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Autonomous Vehicles and Complexities in Allocation of Liability

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Autonomous vehicles are here and they are here to stay. Tremendous advancements in the field of artificial intelligence have unveiled curtains of autonomous vehicles from the future to the present. Although the market for autonomous vehicles seems to have picked up, there lies a myriad of ambiguity and scepticism, specifically with respect to the allocation of "liability" as autonomous vehicles intend to replace humans behind the steering wheel. The dynamics behind the allocation of liability are being re-evaluated and re-visit in toto by law and policymakers. However, when it comes to allocation of liability, there is an outstanding difference between conventional and autonomous vehicles. In the case of the former, liability is placed on drivers to a large extent, but in the case of the latter, it is an entirely different scenario as a multitude of parties such as drivers, occupants, owners, manufacturers, programmers to insurers come into the picture.

The different legal and ethical issues that confront law and policymakers across the world and their endeavour to formulate a balanced legal framework with emphasis on allocation of liabilities are discussed in this paper. A text-based research methodology is used to systematically analyse literature on this subject from different Journals, Books, and Reports across the world. The first part very briefly discusses the multitude of stakeholders while allocating liability. The second part introduces the infamous trolley problem to conceptualise liabilities pertaining to autonomous vehicles. The third part examines the allocation of liabilities through the concepts of product liability and enterprise liability that are used across the world to answer questions of liability along with the concept of the black box, which plays a significant role when it comes to allocation of liabilities, despite being criticised for privacy and security concerns. The fourth part succinctly discusses autonomous vehicles under the ambit of

Indian laws. The last part, based on the research undertaken, concludes the article with observations and suggestions regarding allocation and enforcement of liability pertaining to autonomous vehicles.

Keywords: *artificial intelligence, trolley problem, product liability, enterprise liability.*

INTRODUCTION

The fantasy of driverless cars that transcended for generations has finally come true and is a functional reality today as autonomous vehicles ('**AVs**') with automobile giants GM, Nissan, Mercedes-Benz, Toyota, Lexus, Hyundai, Tesla, Uber, and Volkswagen undertaking development of AVs.[1] While conventional vehicles are designed to privilege the safety of occupants over that of pedestrians, AVs are designed to privilege occupants, pedestrians, the environment, economy, and society as a whole by potentially increasing safety, efficiency, mobility, and productivity while decreasing traffic congestions, energy use, emissions from vehicles, costs, parking spaces, and land use.[2] Therefore, AVs are often equated to a "*critical technological solution, tantamount to a new medicine to cure not just one but many diseases*"[3].

Despite these projected abilities, technology is not perfect, because similar to human errors, it is common for AVs to encounter crashes, glitches, and malfunctions ultimately leading to accidents.[4] In the case of conventional vehicles, liability is placed on the driver to a large extent, but in the case of AVs, it is an entirely different scenario as a multitude of parties from drivers, occupants, owners, manufacturers, AI programmers to insurers come into picture when it comes to allocation of liability.[5] Who really is liable for the accidents caused by AVs?

[1] Andrew M Brown, 'Blame It on the Machines: How Autonomous Vehicles Will Impact Allocation of Liability Insurance and the Resulting Impact on the Legal Community' (2016) 95 North Carolina Law Review 29; Vikram Bhargava and Tae Wan Kim, 'Autonomous Vehicles and Moral Uncertainty' in Markus Dubber, Frank Pasquale and Sunit Das (eds) *Oxford Handbook of Ethics of Artificial Intelligence* (Oxford University Press 2020)

[2] Bryant Walker Smith, 'Ethics of Artificial Intelligence in Transport' in Markus Dubber, Frank Pasquale and Sunit Das (eds) *Oxford Handbook of Ethics of Artificial Intelligence* (Oxford University Press 2020)

