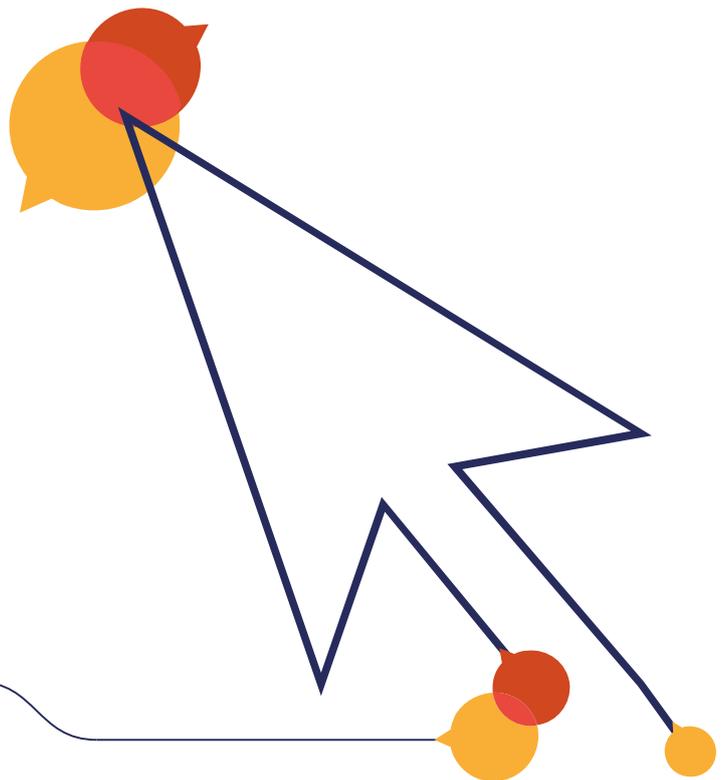




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Automated Vehicles: Challenges and Opportunities

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Introduction

Automated vehicles are vehicles capable of safely driving themselves without human input for at least part of a journey. They use sensors, artificial intelligence, and onboard computing to steer, brake, and perform other driving tasks. Also known as self-driving or driverless vehicles, automated vehicles can operate in defined automated modes, taking over some or all of the driving task from a human driver.

Automated vehicles should be understood not only as a technological innovation, but as part of a wider transport system that includes regulation, infrastructure, operators, and public behaviour. Their safety performance depends not just on how the technology functions, but on how well these elements interact. This means that technology alone does not determine safety or accessibility; how vehicles are regulated, maintained, operated, and understood by the public will also play a key part in outcomes. This means that automated vehicles are as much a social and organisational challenge as a technological one.

Automated vehicles take many forms, from passenger shuttles and automated taxis to delivery robots and specialist mobility vehicles. While deployment is still in its early stages, these vehicles are moving quickly from controlled trials to real-world operation on public roads. This transition raises new questions about how automated vehicles behave outside controlled environments, how they are maintained and monitored over time, and how other road users interpret and respond to their presence. Vulnerable road users, including pedestrians, cyclists, motorcyclists, and even horse riders, will need to interact with automated vehicles, highlighting the need for careful system design and public education. These challenges underscore why coordinated action from government, businesses, and the public is needed, with each group playing a distinct but interconnected role in ensuring safe deployment. In the UK, small-scale pilots are already underway, with plans for automated ride-hailing services to be trialled in London from Spring 2026. Delivery and logistics automated vehicles are also being considered, aiming to reduce congestion, emissions, and reliance on human drivers.

The potential benefits of automated vehicles could be substantial. Human error is widely cited as causing almost 90 per cent of road collisions, suggesting that automated vehicles, which remove the human driver, could significantly improve road safety. They are not prone to fatigue, distraction, or impairment in the way that human drivers can be. Other benefits include improved accessibility for passengers with reduced mobility, increased efficiency in freight and delivery services, and reduced carbon emissions if vehicle use is optimised. While these benefits are significant, realising them depends on addressing challenges such as equitable access, predictable behaviour in mixed traffic environments, and public understanding of automated vehicle capabilities.

Removing human error has the potential to reduce many types of collisions, but automated vehicles may also introduce new risks and collision scenarios. Understanding and managing these emerging risks will be essential to ensuring that overall road safety outcomes improve.

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Automated vehicles must reliably navigate complex, mixed road traffic environments and respond appropriately in emergency situations and unusual circumstances. Ensuring that journeys remain accessible and affordable is also essential to prevent further inequalities. Managing these challenges effectively requires a coordinated approach across government, businesses, and the public, with each group responsible for different elements of safety, accessibility, and reliability.

