ITS AMERICA

Public-Private Framework for Successful AV Deployment

Public-private collaborations have the potential to maximize the benefits of automated vehicle (AV) deployment while reducing risks and improving the likelihood that the technology serves the needs of communities. Successful AV deployment can offer transformative opportunities to enhance safety, mobility, connectivity, and quality of life for communities, paving the way for a more sustainable and inclusive transportation future. The ITS America Standing Committee on Automated Vehicles developed this document to provide considerations for engaging in successful partnerships and collaboration to support all potential partners, including technology developers, original equipment manufacturers (OEMs), operators interested in deploying AVs on public roads, and public agencies seeking to research and deploy AVs, as well as the communities in which they deploy. This Framework provides an overview of considerations related to establishing public-private collaboration, defining AV deployment success, planning and implementation from concept to deployment, conducting effective outreach and engagement, and reviewing lessons learned.

While this document provides insights related to various deployment types, it is important to note that not all deployment scenarios or circumstances are directly addressed. We also reference several resources to support stakeholders in navigating AV deployment; however, these resources are not exhaustive and should be supplemented by ongoing research and dialogue within the industry.

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Establishing Public-Private Collaboration

Start with Why

The potential benefits of AVs are compelling, especially for advocates aiming to achieve safer communities with reduced traffic crashes, more efficient mobility through optimized traffic flow, inclusive accessibility for all residents, sustainable transportation options that reduce emissions, thriving economies with access to job opportunities, and improved quality of life through expanded mobility options. Deploying AVs should not be pursued for the sake of deployment; we must begin by first asking "Why?". Starting with "why" fosters a shared vision that drives collaborative efforts towards a future where AV technology serves society's needs effectively and responsibly. A thoughtful problem statement ensures that stakeholders – from technology developers to public agencies – clearly understand the purpose and intended outcomes of AV integration. With the "why" in mind, we can better articulate, and measure expected outcomes related to AV deployment.

How is Partnership Established?

When a public sector entity invests in or collaborates on an AV deployment, it signifies proactive involvement beyond mere regulatory oversight. This involvement can enhance public safety and trust, infrastructure readiness, research and development support, and policy alignment related to the community's safety, equity, accessibility, economic development, and environmental priorities. This sets the stage for clear objectives and goals, collaborative governance, shared resources and expertise, and flexibility and adaptability which are critical for a successful partnership. This collaboration can take various forms. For instance, a public agency may allocate funds to support AV deployment, using these resources to enhance infrastructure, fund research and development, or support pilot programs. Innovative contracting methods may be used to formalize partnerships with private entities, detailing mutual responsibilities such as infrastructure development, data sharing protocols, and joint research efforts. Examples of contracting mechanisms for public-private collaboration on AV deployments include:

- **Design-Build-Operate-Maintain contracts**, which are often publicly funded, with the private partner responsible for project delivery, performance, operations, and long-term maintenance.
- **Service contracts** in which the public partner may own AV assets and outsource AV-related operations, maintenance, customer support, etc.

- **Public-Private Partnership agreements** to develop, finance, operate, and maintain AV projects, which could involve revenue-sharing, risk-sharing, and joint governance to share project responsibilities.
- **Research and development contracts**, typically funded by government agencies, to advance research, testing, and development of AV technology.
- **Data and information sharing agreements** to facilitate the exchange of data and insights related to AV operations, traffic management, and mobility services.

Under scenarios in which private companies fully fund AV initiatives, public agencies can still play a crucial role by providing input on regulatory actions, facilitating access to testing facilities or public roads, and ensuring that deployment efforts align with local regulations, policies, operational practices, and community interests.

When we look internationally, Australia presents an interesting model of public-private partnership aimed at implementing transportation technology and data services to achieve priority goals for the public. Transport Certification Australia, a not-for-profit entity with government oversight, provides assurance services relating to transport technologies and data to enable priority outcomes around improved road safety, transport efficiency, freight productivity, asset management, and sustainability.

Who is Involved?

