

INTERNATIONAL JOURNAL FOR LEGAL RESEARCH AND ANALYSIS



Open Access, Refereed Journal Multi-Disciplinary
Peer Reviewed

www.ijlra.com

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Avinash Kumar



Avinash Kumar has completed his Ph.D. in International Investment Law from the Dept. of Law & Governance, Central University of South Bihar. His research work is on "International Investment Agreement and State's right to regulate Foreign Investment." He qualified UGC-NET and has been selected for the prestigious ICSSR Doctoral Fellowship. He is an alumnus of the Faculty of Law, University of Delhi. Formerly he has been elected as Students Union President of Law Centre-1, University of Delhi. Moreover, he completed his LL.M. from the University of Delhi (2014-16), dissertation on "Cross-border Merger & Acquisition"; LL.B. from the University of Delhi (2011-14), and B.A. (Hons.) from Maharaja Agrasen College, University of Delhi. He has also obtained P.G. Diploma in IPR from the Indian Society of International Law, New Delhi. He has qualified UGC – NET examination and has been awarded ICSSR – Doctoral Fellowship. He has published six-plus articles and presented 9 plus papers in national and international seminars/conferences. He participated in several workshops on research methodology and teaching and learning.

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INTERNATIONAL JOURNAL FOR LEGAL RESEARCH & ANALYSIS
ISSN

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THE LEGAL LANDSCAPE OF AUTONOMOUS VEHICLES: ISSUES OF LIABILITY

AUTHORED BY - MRUNALI BALASAHEB KHAVALE

Roll No. – 43 Div - A Semester – III 2024-2025

DEPARTMENT OF LAW LL.M. – II

P. E. SOCIETY'S MODERN LAW COLLEGE (Ganeshkhind, University Circle, Pune)

Abstract:

This article is an attempt to investigate the means and need for the legislation for liability by the conceptual study of existing regulatory framework covering motor vehicle in India, through the study of legislations in United Kingdom and United States of America, both of which have remarkably excelled in developing their legal provisions to accommodate autonomous vehicles. It delves into the multifaceted ethical landscape surrounding autonomous vehicles, exploring the challenges, dilemmas, and the imperative role of ethical decision-making in shaping the future of transportation. Recently, on 15th September, 2024 Bengaluru has implemented an AI-driven Adaptive Traffic Control System (ATCS) at 41 junctions, reducing the need for manual traffic management. This upgrade is part of Bengaluru's broader initiative to fully automate its traffic control systems, reducing the need for human intervention and aiming for more efficient traffic management.

KEYWORDS: AI-driven Adaptive Traffic Control System (ATCS), Technological advancement, Product liability, Negligence.

Introduction:

Autonomous vehicle: a car that runs on driver assistance software and does not require a human driver. Automobile automation comes in six levels, from completely manual driving at stage 0 to fully automated self-driving cars at stage 5. Even though the phrases autonomous and self-driving are sometimes used interchangeably, automobiles that are now on the market cannot function entirely on their own and require human interaction to operate. Using the phrase automated is typical practice in the industry. Radar, GPS, cameras, lidar, and other remote sensing technologies are used by autonomous cars to monitor and map their surroundings in

three dimensions. Typically, this environment consists of road signs, traffic signals, pedestrians, other cars, and street infrastructure. As sensors continuously communicate changes about the car's surroundings, powerful computer systems assess the collected data and make decisions about how to operate the vehicle, continuously altering the steering, cruising speed, acceleration, and braking.¹

Evolution:

Around the 1920s, in the USA, due to the large number of accidents caused by the carelessness of drivers, the development of driverless vehicles was discussed. Thus, in August 1921, the first vehicle without driver on board was presented, which was radio-controlled from an army vehicle located 30m behind it.² It can be said that this is the pioneer of cars without a driver. The development of this prototype being closely linked to the technology owned by the army,. Of course, after this presentation, other vehicles appeared either based on the same technology or on something more innovative:

- in 1925, the electronic engineer Francis P. Houdina, equipped an ordinary vehicle with the equipment necessary to perform driving maneuvers, being controlled remotely by radio waves,
- in 1939 during the exhibition “Futurama”, an innovative concept propelled by magnetic field generated by the electric circuit incorporated in the running track was presented. It was made by industrial designer Norman Bel Geddes with the support of General Motors,
- in 1958 – the first “automatically guided automobile” completed a one-mile test at the GM Technical Centre (Michigan). It was a Chevrolet that had two electronic sensors mounted in the front that followed a cable stretched along the track, thus, controlling the position of the steering wheel and implicitly the steering wheels.
- in the 1980s, research on autonomous vehicles took off in many countries, both academically and industrially.
- in 1994 in the PROMETHEUS-Project, Ernst Dickman’s team developed with the help of Mercedes Benz W140 – a robotic vehicle, which was able to travel on congested highways around Paris at speeds of up to 130 Km/h,

Thus, manufacturers companies such as: Mercedes-Benz, General Motors, Continental

¹ https://www.researchgate.net/publication/353858131_Autonomous_vehicles_classification_technology_and_evolution last seen dated 09/09/2024.