The safe deployment of automated vehicles will require action across three interdependent groups:

- **Government**, which must set regulatory frameworks, define standards for safety and accessibility, manage risk, and ensure that automated vehicles deliver benefits consistently
- **Businesses**, including manufacturers, operators, and service providers, who need to embed safety, accessibility, and transparency into design and operations
- **The public**, who must understand how to use automated vehicle services responsibly and share the road safely with them

The following sections explore the challenges and opportunities for each group, beginning with the government, which establishes the conditions under which automated vehicles operate.

Automated Vehicles: Challenges and Opportunities

Challenges and opportunities for government

Government plays a central role in shaping the safe, accessible, and effective deployment of automated vehicles. Its responsibilities extend beyond regulation, and include oversight, guidance, and fostering public confidence in this emerging technology. The decisions made by government will define the conditions under which automated vehicles operate, influence how businesses design and deploy services, and affect how the public perceives and interacts with these vehicles.

Safety and regulatory oversight

One of the government's challenges will be ensuring that automated vehicles operate safely across all road types and traffic environments while interacting safely with human-driven vehicles and other road users. This requires the development and enforcement of safety standards that provide clear expectations for operators, manufacturers, and service providers. Currently, there is limited guidance on how operators should prepare a safety case or how data, including incidents and near misses, should be collected and analysed.

Government must also define what constitutes acceptable risk, balancing innovation with public safety. Operators should be required to demonstrate robust emergency and incident management procedures, ensuring that vehicles can respond appropriately to unexpected events and system failures. Safety standards must also consider interactions with vulnerable road users, including pedestrians, cyclists, and animals such as horses.

Beyond vehicle design and performance, government oversight must include the systems and processes that support deployment, including maintenance schedules, operator responsibilities, and compliance monitoring. Even as vehicles become more automated, human oversight will continue to be vital. Establishing clear accountability for vehicle safety, both at the operational and system levels, is therefore a key government responsibility.

Accessibility and inclusion

Accessibility and inclusion must also be central to government policy on automated vehicles. The new technology offers a unique opportunity to improve transport equity, but only if services are designed from the outset to be accessible to all. Government must ensure that minimum standards cover vehicle design, boarding and alighting procedures, seating arrangements, and service planning. These standards should enable safe and affordable access for older adults, people with disabilities, and passengers with reduced mobility.

Government also plays a role in promoting digital inclusion. Many automated vehicle services rely on apps or online platforms, which may exclude passengers without access to smartphones or the internet. By supporting alternative access options and inclusive service design, government can prevent inequalities from being reinforced and encourage widespread adoption.

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Collaboration, accreditation and public confidence

Collaboration between government, industry, and other stakeholders will be essential to manage risk and to build and eventually maintain public trust. Mechanisms for sharing safety insights, lessons learned from incidents and near misses, and best practice across operators will enable continuous improvement and more consistent safety outcomes. Accreditation schemes, kitemarks, or certification programs can provide reassurance to the public that vehicles and operators meet rigorous safety and accessibility standards.

Public confidence is a critical enabler of automated vehicle adoption. Transparent reporting requirements, clear communication of safety standards, and engagement with consumer groups will help the public understand how automated vehicles operate and what safeguards are in place. Government messaging can set expectations for users, promote responsible behaviour, and support education initiatives. Clear communication about what automated vehicles can and cannot do, and what actions passengers and other road users should take in emergencies, will help prevent misunderstandings and unsafe behaviour.

Enabling safe deployment

By establishing clear regulatory frameworks, promoting accessibility, and encouraging collaboration between operators and technology providers, government can create the conditions for safe and trusted automated vehicle services. Ensuring that standards are met and public confidence is maintained will accelerate adoption and improve overall road safety outcomes.

Government decisions will influence how businesses design their services and how the public engages with the technology. Choices made at the regulatory level cascade through operations and public interactions, shaping the safety, accessibility, and trustworthiness of automated vehicles across the UK.

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Challenges and opportunities for the public

The public plays a dual role in the deployment of automated vehicles, acting both as passengers using these services and as other road users sharing the road. Their understanding, behaviour, and trust are critical to the safe and effective deployment of automated vehicles. The public's actions will directly influence safety outcomes, the effectiveness of regulatory measures, and the confidence with which businesses can deploy services.

Understanding and trust

A key challenge for the public is understanding the capabilities and limitations of automated vehicles. Research, such as a Thatcham study¹, indicates that over half of UK drivers mistakenly believe that fully automated cars are already available for purchase. Misunderstandings about how automated vehicles behave in complex traffic situations can also lead to unsafe actions. For example, automated vehicles are designed to be cautious in uncertain situations, which may appear overly defensive to other road users expecting human-like driving behaviour. This could result in pedestrians stepping out too early, cyclists misinterpreting vehicle intent, or passengers attempting unnecessary interventions.