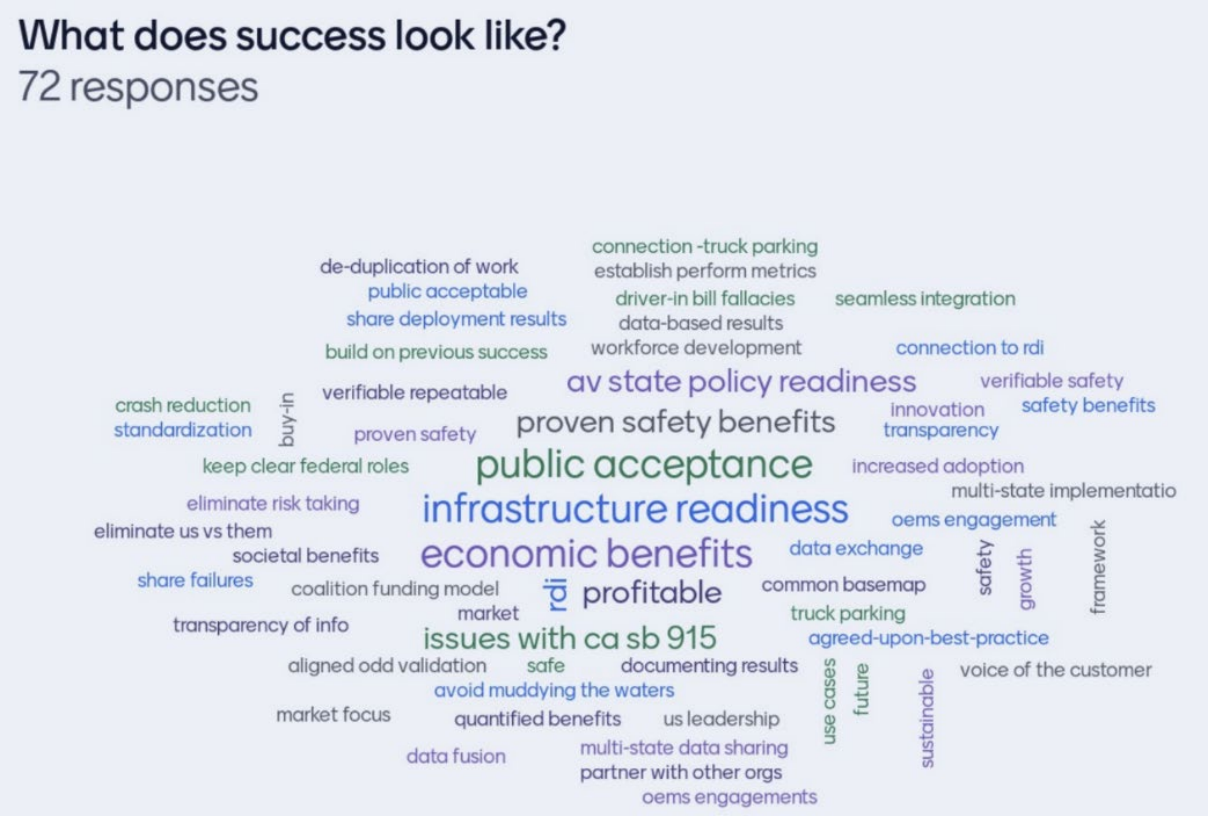
Each partner and stakeholder involved in AV deployment plays a crucial role in shaping the future of transportation through their perspectives and responsibilities. Some of the key stakeholder types in public-private deployments are identified below:

Partner or Stakeholder	**Role**
Impacted Communities	Represent deployment needs, concerns, and local interests that drive planning, public engagement, and decision-making. Advocate for inclusive design, accessibility, and equitable access to AV transportation services.
Automakers and AV Developers	Develop and manufacture AV technology, built-in vehicles or to be retrofit, including, sensors, software, and hardware components.
Operators and Mobility Service Providers	Operate AV fleets for passenger transportation, delivery services, ride-hailing, micro-transit, or share mobility initiatives.