² Maurer M, Gerdes J C., Lenz B, and Winner H 2015 Autonomous Driving

Automotive System, Autoliv, Bosch, Nissan, Toyota, Audi, Hyundai Motor Company, Volvo, Tesla Motors, Peugeot, Navya, Google, BMW, Local Motors, Easy Mile, etc., have developed and are still developing new prototypes of autonomous vehicles. Due to this technological boom, the legislative framework on the testing and circulation of autonomous/automated/robotic vehicles in many countries needs to be rethought. In this sense, in 2013 the UK government allowed their testing on public roads, after that, in 2014, the French Government adopted the same legislative measures, followed by other European countries and not only (in 2015, 5 US states allow AV testing on public roads: Nevada, Florida, California, Virginia, Michigan).

Technological Advancements in Autonomous Vehicles:

Artificial Intelligence or AI is evolving into a powerful tool that enables machines to think and act like humans. There is considerable empirical evidence to infer that AI is "Cognitive Computing" where machines (Specifically computers) are being made to infer, reason, perceive, think, sense and act like humans.

Autonomous Vehicles or Self-Driven Cars use AI to control the car. Autonomous cars work and is dependent on sensors, actuators, complex algorithms, machine learning systems and powerful processors to implement software. Autonomous cars sense the environment based on a variety of sensors situated in different parts of the vehicle. Radars sensors monitor the position and distance of the nearby vehicle. Cameras detect traffic lights, road signs, track other vehicles and look for pedestrians. LIDAR (Light detection and ranging) sensors bounce a pulse of light off the car's surroundings to measure distance, detect road edges and identify lane marking.³

As of now, the concern is not whether India is in the position to accommodate Autonomous vehicles, but whether Indian Laws are capable to tackle the problem arising out of it i.e., liability for accidents.

Automated vehicle systems are based on artificial intelligence and machine learning. Vehicles are educated to learn from the complicated data they acquire through machine learning, which enhances the algorithms they run on and increases their capacity for road navigation. Vehicle

³ <https://www.synopsys.com/automotive/what-is-autonomous-car.html> last seen dated 09/09/2024

systems may now make decisions about how to function without requiring precise instructions for every scenario that might arise while driving thanks to artificial intelligence. linked car technology Through radio waves, vehicles can "see" each other and their surroundings, allowing them to view a larger picture of their surroundings. Technology in connected cars makes it possible to communicate with infrastructure and other cars.

Challenges of current AV technology: 6 major challenges:

1. Traffic Management

AV evangelists often refer to the traffic flow efficiency that could be created by self-driving vehicles. Cars that communicate with one another can avoid accidents and travel much more closely together, maximizing space. Much of the current AV conversation, however, has been focused on personal vehicles. There is enormous potential for self-driving trucks in platooning, the concept for big rigs to drive in caravans extremely close to each other, or self-driving shuttles that can help solve first mile/last mile traffic issues. The problem with these estimates, according to the report, is that if self-driving vehicles become available too quickly, that may lead to more personal vehicles on the road, thus disincentivizing more traffic-efficient public transportation options. AVs could lead to longer commutes, because riders could use their time for reading or perusing social media on a smartphone. Seattle may be able to reap the benefits of limited AV deployment by requiring traffic data to better inform the city departments on how traffic flow is and where the congestion points are. Currently, Seattle's Advances Traffic Management System (ATMS) is capable of collecting on-street traffic data, but transmitting AV traffic data to ATMS could optimize traffic patterns through signal manipulation or direct communication.

2. Infrastructure

Because of the radical change that AVs will bring to the current system of transportation, infrastructure pitfalls will become a glaring need. Often, AVs need clear lane striping, places to store the data collected by driving and if they run on electricity a more robust charging network. Without properly anticipating the sometimes opaque challenges, the system could be crippled in its infancy. The report recommends opening dialog now in order to prioritize public investments in infrastructure. Engaging in community and industry outreach could help officials understand whether it would be necessary to expand existing infrastructure or establish new features for AVs.