[3] *Ibid*

[4] Jeffrey K Gurney, 'Imputing Driverhood' in Markus Dubber, Frank Pasquale and Sunit Das (eds) *Oxford Handbook of Ethics of Artificial Intelligence* (Oxford University Press 2020)

[5] Wulf Loh and Janina Loh, 'Autonomy and Responsibility in Hybrid Systems' in Patrick Lin, Keith Abney and Ryan Jenkins (eds) *Robot Ethics 2.0: From Autonomous Cars to Artificial Intelligence* (Oxford University Press 2017)

Do we continue holding the drivers and owners of AVs liable? Or do we shift the burden on the manufacturers because AVs are completely new machinery and thereby making them liable for any accidents? Or do we make the programmers liable because they were in charge of the program that crashed and failed to function as required? Or do we shift the burden directly on the insurer by covering the accidents due to the crashing of AV under insurance coverage? Before we answer the above questions, to have a better understanding, let us conceptualise the infamous trolley problem in terms of an AV.

THE TROLLEY PROBLEM

The National Highway Traffic Safety Administration ('**NHTSA**') of the USA classifies AVs into 6 different categories based on level of automation.[6] For our purpose, we will broadly categorise AVs under two categories – partially automated vehicles ('**PAVs**') and fully automated vehicles ('**FAVs**').[7] PAVs are AVs that either requires human intervention in certain circumstances (including emergencies) or where humans have the option of disabling auto-pilot mode by overriding AV to take back control of driving.[8] FAVs are AVs that neither

[6] National Highway Traffic Safety Administration, 'Automated Vehicles for Safety' (*National Highway Traffic Safety Administration*) <https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety#topic-road-self-driving> accessed 01 May 2021

> "*Level 0 - The human driver does all the driving*
> *Level 1 - An advanced driver assistance system (ADAS) on the vehicle can sometimes assist the human driver with either steering or braking/accelerating, but not both simultaneously*
> *Level 2 - An advanced driver assistance system (ADAS) on the vehicle can itself actually control both steering and braking/accelerating simultaneously under some circumstances. The human driver must continue to pay full attention ("monitor the driving environment") at all times and perform the rest of the driving task*
> *Level 3 - An automated driving system (ADS) on the vehicle can itself perform all aspects of the driving task under some circumstances. In those circumstances, the human driver must be ready to take back control at any time when the ADS requests the human driver to do so. In all other circumstances, the human driver performs the driving task*
> *Level 4 - An automated driving system (ADS) on the vehicle can itself perform all driving tasks and monitor the driving environment – essentially, do all the driving – in certain circumstances. The human need not pay attention in those circumstances*
> *Level 5 - An automated driving system (ADS) on the vehicle can do all the driving in all circumstances. The human occupants are just passengers and need never be involved in driving*"

[7] Mohamed Alawadhi and others, 'Review and Analysis of the Importance of Autonomous Vehicles Liability: A Systematic Literature Review' (2020) 11 International Journal of System Assurance Engineering and Management 1227

[8] *Ibid*

require human intervention in any circumstances (including emergencies) nor do humans have the option of disabling auto-pilot mode by overriding AV to take back control.[9]

The trolley problem involves a situation where the trolley driver loses control and finds the trolley headed towards a direction that would result in killing five innocent people, but the driver has the option of changing the direction of the trolley which would result in the death of one person.[10] In another situation, with just a small variation, this time, it is the bystander who has the option of changing the direction of the trolley instead of the driver.[11] In order to place the liability as due to the accident, for our purposes, let us assume that here, the driver takes the place of either driver or occupants and the bystander takes the place of the AV (which includes the owners, manufacturers, AI programmers or insurers). The only difference here is that apart from the bystander being present during the event, in some instances the bystander would have acted ex-ante – the owner would have bought the AV informed of all associated risks, the manufacturer would have ensured that manufacturing and sale of AV are done only after all specifications are met, AI programmers would have created programme in advance to deal with upcoming situations and insurer would have agreed to ensure the damages and costs.[12] Let us now look at different scenarios under the PAVs and FAVs to decide upon the allocation of liability.