State or Local Departments of Transportation	Establish AV policies, perform transportation planning, operate, and maintain physical and digital infrastructure, and deploy AVs within their fleet.
Transit Authorities	Integrate AVs to enhance service, operate and maintain physical and digital infrastructure, and implement workforce development initiatives.
Departments / Bureaus of Motor Vehicles	Issue licenses, registration, and/or permits for AV operation on public roads and collect AV testing data.
Insurance Companies	Develop liability frameworks and risk assessment models for AV developers, operators, and users.
Public Safety Agencies	Respond to emergencies and coordinate with AV developers and operators on safety protocols.
Federal Agencies	Provide safety standards, funding support, and research and development initiatives.
Active Living, Aging, and Disability Community Agencies	Advocate for inclusive design, accessibility, and equitable access to AV transportation services. Integrate AVs to enhance service.
Legislators / Policymakers	Regulate AV deployment, testing, and operation; establish licensing requirements; and engage with stakeholders to seek consensus on AV policy.
Academic Institutions	Contribute research and expertise to advance AV capabilities and address emerging challenges.
Labor Organizations	Represent workers' interests, advocate for their rights, and often engage in discussions concerning the impact of technology on employment and working conditions.

What Does Success Look Like?

The ITS America Standing Committee on Automated Vehicles surveyed its members to understand their perspectives on successful outcomes of the deployment of AVs. The responses were visualized in a word cloud depicted below, with the most prominent elements described further.



Increasing Trust through Safety Assurance

Safety is of utmost importance to the testing and deployment of AVs. Proving the safety of AVs through safe deployments is key to scaling the technology, transportation system integration, and building confidence among regulators and the public. An approach to safety verification should be developed early on for any deployment effort, including transparent safety performance monitoring. If an incident occurs and vehicles are approved to re-enter service, a formal protocol for safely returning vehicles to service should be established, as done for the Treasure Island Shared Autonomous Vehicle (AV) Pilot Project.

How can we measure it?

The Automated Vehicle Safety Consortium (AVSC), an industry program of SAE Industry Technologies Consortia, has developed best practices for measuring and communicating automated driving system (ADS) safety information. Foundational AVSC Publications:

- Best Practice for Core Automated Vehicle Safety Information
- Continuous Monitoring and Improvement after Deployment
- Evaluation of Behavioral Competencies for Automated Driving Systems
- Metrics and Methods for Assessing Safety Performance
- Data Collection

In addition, Michigan's Mcity Test Facility offers a Safety Assessment Program to measure basic competency in ordinary scenarios and dangerous scenarios that are significant contributors to crashes.

Infrastructure Readiness

AVs generally use machine vision systems (e.g., cameras, lidar, radar) to collect information about specific roadway elements, and then make decisions on how to safely operate in the environment. Physical and digital infrastructure can enhance the functionality of these systems and enable AV integration into transportation systems, from striping and curb space to cellular coverage and other communications mechanisms, construction zone and roadway hazards information, and geospatial roadway data.

How can we measure it?

The Federal Highway Administration (FHWA) is developing a study on ADS Roadway Features. This study will identify which roadway features are most relevant to support operation of ADS, thresholds for the condition of those roadway features, and methodologies for measuring and gathering data on roadway features, providing information that may assist with infrastructure investment decisions.

There are also several industry tools that can support the measurement of infrastructure readiness, noted below:

- AECOM's AV-Readi™ provides a digital tool to quantify the readiness of roadways to support AV deployment and operation.
- Retrotek provides retroreflectometers that assess the quality of pavement markings in support of automated driving system performance.
- VSI Labs provides technical and applied research on the hardware, software, and connectivity systems that support ADAS and ADS.
- Blyncsy provides roadway asset detection in support of AV performance.

Policy Readiness

A successful regulatory environment can provide clarity, consumer confidence, and flexibility to accommodate evolving AV technologies and business models. The Automated Vehicles Subcommittee of the American Association of Motor Vehicle Administrators (AAMVA) gathers, organizes, and shares information related to the development, design, testing, use, and regulation of AVs and other emerging vehicle technology. AAMVA developed Guidelines for Regulating Vehicles with Automated Driving Systems with considerations and recommendations for jurisdictions that choose to enact some form or level of regulation.

