Recommendation 1: The federal government should facilitate/support the development a National Data/Privacy Framework that clearly delineates the different aspects of data (i.e., machine versus personal) and how they should or shouldn't be utilized in smart transportation technologies.

Description:

In conjunction with supporting a National Privacy Framework, the federal government should consider setting high level policy guidelines for data ownership, retention and usage that includes specific guidance for data that has personal information. These guidelines should leverage existing legislative or regulatory language and provide incentives for state and local jurisdictions to adopt them.

Justification:

The justification for a National Privacy Framework and guidelines for data ownership, retention and usage that include specifics for data that includes personal information would provide states and local jurisdictions the ability to determine how long data should be retained, how personal information should be stripped from any such data, and how to effectively utilize that data in their operations. Here are some key examples:

- Data from a Traffic Camera at an intersection could be used to determine who was responsible for an accident and allow for more efficient insurance claims.
- Data generated from a connected vehicle and its corresponding roadside infrastructure can be utilized to transmit basic safety information to the vehicles driver such as entering a school or work zone.
- Emergency Vehicles and corresponding roadside infrastructure can generate data to preempt traffic signals so the vehicles can get to their destination sooner.

Implementation Considerations:

- Stakeholder engagement: Engage with key stakeholders, including vehicle manufacturers, infrastructure providers, and state/local transportation agencies.
- Focus on practical use cases for data usage and how it can help to save lives: Emergency Vehicle Preemption, Entering School or Work Zone, and pedestrian crossing ahead.
- Share lessons learned from pilot projects and successful case studies.
- Training and education on proper data retention and usage procedures

Potential implementation barriers:

- Funding and resource constraints: Some state and local jurisdictions/agencies don't have either the funding or the staff to effectively implement these programs.
- Coordination across multiple jurisdictions: Implementation of a national privacy framework across multiple states and local jurisdictions that each have their own unique situations is challenging.
- Concerns over data that has personal, private information: It will be a challenge to separate out data that has these aspects.
- Existing privacy legislation: As no national legislation currently existing some states have started to develop their own data privacy laws and regulations. These will need to be considered and made sure that they align.

Possible participating agencies:

Federal agencies that may be impacted by this recommendation include the Department of Transportation, FHWA, NHTSA, and the National Institute of Standards and Technology, among others.

Recommendation 2: The federal government should support research and industry lead standards in areas such as telematics and sensor technologies for autonomous vehicles. These standards should be based on high-level safety guidelines determined by the National Highway Traffic Safety Administration

Description:

The autonomous vehicle (Avs) market in some respects is still emerging. AVs exist in states like CA, and AZ, however in other areas of the country they are only found in designated geo-fenced areas like a university campus. It will be some time before these exist on current highways/streets that have vehicles with human drivers. Research is needed to determine how AVs will interact with these vehicles, with roadside infrastructure, and with pedestrians. In addition, research is needed to how these interactions change in times of bad weather.

High-level safety guidelines will need to be finalized by the National Highway Traffic Safety Administration as there are still open liability questions particularly regarding a determination of fault in the event of an accident. Spurred by these guidelines industry can develop appropriate performance and safety standards in a market that is still emerging while avoiding the possibility of market fragmentation. It's important that all key stakeholders in the autonomous vehicle ecosystem participate in these safety discussions and standards development activities.

Justification:

The justification for supporting research and when appropriate industry standards in telematics and sensor technologies for autonomous vehicles is provided below:

1. Interoperability: Industry standards and protocols are needed to ensure that these devices from different manufacturers can communicate and work together seamlessly.

2. Safety: Industry standards that are based on fundamental safety guidelines can provide a level of assurance that these devices can communicate basic safety information to other vehicles that have differing levels of autonomy as well as corresponding roadside infrastructure.

3. Innovation and competition: Standards can stimulate innovation and competition by providing a level playing field for businesses and developers, regardless of their size or market share. This encourages the development of new products and services that adhere to established standards, ultimately benefiting consumers and the entire industry.

4. Cost savings: Standardization can lead to cost savings for businesses by reducing the need for customized solutions and simplifying the procurement process. This is particularly relevant for vehicle tier 1 and tier 2 component suppliers who would provide the same component across different automotive vehicle manufacturers. This also promotes economies of scale, as standardized components and devices can be produced more efficiently, leading to lower costs for manufacturers and end-users.