<u>PAV Scenario I</u> – The drivers/occupants can take back control of driving either after receiving a warning from AV or noticing that the AV is out of control.

<u>PAV Scenario II</u> – The drivers/occupants are not able to take back control of driving because they are either unable to disable auto-pilot mode, or they failed to receive a warning from the AV or they failed to notice that the AV is out of control.

<u>FAV Scenario I</u> – The drivers/ occupants do not have the option of taking back control of driving and are left at mercy of AV.

[9] *Ibid*
[10] F M Kamm, 'The Use and Abuse of the Trolley Problem' in S Matthew Liao (ed) *Ethics of Artificial Intelligence* (Oxford University Press 2020)
[11] *Ibid*
[12] *Ibid*

Under PAV Scenario I, it is obvious that the driver/occupant is be held liable. But, under PAV Scenario II and FAV Scenario I, doesn't the shift in control of the operation of vehicles from drivers/occupants to AV make it ideal to shift the liability from drivers/occupants to the AV?[13] Or do we hold the driver liable despite him trying to take over the AV or because he was simply present in a vehicle over which he had no control? To answer these questions, it will be necessary to understand the concepts of product liability and enterprise liability.

CONCEPTS OF LIABILITIES

The concept of product liability ('**PL**') and enterprise liability ('**EL**') although are similar as they allocate liability on the manufacturer, are distinct on the merits of allocating liability. Broadly speaking, PL relies on manufacturing, design, and warning defects while EL relies on allocating liability based on characteristic risks and no-fault liability based on an internalisation of costs with a prime focus on compensating victims.[14] While PL focuses only on the product, EL focuses on the entire enterprise (manufacturer) to allocate liability. The concept of Flight Data Recorder colloquially referred to as Black Box ('**BB**') is a widely used mechanism to monitor and record data about the functioning of flights and pilot errors.[15]

PRODUCT LIABILITY

Manufacturing Defect

Manufacturing defect ('**MD**') stems out of expectation that the product meets all specifications and includes all necessary safety that matches with those of other similar units.[16] Manufacturers maintain an implicit duty to check that the parts are of a reasonable standard

[13] Gurney (n 4)

[14] Kevin Funkhouser, 'Paving the Road Ahead: Autonomous Vehicles Products Liability and the Need for a New Approach' (2013) Utah Law Review 437; Jacob D Walpert, 'Carpooling Liability?: Applying Tort Law Principles to the Joint Emergence of Self Driving Automobiles and Transportation Network Companies' (2017) 85 Fordham Law Review 1863; Gregory C Keating, 'Products Liability as Enterprise Liability' (2017) 10 Journal of Tort Law 41

[15] James M. Anderson and others, *Autonomous Vehicle Technology* (Rand Corporation 2016)

[16] Kevin Funkhouser, 'Paving the Road Ahead: Autonomous Vehicles Products Liability and the Need for a New Approach' (2013) Utah Law Review 437; Jeffrey K Gurney, 'Sue My Car Not Me: Products Liability and Accidents Involving Autonomous Vehicles' (2013) Journal of Law Technology and Policy 247

and the standard is maintained.[17] Apart from this, MD is put into an exercise in cases of malfunction despite the manufacturers meeting all standards.[18] To prove MD, one has to prove that manufacturers failed to meet the specifications and standards and that the malfunction occurred during proper use when the product was in no way altered or misused to induce malfunction.[19]

Design Defect

Design Defect ('**DD**') highlights defects usually present a much larger issue when compared to MD as they highlight the defects existing in the entire line of products and are not restrained to just a single incident.[20] DD is proved by satisfying either a consumer expectation test[21] or a risk-utility test[22].[23] To prove DD, one has to prove that a reasonable alternative design to the one sold to the consumer was available, the failure to adopt the design rendered the vehicle unsafe and the foreseeable risks of harm caused by the product could have been reduced or avoided by an alternative design by the manufacturer.[24] The DD are generally complex and require many expert witnesses, ultimately making the claim a costly affair.[25]