Public education and engagement present significant opportunities. Clear guidance on what automated vehicles can and cannot do, trial experiences, demonstrations, and transparent reporting of incidents and near misses can help the public understand how to use these vehicles safely. Effective public communication reinforces safe interaction, reduces misconceptions, and builds trust in the technology.

Safe interaction

Automated vehicles follow traffic rules strictly and avoid risky manoeuvres, which can improve safety but may also challenge established informal behaviours on the road. For instance, pedestrians often rely on eye contact or gestures to interpret a driver's intentions. Automated vehicles may not respond in the same way, potentially causing uncertainty.

To mitigate these risks, public education must emphasise typical automated vehicle behaviours, and vehicles themselves may need visual signals or other cues to indicate intent. Passengers also have responsibilities: following boarding and exit procedures, remaining seated

¹ Thatcham Research (2022) 'Confused UK drivers believe they can buy a fully Autonomous car today'
<https://news.thatcham.org/confused-uk-drivers-believe-they-can-buy-a-fully-autonomous-car-today/>
Date accessed: 09/02/2026.

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while the vehicle is in motion, and reporting any issues promptly. Understanding both the vehicle's capabilities and their own role in safe interaction is essential for all road users.

Accessibility and inclusion

Accessibility is a vital consideration for the public. Automated vehicles offer the potential to improve mobility for older adults, people with disabilities, and passengers with reduced mobility, but only if inclusive design is implemented from the outset. Physical features such as wheelchair ramps, priority seating, handrails, and space for mobility aids are required. Service design should also ensure accessible pick-up and drop-off points, route planning that accommodates passengers with additional needs, and alternative booking methods for those who are unable to use digital booking platforms.

Embedding accessibility into public-facing services will require engagement with people with lived experience. Co-creation of solutions ensures that automated vehicles meet diverse needs and prevent excluding groups with different needs. Fair pricing and service availability will further ensure that services benefit all, reducing existing transport inequalities.

Fostering responsible engagement

The public's role is not only to access services safely but also to support wider adoption. Responsible engagement includes understanding emergency procedures, interacting safely with automated vehicles in shared spaces, and contributing feedback through reporting. By doing so, the public reinforces both trust and safety.

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Challenges and opportunities for businesses

Businesses, including vehicle manufacturers, service operators, technology providers, and organisations managing fleets will play a key role in the safe, accessible, and reliable deployment of automated vehicles. Their responsibilities go beyond vehicle design, extending to day-to-day operations, integration with the wider transport system, and how passengers and other road users interact with these services. Decisions made by businesses will significantly influence public confidence, safety outcomes, and accessibility.

Ensuring safe and reliable operations

A key challenge for businesses is ensuring that automated vehicles operate safely across a wide range of real-world conditions. Vehicles must manage complex traffic situations, respond to changing road conditions, and maintain high safety standards on different road types, including urban streets, rural roads, and motorways. Robust testing, ongoing monitoring, and structured procedures for identifying and addressing operational issues or system limitations are essential.

Because automated vehicles may behave differently from human-driven vehicles, for example, slowing earlier at junctions or taking more defensive actions, businesses must anticipate how these differences could lead to misunderstandings or near misses. Mixed fleets, where automated and conventional vehicles operate together, further increase operational complexity and demand careful planning.

Transparent sharing of operational data, including incidents and near misses, is critical for building public trust. Analysing near-miss data alongside collision data provides early warning of emerging risks and informs continuous improvement in road safety.

Businesses also face operational challenges, such as managing vehicle maintenance, route planning, scheduling, and compliance. Clear procedures for responding to breakdowns, emergencies, or unexpected events, such as safely stopping a vehicle or assisting passengers, will be vital. Coordination with local authorities on pick-up and drop-off points, road space management, and interactions with vulnerable road users will improve safety.

Accessibility and inclusion

Accessibility must be embedded in vehicle and service design. Without careful planning, certain passenger groups, such as people with disabilities, older adults, or those who are unable to use digital booking platforms, may face barriers to using automated vehicle services. Physical features such as accessible seating, ramps, and secure spaces for mobility aids are essential.

Operational design must consider accessible pick-up and drop-off points, safe support for passengers requiring assistance, and alternative booking methods for those without access to smartphones or digital tools. Staff and remote operators must receive training in safe passenger assistance, safeguarding, and awareness of accessibility needs.

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Engaging with users with lived experience during the design stage ensures that services meet diverse requirements and are genuinely inclusive. Businesses that prioritise accessibility not only enhance social equity but also build public trust, encouraging broader adoption of automated vehicles.

Fostering public confidence

Businesses also play a key role in building public confidence. Transparent communication about vehicle capabilities, operational limitations, and safety improvements reinforces public trust. By actively collecting feedback, reporting incidents, and sharing lessons learned, businesses contribute to a safer transport system.

