeed, once the device is truly autonomous and the human being cannot interfere with its functioning (not even by supervising and eventually intervening to avoid collision or take over control in some cases), the only party responsible for the functioning of the device will be the producer or designer. [...] Nonetheless, such a problem will only exist once driverless vehicles become completely independent from human control and supervision, while for the moment existing liability schemes and insurance products may prove adequate. In the same sense *see* L Gatt, IA Caggiano, MC Gaeta, 'Italian Tort Law and Self-Driving Cars: State of the Art and Open Issues' (n 14) 29.

the liability of the driver/owner, which in that of the producer's liability, the best solution would seem to be that of a third party mandatory insurance, with the possibility for the insured to include other types of damages, such as his personal or patrimonial damage or vehicle damage.

In order to always guarantee damages to the injured person, then, it is necessary to provide for an *ad hoc* fund<sup>294</sup> on which he or she can have recourse in a residual way, when it is not possible to identify the tortfeasor and/or his insurance. This fund should be European, since most vehicle accidents involve subjects or objects belonging to different Member States and are therefore cross-border. Moreover, the fund, so determined, could be increased by a government tax on autonomous vehicles and entrusted to the management of a specific insurance company, as already done for the so-called Guarantee Fund for Victims of the Road.<sup>295</sup>

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<sup>294</sup> To deepen the requirements of the see fund *see* E Quadri, 'Considerazioni in tema di responsabilità medica e di relativa assicurazione nella prospettiva dell'intervento legislativo' (2017) 1 Resp. civ. e prev. 27 ff.

<sup>295</sup> The Guarantee Fund for Victims of the Road is a compensation body established in implementation of the Strasbourg Convention of 1959 and regulated by the Italian Private Insurance Code in order to compensate: (a) damage caused by an unidentified vehicle or boat; (b) damage caused by a vehicle or a boat identified but not covered by insurance; (c) damage caused by a vehicle or a boat that is insured with an insurance company that at the time of the accident is in a state of **compulsory winding up**; (d) damage caused by a vehicle placed in circulation against the owner's will (e.g. theft); (e) claims caused by vehicles sent to the territory of the Italian Republic by another State of the European Economic Area; (f) accidents caused by foreign vehicles with a licence plate that does not correspond or no longer corresponds to the same vehicle.

**Figure no 5– Liability and insurance policy in relation with the automation level**

SAE level	Name of the automation level	Liability	Applicable law	Insurance Policy
0	No Automation	<b>Driver/Owner of the vehicle</b> (his similar subjects), with the right of recourse against the producer of the vehicle or of its defective component part.	<b>National rules of car accident liability</b> (if necessary identified according to the rules of Private International Law) and eventually European and national Product liability regulation.	Car Insurance policy of the vehicle owner.
1	Driver Assistance	<b>Driver/Owner of the vehicle</b> (his similar subjects), with the right of recourse against the producer of the vehicle or of its defective component part.	<b>National rules of car accident liability</b> (if necessary identified according to the rules of Private International Law) and eventually European and national Product liability regulation.	Car Insurance policy of the vehicle owner.
2	Partial Automation	<b>Driver/Owner of the vehicle</b> (his similar subjects), with the right of recourse against the producer of the vehicle or of its defective component part.	<b>National rules of car accident liability</b> (if necessary identified according to the rules of Private International Law) and eventually European and national Product liability regulation.	Car Insurance policy of the vehicle owner.
3	Conditional Automation	<b>Owner of the vehicle</b> (his similar subjects) and the driver of the vehicle if he had a behaviour that does not comply with his driving tasks.	<b>National rules of car accident liability</b> (if necessary identified according to the rules of Private International Law) and eventually European and national Product liability regulation.	Car Insurance policy of the vehicle owner.
4	High Automation	<b>Owner</b> (his similar subjects) <b>and/or producer</b> of the vehicle	<b>National rules of car accident liability</b> (if necessary identified according to the rules of Private International Law) and/or European and national Product liability regulation.	Car Insurance policy of the vehicle owner and/or Professional insurance of the producer and a compensation fund for autonomous vehicles
5	Full Automation	<b>Producer</b> of the vehicle.	<b>New framework or rules</b> for autonomous vehicles	Professional insurance of the producer and a compensation fund for autonomous vehicles