Warning Defect

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[17] Keri Grieman, 'Hard Drive Crash' (2018) journal of Intellectual Property Information Technology and e-Commerce Law 294

[18] Gurney (n 4)

[19] Roy Alan Cohen, 'Self Driving Technology and Autonomous Vehicles: A Whole New World for Potential Product Liability Discussion' (2015) 5 Product Liability Committee Newsletter

[20] *Ibid*

[21] The consumer expectations test evaluates the defectiveness of a design based on whether the danger posed by the design is greater than an ordinary consumer would expect when using the product in an intended or reasonably foreseeable manner, see Kevin Funkhouser, 'Paving the Road Ahead: Autonomous Vehicles Products Liability and the Need for a New Approach' (2013) Utah Law Review 437, 449

[22] The risk-utility test, for its part, sounds in negligence, but is carefully constructed to be more stringent than ordinary negligence liability. It incorporates hindsight balancing; relieves the plaintiff of the burden of proving a feasible alternative design as part of its *prima facie* case; and places the burden of proving that the product's design is safe on the defendant (manufacturer), see Gregory C Keating, 'Products Liability as Enterprise Liability' (2017) 10 Journal of Tort Law 41, 95

[23] Funkhouser (n 16)

[24] Alfred R Cowger Jr, 'Liaility Considerations When Autonomous Vehicles Choose the Accident Victim' (2018) 11 Journal of High Technology Law 1

[25] Gurney (n 4)

Warning defect ('**WD**') focuses on the duty of the manufacturer to inform regarding hidden dangers and instruct regarding safe handling of the product.[26] To prove WD, one has to prove the manufacturer failed to inform or instruct and the adequacy of information and instruction.[27] While, the general standard to invoke WD has been failure to inform, in the case of AVs, the failure to instruct will play a much bigger role as AV is an extremely new, advanced, and nuanced technology and manufacturers have to shoulder this burden if they wish to expand AVs into the mainstream market.[28]

ENTERPRISE LIABILITY

Characteristic Risks

Characteristic risk ('**CR**') is essentially a normative, non-fault criterion that mixes factual and evaluative judgment in a reasonable way without appealing to fault with the rationale that the enterprise (manufacturer) must be held liable for creating risks that are different and "characteristic" to the product.[29] It is based on the assertion that the enterprises (manufacturers) must be held liable for the foreseeable "characteristic risks" that are potentially hazardous.[30] Today, AVs are largely regarded as potentially hazardous *inter alia* due to the knowledge gap between users and manufacturers, technical complexities, dearth of skills, education, and training of the end consumers.[31] To prove CR, one has to prove that the issue at hand is a characteristic risk associated with the product of the enterprise.

No-Fault Liability

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[26] *Ibid*

[27] Jeffrey K Gurney, 'Sue My Car Not Me: Products Liability and Accidents Involving Autonomous Vehicles' (2013) Journal of Law Technology and Policy 247

[28] *Ibid*

[29] Gregory C Keating, 'Products Liability as Enterprise Liability' (2017) 10 Journal of Tort Law 41

[30] Walpert (n 14)

[31] Jo Ann Pattison, Haibo Chen and Subhajit Basu, 'Legal Issues in Automated Vehicles: Critically Considering the Potential Role of Consent and Interactive Digital Interfaces' (2020) 7 Humanities and Social Sciences Communications

No-Fault Liability intends to compensate and spread the loss by holding enterprises (manufacturers) liable even when no particular faults can be associated with them because manufacturers are in the best position to spread the losses through internalisation of costs.[32] Enterprises ought to disperse the costs of their "characteristic risks" across all those who participate in the enterprise, ideally in proportion to the extent of their participation because all participants are collectively responsible.[33]