3. Revenue

In its ultimate form, AVs will not run red lights, they will not speed down the highway over the limit or overstay metered parking spots. This will, however, impact the city's budget. In Seattle, traffic fines constitute 2.6 percent of the city's operating fund. Seattle will have to generate new revenue streams in order to counteract the loss of funding. One suggestion from the report is for the city to develop a mileage tax or an AV registration tax.

4. Liability Insurance

One of the murkiest areas for self-driving vehicles is the issue of liability and insurance. How will insurance companies handle fender benders while a driver was reading and not paying attention to the road? Furthermore, who will constitute as the "driver;" who has ultimate "control"? The answer again lies in community partnerships. The report recommends opportunities for partnering with AV companies to facilitate the smooth introduction to AVs. And while many insurance and liability issues are not under city jurisdiction, Seattle should remain informed of developing liability policies.

5. Police and Emergency Response

More questions arise from AVs when thinking about law enforcement. How will police officers be able to recognize if a tailgating car is actually a series of connected AVs? It is not hard to imagine AVs being used as drug mules to transport narcotics. Local police departments could also become confused if during a routine traffic stop, an AV is pulled over. In the short term, the report suggests developing specific training procedures for police and emergency services interactions with AVs. In the long run, law enforcement agents may want to work with manufacturers on creating a "kill switch" to disable an AV that could be suspected of transporting illegal cargo. In the medium term, emergency services could coordinate with AVs to automate some police surveillance efforts or ambulance dispatch.

6. Social Justice and Equity

Among the most challenging issues facing the onset of AVs is the danger that it could overly benefit the wealthy and create more burdens for lower income residents. If AVs follow typical ownership models, the technology will be exclusively owned by the upper class, and lower-income community members will inadvertently be forced to bear the brunt of traffic fines. Those without AVs may also be disadvantaged when it comes to employment, as those with AVs would be able to work and answer emails while commuting. There is no easy solution to

this problem. “Seattle should proactively consider both the positive and negative impacts of AV technologies and policy responses on disadvantaged groups at every stage of regulation development and infrastructure funding,” the report reads. Only by actively staying aware of the benefits and drawbacks will Seattle officials be able to distribute the benefits equally.⁴

LEGAL AND REGULATORY FRAMEWORK FOR AUTONOMOUS VEHICLES:

Law Relating To Registration Of Vehicle:

Registration is a proof of ownership, and it is also an important document for the sale of a vehicle and transfer of its ownership.⁵ Vehicle Registration is mandatory under the purview of section 39 of The Motor Vehicle Act, 1988 that falls under the Concurrent List of Schedule VII of the Constitution of India. Section 39 prohibits driving of any unregistered motor vehicle and states that no owner of the vehicle should permit driving of an unregistered vehicle in public place, which is not registered under the provision of the MV Act. The exception to this provision is cars with the dealers. Section 192 of The Motor Vehicle Act, 1988, states that whoever drives a motor vehicle or causes or allows a motor vehicle to be used in contravention of the provisions of Section 39 shall be punishable with a fine, which may extend to five thousand rupees but shall not be less than two thousand rupees for a second time or subsequent offence with imprisonment which may extend to one year or with fine which may extend to ten thousand rupees but shall not be less than five thousand rupees or with both.

Car Manufacturers Vs. Legislative Reality:

A well-established system for assessing blame and fault for human operated automotive accidents currently exists. However, no easy solution exists or is available for state legislatures or courts to deal with the problem of accident aftermath involving AVs. AVs are used in such a limited capacity right now, compared to regular car usage, that legislatures are not likely to fully address these issues now or in the near future. Uncertainty remains. Both Ford and BMW have announced that fully autonomous vehicles most likely will not be ready until 2021. Even so, 2021 seems like a lofty goal to some. Car manufacturers have yet to properly teach AVs to traverse certain weather conditions and certain scenarios where it may be necessarily safer

⁴ <https://www.govtech.com/fs/the-6-challenges-of-autonomous-vehicles-and-how-to-overcome-them.html> last seen dated 09/09/2024.

⁵ Section 50 of The Motor Vehicles Act, 1988 states that Transfer of ownership should be reported within 14 days of the transfer if the vehicle is sold within the State and 45 days if the vehicle is sold outside the State.

foran AV to break the law (even though this would contradict how AVs are programmed to act). However, the Insurance Institute for Highway Safety (IIHS) predicts there will be 3.5 million AVs by 2025 and 4.5 million AVs by 2030. In addition, the IIHS added that these AVs would not be fully autonomous. This shows a rapid increase in production and thus an increasing need for establishing laws.