5. Regulatory compliance: Standards and protocols can serve as a foundation for subsequent government regulations and policies related to autonomous vehicle technology.

Implementation Considerations:

Implementation considerations for creating industry standards and protocols for supply chain include:

1. Inclusiveness: Involve a diverse range of stakeholders, autonomous vehicle manufacturers, roadside infrastructure manufacturers, communication technology

providers, software developers, academia, and government agencies, in the development of standards and protocols. This ensures that the resulting standards and guidelines are comprehensive, practical, and aligned with the needs and priorities of all relevant parties.

2. Prioritize safety: Deaths from traffic accidents continue to increase and standards/guidelines need to address how these technologies can help to decrease these.

3. Build on existing standards: Leverage existing industry standards and best practices as a starting point, in particular those for how connected vehicles that have a human driver present interact with transportation infrastructure.

4. Flexibility and adaptability: Design standards and protocols that are flexible and can be easily updated to accommodate new technologies, emerging threats, and evolving industry needs.

5. Promote adoption: Encourage and incentivize adoption of the established standards and protocols through education, outreach, and support programs.

6. Ensure compliance: Develop mechanisms to monitor and enforce compliance with the established standards and protocols, including certifications, audits, and penalties for non-compliance.

Potential implementation barriers:

Possible barriers to implementing this recommendation include:

1. Industry is still emerging: The autonomous vehicle market needs to have sufficient time to develop. Technical challenges exist in areas such as radar interference, driving in extreme weather conditions. Developing standards and guidelines too early may hinder its growth.

2. Infrastructure: AVs will require certain infrastructure aspects like clear lane striping, and a means to charge if they are electric.

3. Lack of regulatory guidance: High-level guidance is needed from applicable government agencies to set the safety requirements for autonomous vehicles.   There is still an open issue of liability concerns that needs resolution.

4. Cost and resource constraints: Developing and implementing industry standards and protocols can be resource-intensive, requiring significant investments in time, money, and expertise.

5. Public Concerns/Opinions: There is a need for consumer education on autonomous vehicle technology.

Possible participating agencies:

Federal agencies that may be impacted by this recommendation include the Department of Transportation, FHWA, NHTSA, and the National Institute of Standards and Technology, among others.

Recommendation 3: The federal government should consider developing programs and grants to allow underserved and less developed communities as well as rural areas to adopt smart transportation technologies.

Description:

A more holistic approach to how these programs and grants are developed can better serve these areas.

Justification:

The main reasons for this recommendation are:

1. Accessibility and Inclusion: The benefits from the adoption of these technologies are not necessarily available to everyone.

2. Stimulating private investment: Government grants and programs targeted towards these areas could spur private investment in these areas as well.

3. Creating jobs and economic growth: As the technologies are adopted in these areas, they will require skilled workers to develop, implement, and maintain these systems. Financial incentives can help stimulate this job growth and support the development of a skilled workforce in the IoT sector.

Implementation Considerations:

Implementation considerations for developing programs and grants for underserved and less developed communities as well as rural areas include the following:

1. Identifying appropriate tactics/methods: The federal government should include items such as ADA-compliant EV Charging stations, EV Ready language into building codes, small- disadvantaged business set asides, DOT Grand challenges as programs/grants are developed.

2. Defining eligibility criteria: Clear eligibility criteria should be established to ensure that these grants/incentives are targeted only at these types of communities and areas.

3. Monitoring and evaluation: The federal government should establish a system for monitoring and evaluating the effectiveness of these grants/incentives.

4. Addressing potential barriers: Possible barriers to implementing this recommendation may include budget constraints, lack of political support, or concerns about market distortion. The federal government should address these concerns by demonstrating the potential economic and environmental benefits of IoT adoption in supply chains, leveraging public-private partnerships to share costs, and ensuring that the financial incentives are designed to minimize market distortions.

Potential implementation barriers:

Possible barriers to implementing this recommendation include:

1. Lack of awareness on the benefits of these technologies: Individuals that reside in these areas may not be fully aware of all the potential benefits that these technologies provide.

2. Connectivity might be an issue in rural areas. Should consider those rural areas that already have some base level of connectivity.