Black Box

AVs are equipped with sensors, cameras, user inputs, passenger information, and a global positioning system (GPS) and all of this information will play an important role in allocating liability.[34] Along with all this information, programmers also embed manufacturers' decisions with respect to the manner of driving, reactions to changes in the environment, when and where to stop into the AV and this information is available in BBs which could potentially help in allocating liability in helping decide if the manufacturer "drove" reasonably.[35]

However, the authenticity and legality of this data need to be closely looked into as it will be subject to privacy concerns because if this data starts becoming available in courts, then it would become a "*treasure trove of evidence for litigants*"[36] and they can be used against the interest of the users because this data can not only identify a person and their location but also about their habits, friends, and lifestyle.[37] Additionally, there will arise discrepancies with

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[32] Walpert (n 14); Andrew M Brown, 'Blame It on the Machines: How Autonomous Vehicles Will Impact Allocation of Liability Insurance and the Resulting Impact on the Legal Community' (2016) 95 North Carolina Law Review 29

[33] Keating (n 28)

[34] Jason Millar, 'Ethics Settings for Autonomous Vehicles' in Markus Dubber, Frank Pasquale and Sunit Das (eds) *Oxford Handbook of Ethics of Artificial Intelligence* (Oxford University Press 2020)

[35] Keri Grieman, 'Hard Drive Crash' (2018) journal of Intellectual Property Information Technology and e-Commerce Law 294; Jeffrey K Gurney, 'Imputing Driverhood' in Markus Dubber, Frank Pasquale and Sunit Das (eds) *Oxford Handbook of Ethics of Artificial Intelligence* (Oxford University Press 2020)

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

[37] Jason Millar, 'Ethics Settings for Autonomous Vehicles' in Markus Dubber, Frank Pasquale and Sunit Das (eds) *Oxford Handbook of Ethics of Artificial Intelligence* (Oxford University Press 2020); Frank Douma and Sarah Aue Palodichuk, 'Criminal Liability Issues Created by Autonomous Vehicles' (2012) 52 Santa Clara Law Review 1157; Ujjayini Bose, 'The Black Box Solution to Autonomous Liability' (2015) 92 Washington University Law Review

respect to the source of data and its verification.[38] Therefore, to be able to even use BB, the use and disclosure of information must be highly regulated.

INDIAN LAWS AND AUTONOMOUS VEHICLES

The Motor Vehicles Act[39] ('**MVA**') governs laws related to motor vehicles and compensation in case of accidents. Recently, the Motor Vehicles (Amendment) Act, 2019[40] ('**Amendment**') introduced Section 2B[41] to promote innovation and exempted application of MVA to "*mechanically propelled vehicles*". MVA seems to be extended to self-driving cars indirectly through the Amendment.[42] Under MVA, compensation is provided either by the owners or insurance companies to victims based on "no-fault liability"[43] and "strict liability"[44]. Apart from MVA, Consumer Protection Act[45] ('**CPA**') and Information Technology Act[46] ('**ITA**') can be made applicable on AVs. CPA *inter alia* covers issues of product liability, strict liability, and right to consumer education and as AVs discount human error, manufacturers would be liable in case of any defect or deficiency.[47] ITA *inter alia* covers issues of privacy, protection of data,

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1325; Keri Grieman, 'Hard Drive Crash' (2018) Journal of Intellectual Property Information Technology and e-Commerce Law 294

[38] Frank Douma and Sarah Aue Palodichuk (n 35)

[39] Motor Vehicles Act, 1988

[40] Motor Vehicles (Amendment) Act 2019

[41] Motor Vehicles Act 1988, s 2B

> "*Notwithstanding anything contained in this Act and subject to such conditions as may be prescribed by the Central Government, in order to promote innovation, research and development in the fields of vehicular engineering, mechanically propelled vehicles and transportation in general, the Central Government may exempt certain types of mechanically propelled vehicles from the application of the provisions of this Act*"