The National Highway Traffic Safety Administration (NHTSA), through its Standing General Order (SGO) has set an important standard nationwide in terms of transparency by gathering information on all AV-related crashes. Gathering additional data elements, such as vehicle miles traveled by providers that allow for normalization would strengthen the SGO further.

It is important to note that regulations and processes vary across states, highlighting the need for the private sector to engage in early discussions with public sector partners regarding the most current policy and operational considerations.

How can we measure it?

Regulations related to vehicle types, licensing, liability, insurance, data sharing, and privacy protection, may be evaluated to facilitate the safe, responsible, and inclusive deployment of AVs. In addition, opportunities for stakeholders to provide input, share expertise, and participate in policy development may be assessed.

Industry interest organizations have developed guidance focused on deployment and commercialization of AV technology. The Autonomous Vehicle Industry Association (AVIA) provides a Federal Policy Framework for Our AV Future that was informed by its member companies. In addition, the Alliance for Automotive Innovation developed a Policy Roadmap to Advance AV Innovation that provides industry recommendations to advance AV testing and deployment.

Gaining Public Confidence

Public acceptance and confidence are critical to realizing the potential benefits of AVs, promoting equitable access, facilitating transportation integration, and ensuring the economic viability of AV operations. Research from the University of Florida suggests a strong correlation between willingness to use or accept AVs and prior exposure to these vehicles. Moreover, transparency in providing information about AV technology – such as sharing safety data, test results, and demonstrating real-world performance – can significantly enhance public trust in the technology. In addition to transparency from the deployment team, another crucial factor

in fostering widespread acceptance is active involvement from regulatory bodies that demonstrate proactive management of the sector through timely supervision and updates to regulations.

How can we measure it?

Measuring public acceptance of AVs can involve assessing attitudes, perceptions, and behaviors of individuals and communities. Methods for that assessment include surveys, interviews, and evaluating ridership of AV deployments and operations. The Treasure Island Shared Autonomous Vehicle (AV) Pilot Project implemented user surveys to assess user experience, perceptions of safety, and accessibility.

Realizing Economic Benefits

AV deployments have the potential to generate economic benefits across various sectors. Automated freight can improve logistics and business efficiency; passenger moving AVs can enhance accessibility to communities and support tourism; and AVs can promote environmental sustainability with electrification and more efficient driving.

How can we measure it?

Various quantitative and qualitative indicators across domains may be assessed to measure economic benefits of AV deployments, such as emission reductions, social inclusion, particularly for underserved populations, travel time savings, changes in fatality, serious injuries and crash rates, and tourism revenue.

Gap in Realizing Successful AV Deployments

It is important to recognize that some anticipated societal benefits promised by AV deployment have not yet been realized. While ideas on how to measure outcomes related to automated vehicle (AV) deployment are proposed, the challenge remains in the limited availability of publicly accessible, good quality deployment data and performance metrics, as described in the San Fransisco County Transportation Authority TNCs 2020 Report. To address this gap, future deployments should prioritize rigorous documentation and transparency regarding their outcomes. This approach will enable stakeholders to better evaluate the effectiveness of AV technologies and ensure that future advancements align with societal needs and expectations. While not AV focused, the Federal Transit Administration provides insights for the evaluation of several cross-cutting, technology-enabled mobility initiatives as part of their Mobility on Demand (MOD) Sandbox.