Product Liability And Its Implications For AV Manufacturers:

AV manufacturers must prepare for potential product liability risk when individuals or property are damaged by or in circumstances surrounding autonomous vehicles. Such product liability matters are most likely to centre around the AV technology, as opposed to driver, road, and weather conditions (thereby limiting defences). Product liability plaintiffs will likely pursue what a company did to fully understand its artificial intelligence (“AI”) capabilities, what inputs were used to guide AI, and how a product was programmed to react to various inputs. As responsibility for accidents shifts away from drivers and toward those that design, manufacture, and maintain AVs, the pool of companies potentially liable for accidents will deepen—as will the complexity of sorting out who should be held responsible. One anticipated challenge will be assessing whether software or hardware caused a particular event, which will require litigants and courts to delve into, among other fairly novel subjects, the interactions between them. This may be particularly troubling for entities within the supply chain that lack access to proprietary source code, which often sits at the root of sorting this out.⁶ The manufacturer can also defend their product failure and are not defense less as described below.

1. Comparative negligence:

The manufacturer has a comparative negligence defense, arguing that they cannot be fully or partially held liable because of the negligence of the claimant. The court will analyze the claimant’s conduct when the accident happened, e.g., the operator decided not to intervene when the accident happened, etc. Similarly, a claimant reading a book is more negligent as compared to an attentive driver. The disabled driver cannot do anything, but for an attentive driver, evidence is required that the accident could not have been prevented even with operator intervention. However, the situation is more complex for diminished capabilities and distracted drivers. On the other hand, manufacturers cannot avoid liability by forcing anyone to be attentive.

⁶ <https://www.automotiveworld.com/articles/autonomous-vehicles-driving-regulatory-and-liability-challenges/> last dated 10/09/2024

2. Misuse:

The Manufacturer can also use a misuse defense. A manufacturer can only warn people that an accident will happen if the product will be misused. The manufacturer is not liable for all kinds of misuses. However, reading a book is not misusing the AV.

3. State of the art:

The state of the art defense can be used against design defect and warning defect claims. For warning defects, the manufacturer can only warn based on current technology and scientific knowledge at the time of production. Similarly, for design defect, the manufacturer can only be liable if he has not used an advanced design at the time of production to make the AV safe. A claimant can only win the claim if he proves that a better design/technology was available and was not used by the manufacturer at the time of production.

4. Assumption of risk:

The manufacturers have to inform the buyer about the potential risk of using the product to use this defence. For example, the user must be informed that he must take control of the AV in snowy conditions. Assume that the consumer has no idea that the snow will start during the journey. Then, the snow starts during the trip, and the AV asks the operator to take control. However, whether the manufacturer can use this defence or not will depend on who is the operator at that time, as a disabled driver cannot do anything. Similarly, it depends on the capability of the diminished capability driver, whether he can take control or not. For a distracted driver, the AV can ask the driver to take control. The attentive driver should take control in such a situation.

Legal Challenges For India:

The current legal framework that governs automobiles in India poses a serious obstacle for the introduction of the automated vehicles in India and a serious legal-policy transformation needs to be undertaken to achieve the needful.

Currently, automobiles and their operation in India are regulated and governed by a statute named the motor vehicles act, 1988 which does not legally permit and sanction the usage of autonomous vehicles in India. In fact, the regulatory system is so restrictive and complicated in nature that even testing of AVs is not allowed within India. The draft motor vehicles (amendment) bill of 2017 does provide for testing. However, not much progress has been made

post the proposing of the bill.

Another significant issue that arises with respect to providing legal sanction to AVs is the allocation of liability in case a self-driven vehicle hits a pedestrian or another automobile on the road. As per the current laws in India, there arises a no-fault liability as per section 140 of the motor vehicle act, 1988 on the owner or insurance company in case of fatality or permanent disability. There are also apprehensions regarding privacy issues that arise with the emergence of AVs, as these vehicles require an enormous amount of personal data and user preferences.⁷

Ethical Considerations in Autonomous Vehicle Development:

As technology propels us toward a future of self-driving cars, the intersection of innovation, safety, and moral responsibility takes centre stage. The very nature of autonomous vehicles, which operate through algorithms and machine learning, raises ethical questions that challenge both developers and society.