[42] Madhura Bhandarkar, 'Moving Towards a Driverless Era' (*RMLNLU Law Review Blog*, 25 October 2017) <https://rmlnlulawreview.com/2017/10/25/moving-towards-a-driverless-era/> accessed 23 April 2021

[43] Motor Vehicles (Amendment) Act 2019, ch 10

[44] *Ibid* ch 11

[45] Consumer Protection Act 1986

[46] Information Technology Act 2000

[47] Nishith Desai Associates, *Preparing for a Driverless Future* (Nishith Desai Associates 2019)

sensitive data and personal information, cybersecurity, and hacking.[48] As AVs are susceptible to all these issues, manufacturers must give separate emphasis in taking all measures for ensuring security.[49]

CONCLUSION

AVs are at a very nascent stage in the market. Society is yet to accept AVs in full swing because of numerous challenges associated with them. The fundamental one being the allocation of liability in cases of crashes by AVs. As discussed above, we could answer this question using multiple concepts such as PL, EL, and BB with each of them making it invincibly clear that liability must be allocated to manufacturers. Enforceability of this liability is also a major concern. While PL is an extremely popular concept, in the case of AVs, it is highly unlikely that it would help victims as proving MD, DD or WD would be coupled with heavy expenses on the person claiming relief.[50] And, BB is still flourishing as a concept, faced with challenges of its own such as ensuring adequate consumer privacy protection, limited usage of data, and affirmative consent for commercial use as these sensor-laden AVs have the scope of dangerous violations.[51] Thus, EL serves as best to allocate liability on manufacturers as the prime focus is on compensating victims.[52] The threat of litigation is a natural incentive for the manufacturers to create safer products while allocating costs to parties who are equipped to design around future incidents.[53] With characteristic risks, no-fault liability, and internalisation of costs, EL is the most comprehensive and adequate means of protection for all victims of personal injuries without placing too heavy a burden on enterprises or other segments of the social group.[54] EL would further ensure the highest safety from manufacturers

[48] *Ibid*
[49] *Ibid*

[50] Gurney (n 25)

[51] Ujjayini Bose, 'The Black Box Solution to Autonomous Liability' (2015) 92 Washington University Law Review 1325; Nishith Desai Associates, *Preparing for a Driverless Future* (Nishith Desai Associates 2019)

[52] Alawadhi (n 7)

[53] Andrew M Brown, 'Blame It on the Machines: How Autonomous Vehicles Will Impact Allocation of Liability Insurance and the Resulting Impact on the Legal Community' (2016) 95 North Carolina Law Review 29

[54] Walpert (n 14)

with respect to the extent of technology under the context of "safe operation" and "potential risk" because AIs have the capacity to learn based on analysis of data, outcomes, and algorithms accordingly and consequentially change incorporate responses with time.[55] India seems to have taken just a baby step towards formulating laws for the regulation of AVs, but there seems to be no progress in actual terms as it is still delaying the inevitable task of framing concrete rules and regulations that fits the world of accidents with innumerable complexities.[56]

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[55] Roy Alan Cohen, 'Self Driving Technology and Autonomous Vehicles: A Whole New World for Potential Product Liability Discussion' (2015) 5 Product Liability Committee Newsletter; Alfred R Cowger Jr, 'Liaility Considerations When Autonomous Vehicles Choose the Accident Victim' (2018) 11 Journal of High Technology Law 1

[56] Madhura Bhandarkar, 'Moving Towards a Driverless Era' (*RMLNLU Law Review Blog*, 25 October 2017) < https://rmlnlulawreview.com/2017/10/25/moving-towards-a-driverless-era/> accessed 23 April 2021; Hann Rzeczycka and Mtija Kovac, 'Autonomous Self Driving Vehicles the Advent of a New Legal Era?' (2019) 10/1 The King's Student Law Review 30