## Conclusions

This work started from a *de jure condito* analysis of the state of the art and has tried to demonstrate that current civil liability regulation in road traffic is not a functional regulatory tool for to the protection of the injured person in the event of a self-driving car accident. More precisely, the liability rules in road traffic regulates the liability of the driver and/or of the owner of the vehicles (and the subjects similar to him) in the circulation of the traditional vehicles, and could be applied only to human-driven vehicles or, at most, to semi-autonomous vehicle until the most important driving tasks are controlled by a human driver, who have to monitor the environment (i.e. until level 2 of automation of the SAE J3016 standard). Undoubtedly, also in these cases, if the accident is caused by a vehicle defect, the driver/owner of vehicle has the right of recourse against the producer of the vehicle or of the defective component part. Alternatively, in the litigation phase, the examination of the specific case will allow to ascertaining whether it is an hypothesis of joint and several liability of the driver/owner and the producer or whether it can instead be considered exclusively liable one of them.

With higher automation (i.e. levels 3, 4 and 5 of automation of the SAE J3016 standard), instead, the role of the common driver fails, being replaced at most by that of the user or passenger on-board. So, the vehicle owner can be held liable for having purchased an autonomous vehicle but, with the disappearance of the driver's role, the gradual overcoming of the owner system for vehicles is unavoidable. In this scenario, remains only the vehicle producer (or the one of the component part) who is considered liable for placing an autonomous vehicle on the market.

Regarding this last aspect, the autonomous vehicle is a product and as product falls within the scope of the PLD which, it seems to be the more functional regulation to protect the interests of the parties. Nevertheless, a few doubts also arise regarding the PLD, because it does not take into account the impact that new technology had in terms of new damages and new party involved, since the directive came into force more than thirty years ago and so is not keep up with times. For this reason, the PLD does not appear sufficient for a complete and systematic regulation of autonomous vehicles.

Carrying out a *de iure condendo* analysis, the possible solution should be that to apply extensively PLD to high automated car. As a matter of fact, already existing a normative regulation of product liability and re-entering the driverless car in the concept of product, it is clear that it is not necessary to apply the PLD by analogy.

Lastly, in an evolutionary way, for the fully autonomous vehicle (level 5 of the SAE J3016) it could be necessary to introduce an *ad hoc* framework of rules for self-driving cars, with particular regard to liability and insurance issue. In particular, is needed a sector-specific laws for robotics, and in particular a sector-specific law for driverless cars. The differences between robotics applications are too significant to allow for a single 'Law of Robotics'.

With regard to the insurance profiles, the functional solution could be to continue to apply the compulsory third-party insurance imposed on the vehicle owner, who may be asked to compensate the damage, whether or not he was personally using the vehicle. It may then be discussed if the cost of the insurances should be bear by the producer, with his professional insurance (always following the third party scheme), when the damage derives from the malfunctioning of the vehicle or its component part. Furthermore, in order to always guarantee damages

to the injured person, it is necessary to provide for an *ad hoc* fund which the victim has a right of recourse, when it is not possible to identify the tortfeasor and/or the tortfeasor has no insurance.

Anyway, the real problem of the identification of the tortfeasor and of the policyholder will only exist once driverless vehicles achieve a high level of automation, and even more, the full automation. Currently, the existing liability (driver/owner's liability or producer's liability) and insurance schemes (first of all third-party insurance) may be rather adequate.



## **Sintesi in italiano.**

Lo sviluppo dei sistemi di automazione dei veicoli ha raggiunto livelli elevati e si proietta, grazie all'evoluzione tecnologica, verso progressi sempre più rapidi. Le tecnologie attualmente utilizzate nel traffico stradale includono gli *Advanced Driver Assistance Systems* (ADAS) e i veicoli dotati di un crescente livello di automazione e intelligenza artificiale, che sono l'oggetto della tesi di dottorato della dott.ssa Gaeta.