Possible participating agencies:

Federal agencies that may be impacted by this recommendation include the Department of Transportation, FHWA, NHTSA, US Telecom, and the National Institute of Standards and Technology, among others

Recommendation 4: The federal government should support industry lead standards for minimum baseline interoperability and cybersecurity requirements for smart transportation technologies and corresponding transportation infrastructure (i.e. sensors in roads, cameras at intersections)

Description:

Industry lead standards that provide minimum interoperability and cybersecurity need to reflect input from all key stakeholders. There are likely some areas where standards activity can occur more readily such as sensors in roads that can detect defects, traffic cameras at intersections, The standards process needs to be open to allow interested parties the ability to participate.

Justification:

The justification for creating industry standards that provide minimum requirements is provided below:

1. Interoperability: Industry standards and protocols ensure that devices from different manufacturers can communicate and work together seamlessly. This is particularly important when dealing with multiple states and local jurisdictions.

2. Addressing Cybersecurity Risks: Industry standards that describe minimum cybersecurity requirements of these technologies (i.e., having unique set of keys for traffic controller cabinets) will help to provide implementing agencies some level of assurance that these risks are mitigated.

3. Innovation and competition: Standards can stimulate innovation and competition by providing a level playing field for businesses and developers, regardless of their size or market share. With a level baseline companies can now build upon it and tailor their own solutions.

4. Cost savings: Standardization can lead to cost savings for businesses by reducing the need for customized solutions and simplifying the procurement process.

5. Regulatory compliance: Standards and protocols can serve as a foundation for subsequent government regulations and policies.

Implementation Considerations:

Implementation considerations for creating industry standards and protocols for supply chain include:

1. Inclusiveness: Involve a diverse range of stakeholders, autonomous vehicle manufacturers, roadside infrastructure manufacturers, communication technology providers, software developers, academia, and government agencies, in the development of standards and protocols. This ensures that the resulting standards and guidelines are comprehensive, practical, and aligned with the needs and priorities of all relevant parties.

2. Prioritize safety and Cybersecurity: Deaths from traffic accidents continue to increase and standards/guidelines need to address how these technologies can help to decrease these. In addition, these devices can serve as a gateways for malicious actors.

3. Build on existing standards: Leverage existing industry standards and best practices as a starting point, creating duplicated standards only adds confusion to the market.

4. Flexibility and adaptability: Design standards and protocols that are flexible and can be easily updated to accommodate new technologies, emerging threats, and evolving industry needs.

5. Promote adoption: Encourage and incentivize adoption of the established standards and protocols through education, outreach, and support programs.

6. Ensure compliance: Develop mechanisms to monitor and enforce compliance with the established standards and protocols, including certifications, audits, and penalties for non-compliance.

Potential implementation barriers:

Possible barriers to implementing this recommendation include:

1. Cybersecurity threats are constantly evolving: These standards and guidelines could be outdated rather quickly.

2. Concern over a particular organizations IP: Some organizations may have their own IP that is different from what is described in a baseline standard and would chose not to participate in any such activities.

3. Cost and resource constraints: Developing and implementing industry standards and protocols can be resource-intensive, requiring significant investments in time, money, and expertise.

Possible participating agencies:

Federal agencies that may be impacted by this recommendation include the Department of Transportation, FHWA, NHTSA, and the National Institute of Standards and Technology, among others.

Recommendation 5: The federal government should invest and promote education and workforce development in smart transportation technologies.

Description:

While workforce development and education is a broader topic across the IoT, there are specialized training/apprenticeship programs needed in this area. They could start as early as high school (could also be summer intern programs) and need to include cybersecurity topics. The inclusion of yearly certifications on these in also encouraged.

Justification:

The justification for the recommendation to invest in education and workforce development in the is provided below:

1. Addressing skills gap: This is particularly evident for traffic engineers who are not familiar with these types of new technologies. They think of traffic engineering as concrete and asphalt

2. Enhancing competitiveness: A well-trained and skilled workforce is a key factor in the competitiveness of the sector. By investing in education and workforce development, the government can help businesses stay ahead of international competition and maintain a strong position in the global market.

3. Fostering innovation: A skilled workforce with a strong foundation in these technologies can drive innovations and development in new cutting-edge solutions.

4. Supporting digital transformation: The transportation sector is already undergoing a digital transformation and businesses need to adapt their operations and processes accordingly.

5. Encouraging job creation: As these new cutting-edge technologies are being developed in the transportation sector new jobs may be created-particularly as autonomous vehicles become more mainstream.