Safe, accessible, and reliable operations are interconnected with government regulation and public understanding. Businesses translate regulatory standards into practical actions, manage day-to-day vehicle performance, and ensure services meet user needs. Their decisions shape both individual experiences and broader public perceptions, highlighting the importance of a proactive, inclusive, and transparent approach to automated vehicle deployment.

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Future challenges

As automated vehicles move from small-scale trials to widespread deployment, new safety challenges will continue to emerge. While early pilots allow close monitoring, scaling up will require consistent oversight, transparent data sharing, and a culture of continuous learning across government, businesses, and the public.

One of the most significant challenges will be managing safety in mixed-traffic environments. Automated and human-driven vehicles will share the roads for many years, requiring systems capable of predicting and responding safely to the unpredictable behaviour of people, pedestrians, cyclists, and other drivers. Small variations in expectations, for example a pedestrian crossing unexpectedly, a cyclist misinterpreting a vehicle's intentions, or a driver misjudging how an automated vehicle might respond, could create new collision risks if the vehicles are not tested and programmed for the full range of real-world interactions. Businesses will need to ensure that their vehicles are designed, tested, and deployed with these conditions in mind, while public understanding and responsible behaviour remain essential to mitigate risk.

The way safety is monitored and reported must also evolve. Current systems underreport collisions, and near misses are usually not captured, meaning that opportunities to learn from potential hazards could be missed. Establishing common standards for data collection, sharing, and open reporting will be essential to identify trends, prevent repeat incidents, and maintain public confidence. Operators and regulators will need to collaborate to ensure transparency, support continuous learning, and protect privacy.

Cybersecurity and software reliability will be central to ongoing safety management. Automated vehicles rely on complex networks of sensors, communications, and software, creating vulnerabilities that could be exploited or disrupted. While some cyber risks extend beyond the vehicle itself, businesses must ensure robust system design, testing, and monitoring. Government guidance and oversight will be essential to maintain public trust. Confidence in these systems is vital, because even minor technical failures or perceived malfunctions can undermine public trust.

Ensuring safe performance across complex and differing road environments will be another key challenge. Rural roads, with limited infrastructure and connectivity, present different risks than dense urban streets with high pedestrian and cyclist activity, complex junctions, or variable lighting and weather conditions. Safety standards, testing, and operational planning must reflect this diversity to ensure reliability in all settings.

As vehicles become more automated, the roles of people in maintaining road safety will shift. Responsibility may fall on drivers in partially automated vehicles, passengers, operators, or the companies that develop and maintain the technology, depending on the context. Everyone, pedestrians, cyclists, other motorists, and passengers, will need guidance on how to interact safely with automated vehicles. Clear communication about roles, responsibilities, and emergency procedures will be essential to maintain safety and public confidence.

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The move towards fully automated transport will not be determined by technology alone, but by how effectively safety is managed, risks are communicated, and lessons are learned from experience. Government, businesses, and the public must collaborate to share information, coordinate actions, and build trust. By focusing on transparency, inclusivity, and continuous improvement, the UK can lead in ensuring that automated vehicles enhance road safety, accessibility, and efficiency for all.

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Conclusion

Automated vehicles have the potential to deliver significant benefits for road safety, accessibility, and transport efficiency. However, these benefits will only be realised if safety, inclusion, and public confidence are prioritised throughout their deployment. Automated vehicles should not be viewed solely as a technological innovation, but as part of a wider transport system shaped by regulation, operational decisions, and human behaviour.

Government has a central role in establishing the regulatory frameworks, safety standards, and oversight mechanisms for safe deployment. Clear guidance on acceptable risk, accessibility requirements, incident reporting, and data sharing will be essential to ensure positive safety outcomes and public trust. By providing strong leadership and fostering collaboration across sectors, government can create the conditions in which automated vehicles are deployed responsibly and in the public interest.

Businesses, including manufacturers, operators, and service providers, are responsible for translating regulation into safe and reliable real-world operations. This includes designing vehicles and services that are accessible and inclusive, managing maintenance and operational risks, responding effectively to incidents, and sharing safety data transparently. Decisions made by industry will directly influence how automated vehicles interact with other road users and how confident people feel in using and sharing the road with them.

The public also plays a critical role, both as passengers using automated vehicle services and as pedestrians, cyclists, and drivers interacting with them. Clear communication, education, and engagement will be necessary to ensure that people understand how automated vehicles behave, what they can and cannot do, and how to interact with them safely. Building public trust will depend on transparency, consistent performance, and commitment to safety and accessibility.

The transition to deployment of automated vehicles will be shaped not only by technological progress, but by how effectively risks are managed, lessons are learned, and responsibilities are shared. By working together and maintaining a focus on safety, inclusion, and continuous improvement, government, businesses, and the public can ensure that automated vehicles contribute to a safer, fairer, and more accessible transport system for everyone.



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