I veicoli autonomi mirano a migliorare il *comfort* del conducente e minimizzare l'errore umano. Ciò implica, da un lato, un minore coinvolgimento del conducente nelle attività di guida e, dall'altro, un probabile miglioramento della sicurezza stradale. Tuttavia, è stato rilevato che l'immissione dei veicoli autonomi sul mercato comporta notevoli vantaggi ma, allo stesso tempo, induce a chiedersi se le attuali norme sulla responsabilità civile siano ancora adeguate.

In effetti, le norme sulla responsabilità civile non affrontano direttamente il problema degli incidenti che coinvolgono almeno un veicolo autonomo e, anche se le norme sulla circolazione stradale prevedono alcuni casi che possono essere applicati a veicoli autonomi, non esiste una legislazione completa che permetta di identificare pienamente il responsabile in questo nuovo scenario. In particolare, le auto senza conducente potrebbero comportare il superamento della responsabilità del conducente e/o del proprietario del veicolo, nonché dei soggetti ad esso equiparati imputabili negli incidenti stradali. Ciò comporta la necessità di analizzare il tradizionale schema della responsabilità civile extracontrattuale da circolazione stradale, al fine di verificare se sia necessario coinvolgere altri soggetti come ad esempio il produttore, il fornitore di servizi Internet e altre parti (ad esempio gli *hacker* che possono manomettere il software di guida del veicolo).

In questo modo, deve essere effettuata un'analisi relativa alla corretta allocazione del rischio tra le diverse parti coinvolte nel settore automobilistico e, di conseguenza, anche una valutazione dei principi del diritto assicurativo che potrebbe garantire un elevato livello di protezione nel traffico "autonomo".

Nell'individuazione del soggetto responsabile, la ricerca, in primo luogo, ha preso in considerazione la prospettiva della legge italiana con particolare attenzione all'identificazione dei principi e della funzione della responsabilità civile in Italia. Le soluzioni che possono essere previste dalla legge italiana, poi, sono state confrontate con quelle in vigore negli ordinamenti giuridici francese, tedesco, inglese e americano, tenendo conto non solo della legislazione ma anche della giurisprudenza e della dottrina. Inoltre, il confronto è stato esteso anche alla normativa dell'Unione Europea, con particolare riguardo a quella sulla responsabilità da prodotto difettoso (in alternativa alla responsabilità da sinistro stradale) e alla recente soft-law sul tema della robotica e dell'intelligenza artificiale.

Partendo da un'analisi *de iure condito* dello stato dell'arte, si è tentato di raggiungere un duplice obiettivo. Prima di tutto, valutare se esista una normativa sulla responsabilità civile che sia funzionale alla protezione del soggetto leso, anche in caso di incidente stradale causato da un'auto a guida autonoma. In secondo luogo, valutare se tale legislazione sia sufficiente per una regolamentazione completa e sistematica dei veicoli autonomi, oppure se sia necessario modificarla ovvero introdurre un quadro di regole *ad hoc* per le auto a guida autonoma.

A tal proposito, nella tesi si cerca di dimostrare che l'attuale regolamentazione della responsabilità civile da circolazione stradale non è uno strumento normativo

funzionale per la protezione della persona lesa in caso di incidente causato da un veicolo autonomo. Più precisamente, le regole di responsabilità nel traffico stradale prevedono la responsabilità del conducente e/o del proprietario del veicolo (e dei soggetti a esso equiparati) nella circolazione dei veicoli tradizionali (cioè a guida umana) e potrebbero essere applicate al massimo ai veicoli semi-autonomi, fino a quando i compiti di guida più importanti siano controllati da un conducente umano, che deve monitorare l'ambiente circostante (cioè fino al livello 2 di automazione dello standard SAE J3016). Indubbiamente, anche in questi casi, qualora l'incidente sia causato da un difetto del veicolo, il conducente/proprietario dello stesso avrebbe il diritto di regresso nei confronti del produttore del veicolo. In alternativa, in fase giudiziale, l'esame del caso specifico consentirebbe di accertare se si tratti di un'ipotesi di responsabilità solidale del conducente/proprietario con il produttore o se invece possa essere considerato esclusivamente responsabile uno solo di essi.