The Core Ethical Considerations

- 1. Safety and Liability:** Determining who bears responsibility in the event of accidents involving autonomous vehicles is a pressing ethical concern.
- 2. Decision-Making Algorithms:** Autonomous vehicles must be programmed to make split-second ethical decisions, such as choosing between protecting occupants or pedestrians.
- 3. Privacy:** Autonomous vehicles gather vast amounts of data about passengers' movements and preferences, sparking concerns about data privacy.
- 4. Job Displacement:** As autonomous vehicles replace human drivers, ethical considerations arise around the impact on employment in the transportation sector.

Advantages of Ethical Considerations in Autonomous Vehicle Development

- 1. Public Trust:** Ethical decision-making fosters public trust, essential for the successful adoption of autonomous vehicles.
- 2. Safety Enhancement:** Ensuring ethical algorithmic decision-making can lead to safer road environments for all users.

⁷ <https://blog.ipleaders.in/legal-issues-related-autonomous-vehicles/> last seen dated 11/09/2024

3. **Privacy Preservation:** Addressing privacy concerns safeguards user data, promoting ethical behaviour in autonomous systems.
4. **Societal Integration:** Ethical development ensures that autonomous vehicles seamlessly integrate with existing societal norms.

Safety and Liability: The Moral Quandary

- **The Trolley Problem:** Autonomous vehicles face scenarios where they must make life-and-death decisions. Balancing the moral outcomes in such cases poses a significant challenge.
- **The Responsibility Spectrum:** Determining the party responsible—be it the vehicle manufacturer, software developer, or human occupant—in case of accidents is a complex issue.

Privacy in the Age of Data Collection

- **Data Collection:** Autonomous vehicles gather extensive data about occupants, their locations, and behaviours. Striking a balance between data collection and user privacy is crucial.
- **Anonymization and Data Security:** Protecting data through anonymization and robust cybersecurity measures ensures that privacy is maintained.

Job Displacement and Ethical Dilemmas

- **Impact on Drivers:** The transition to autonomous vehicles could lead to job displacement among human drivers, necessitating ethical strategies to mitigate negative consequences.
- **Responsibility to Workers:** Ethical considerations require addressing the welfare of drivers whose jobs are at risk.
- **Algorithmic Transparency:** Ensuring that the decision-making algorithms of autonomous vehicles are transparent is vital for accountability.
- **Liability and Regulation:** Legal frameworks and regulations must be established to hold manufacturers and developers accountable for ethical considerations.

Ethics in Practice: Guiding Principles

- **Prioritizing Human Safety:** Ensuring the safety of all road users must be the primary ethical principle.

- **Transparency:** Developers must be transparent about how autonomous systems make decisions, fostering public trust.
- **Privacy by Design:** Designing systems with privacy in mind, minimizing data collection, and ensuring consent are ethical practices.
- **Collaboration and Education:** Ethical development requires collaboration among stakeholders and educating the public about the technology's capabilities and limitations.

The voyage toward autonomous vehicles is not merely a technological endeavour; it is a moral expedition that requires us to confront challenging ethical questions. As engineers and innovators steer the course of autonomous vehicle development, the ethical considerations that underpin this journey become increasingly vital. The decisions made today will ripple through our society, shaping the way we navigate roads, interact with technology, and safeguard our values. By embracing ethical principles, fostering transparency, and prioritizing human safety, we can ensure that the road ahead is not only paved with technological innovation but also guided by a commitment to the greater good. As we stand at the crossroads of technology and morality, our ethical choices will determine whether autonomous vehicles become a beacon of progress, safety, and convenience or a source of ethical dilemmas and unintended consequences.⁸

Conclusion:

It is important to remember that the welfare and security of the general population are the main goals of every new technology. No innovation is perfect, and antivirus software is no different. Therefore, sufficient testing is required to guarantee their security requirements for human users, and stricter measures pertaining to culpability determination must be included in future regulations. Furthermore, the government's concerns about job losses and unemployment following the deployment of autonomous vehicles (AVs) in India are not entirely unfounded. It is impossible to deny, though, that technology will make it easier for a number of freshers, more varied career paths to emerge, including those in artificial intelligence, information technology, engineering, robotics, automotive, and software development in India.

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<https://www.indikaai.com/blog/understanding-ethics-of-autonomous-vehicle-development#:~:text=Safety%20and%20Liability%3A%20Determining%20who,between%20protecting%20occupants%20or%20pedestrians.> Last seen dated 11/09/2024.