Implementation Considerations:

Implementation considerations for investing in education and workforce development include:

1. Identifying skill requirements: Conduct a thorough analysis of the specific skills and expertise needed.

2. Developing targeted curricula: Collaborate with educational institutions, industry stakeholders, and training providers to develop targeted curricula and training programs unique to the transportation sector.

3. Expanding access to education and training: Implement policies and programs that ensure broad access to this and training, including financial aid, scholarships, and online learning options to reach underserved communities.

4. Encouraging industry-academia partnerships: Promote partnerships between industry and educational institutions to facilitate real-world learning experiences, internships, and collaborative research projects.

5. Focusing on reskilling and upskilling: Implement programs to reskill and upskill the existing workforce, enabling them to adapt to the changing requirements of the transportation sector.

6. Establishing performance metrics: Develop performance metrics and evaluation methods to assess the effectiveness of education and workforce development initiatives and make data-driven improvements as needed.

Potential implementation barriers:

Possible barriers to implementing this recommendation include:

1. Insufficient funding and resources: Limited resources may constrain the government's ability to invest in education and workforce development programs at the desired scale. Also, some state and local agencies may not have enough staff on hand.

2. Resistance to change: Some industry stakeholders may resist investing in new training and education programs due to concerns about costs, time constraints, or disruption to existing processes. This is particularly relevant to those traffic engineers who have spent their entire career on replacing concrete and asphalt on roads and bridges.

3. Difficulty in identifying skill requirements: Rapidly evolving technologies and market dynamics may make it challenging to accurately identify the specific skills needed. As these technologies become smarter and more digitized it will require more than one core skill set to operate and maintain installed transportation equipment.

4. Skills mismatch: A mismatch between the skills taught in educational institutions and the skills required by industry can limit the effectiveness of education and workforce development initiatives.

Possible participating agencies:

Federal agencies that may be impacted by this recommendation include the Department of Education, the Department of Labor, the Department of Transportation, among other.

Recommendation 6: The Federal Government should provide overarching regulatory guidance for the drone industry. The Federal Government should also provide funding for the drone industry for additional research in order that existing technical obstacles can be overcome.

Description:

The Federal Government should provide overarching regulatory guidance for the drone industry. There are conflicting regulations that govern drones for recreational pilots versus those that govern drones for commercial pilots. The regulations that govern drones for commercial pilots are put forth by the FAA as they regulate that section of the airspace. Sometimes these regulations are mistakenly applied to recreational pilots. In some jurisdictions there is uncertainty over who regulates the airspace for recreational pilots (FAA versus Local Police).

In addition, there are commercial drone pilots that fly large aircraft in sections of the airspace that fall under Advanced Air Mobility (AAM) jurisdiction. Another issue facing the drone industry is Remote ID- a requirement for a drone to have an internal signal broadcasting the drone's location, latitude, longitude and heading. Not all drones currently have this requirement. Drones need to operate in line of sight, and there are only extenuating circumstances where a waiver applies.

The Federal Government should also provide funding for the drone industry for additional research in order that existing technical obstacles can be overcome. When drones are at low altitudes, they sometimes get interference from surface transportation. These could become exasperated if Autonomous Vehicles become more prevalent.

Justification:

The justification for the recommendations to provide overarching regulatory guidance for the drone industry. The Federal Government should also provide funding for the drone industry for additional research in order that existing technical obstacles can be overcome is provided below:

1. Conflicting Regulations/Legislations: With regulations/legislations that conflict there is a question of liability in the event of an accident involving a drone. There are also safety concerns.

Implementation Considerations:

Implementation considerations to address regulatory uncertainty in the drone industry and provide funding for drone technology research include:

1. Involving all stakeholders: drone equipment manufacturers, communications providers, among others need to be involved.

2. Expanding access to education and training: particularly on safety aspects related to drones.

Potential implementation barriers:

Possible barriers to implementing this recommendation include:

1. Insufficient funding and resources: Limited resources may constrain the government's ability to fund drone research.

2. Supply Chain: The drone industry is facing supply chain challenges. Drones approved by the DoD need to be on the Blue UAS Cleared Drone List. Drones on this list are

validated as cyber-secure and safe to fly, and are available for government purchase and operation.

Possible participating agencies:

Federal agencies that may be impacted by this recommendation include the Federal Aviation Administration.