Con una maggiore automazione (ovvero con i livelli 3, 4 e 5 di automazione dello standard SAE J3016), invece, il ruolo del *driver* assume sempre meno rilevanza fino ad essere sostituito da quello dell'utente o del passeggero di bordo. In questo caso il proprietario del veicolo può essere ritenuto responsabile per aver acquistato un veicolo autonomo anche se, anche a seguito della scomparsa del ruolo del guidatore, il superamento graduale del sistema proprietario per i veicoli è inevitabile. In questo scenario, rimane solo il produttore del veicolo, che può essere considerato responsabile per l'immissione sul mercato di un veicolo completamente autonomo.

Riguardo a quest'ultimo aspetto, il veicolo autonomo è un prodotto e come prodotto rientra nel campo di applicazione della Direttiva n. 85/374/CEE sul danno

da prodotti difettosi, che sembra essere la normativa più efficace per proteggere gli interessi delle parti coinvolte. Tuttavia, sorgono alcuni dubbi riguardo tale Direttiva CEE, perché non tiene conto dell'impatto che la nuova tecnologia ha avuto in termini di nuovi danni e nuovi soggetti coinvolti, dal momento che è entrata in vigore più di trenta anni fa. Per questo motivo, la Direttiva non sembra sufficiente per una regolamentazione completa e sistematica dei veicoli autonomi.

Giungendo a un'analisi *de iure condendo*, la soluzione possibile potrebbe essere quella di applicare estensivamente la Direttiva anche alle auto ad alta automazione. Infatti, essendo già esistente una regolamentazione normativa della responsabilità da prodotto difettoso e rientrando le auto senza conducente nel concetto di prodotto, è chiaro che possa essere applicata la Direttiva europea di riferimento.

Invece, in via evolutiva, per il veicolo completamente autonomo (livello 5 dello standard SAE J3016) potrebbe essere necessario introdurre un quadro di regole *ad hoc*, con particolare riguardo alla responsabilità e alla questione assicurativa. Appare necessaria una legge specifica per la robotica, e in particolare una legge settoriale per le auto senza conducente, in quanto le differenze tra le applicazioni robotiche sono troppo significative per consentire un'unica "Law of Robotics".

Per quanto riguarda i profili assicurativi, una soluzione funzionale potrebbe essere quella di continuare ad applicare l'assicurazione obbligatoria secondo lo schema della R.C. auto imposta al proprietario del veicolo, al quale sarebbe richiesto di risarcire il danno, indipendentemente dal fatto che stesse utilizzando o meno il veicolo. Con il raggiungimento dell'automazione totale, poi, può essere previsto che il costo dell'assicurazione venga sostenuto dal produttore, con la sua assicurazione professionale (sempre seguendo lo schema della *third-party insurance*). Inoltre, al fine di garantire sempre il risarcimento dei danni alla

persona lesa, risulta necessario prevedere anche un fondo *ad hoc* sul quale la vittima possa rivalersi in via residuale, quando non sia possibile identificare il colpevole dell'incidente o lo stesso non sia assicurato.

Ad ogni modo, il vero problema dell'identificazione del responsabile e del titolare della polizza sussisterà solo quando i veicoli senza conducente raggiungeranno un elevato livello di automazione e, ancora di più, l'automazione completa. Attualmente, la responsabilità esistente (responsabilità del conducente/proprietario o responsabilità del produttore) e i regimi assicurativi previsti possono essere strumenti adeguati per la tutela dei soggetti coinvolti.

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