Planning and Implementation: From Concept to Deployment

There are several resources that provide planning and project implementation for AV deployment, such as:

- FHWA's Roadway Automated Driving Systems Integration Concept of Operations
- National Association of City Transportation Officials (NACTO) Blueprint for Autonomous Urbanism
- FHWA's Collaborative Research Framework for Automated Driving System Developers and Infrastructure Owners and Operators
- Deployment Playbook Based on the Smart Columbus Demonstration Program
- Stantec's AV Deployment Playbook: The Roadmap for Successful AV Implementation
- Cityfi's Autonomous Vehicles: A Guide for Cities
- AV Pooled Fund Guidance for Sustainable Integration of Automated Transportation Technologies (*forthcoming Summer 2025*)

The ITS America AV Committee further summarized significant planning and implementation steps, from concept to deployment. these steps can be undertaken by any AV deployer or deployment team, across public and private sectors.

Planning and Implementation Steps

Conceptualize

- Begin with a need
- ID all solutions
- ID measures of success
- Initial review of regulatory and technical barriers
- Stakeholder engagement plan

Feasibility Assessment

- Address stakeholder concerns and opportunities
- ID relevant regulations
- Clearly define ODD
- Tech market scan (see ITSA Supplier list)
- Funding assessment, including community value and revenue potential

Design

- Perform systems engineering
- Develop safety verification approach
- Evaluate need for:
  - Roadside equipment
  - Roadway design updates
  - Temporary signage
  - Backend digital systems
- Note phasing of design needs
- Cybersecurity and privacy

Procure

- Results-driven procurement approach
- Focus on needs / requirements, versus solutions
- Steps may include:
  - RFI/RFQ
  - RFP for services
  - P3 procurement
  - State-level procurement (existing contracts for fleet or IT solutions)

Scaled Deployment

- Safety verification
- Evaluate measures of success
- Determine thresholds for scaling up
  - Could include expanding design domain, integrating operational data, etc.
- Iterate and improve based on performance and deployment gaps

Operations & Maintenance

- Fund O&M to support technology improvement
- ID milestones, as needed, to change funding strategy
- Consider funding workforce training / re-training
- Cybersecurity audits
- Safety checks

Outreach and Engagement

Effective outreach and engagement are crucial for garnering support, building trust, and ensuring the success of AV deployment. By prioritizing education, transparency, community involvement, and continued collaboration, stakeholders can foster public trust, address concerns, and pave the way for the responsible integration of AV technology into our transportation systems.

Be Transparent

Develop messaging on why, expected outcomes, potential disruptions, etc. Address stakeholder concerns transparently, providing accurate information, evidence-based explanations, and opportunities for dialogue and collaboration.

Use Understandable Terminology

Use clear, concise language and visuals to convey key information about AV technology, benefits, risks, and regulatory processes. Develop a library for clear and consistent messaging among all partners.

Empower Inclusivity and Equity

Ensure that engagement efforts are inclusive, equitable, and accessible to all community members, including marginalized and underserved populations. Provide language assistance, accommodations, and outreach materials in multiple formats to reach diverse audiences.

Circle Back

Engage stakeholders early and throughout AV deployment and evaluation. Provide updates and enlist feedback with communication channels, such as participation in existing community meetings, project forums, and online platforms. Respond promptly to inquiries, concerns, and requests for information to demonstrate accountability and trustworthiness.

Resources to support AV-related outreach include:

Partners for Automated Vehicle Education (PAVE): A coalition of industry, nonprofits, and academics with a goal of informing the public about AVs and their potential so everyone can fully participate in shaping the future of transportation.

Texas CAV Task Force: A task force designed to provide the state of Texas with a single, unified resource for information regarding the coordination and advancement of CAV technologies.

Stantec GenerationAV™ Learning Center: A one-stop-shop for education on all things to do with AVs and their applications.

Lessons Learned

Below is a summary of key AV deployment lessons learned compiled by ITS America members:

Feasibility

- Include an ODD Assessment, Risk Assessment with Mitigation Plans, Supplier Assessment, and funding plan.
- Develop a concept of operations to fully understand integration needs and impacts on various affected users.
- Perform Safety Verification prior to public use.

Operational Safety Guidelines & Best Practices

- Ensure safety operator and supporting staff are trained for incidents and emergencies.
- Use automated tools to support supporting staff operations, like a digital checklist.

Public Acceptance

- Ensure public buy-in for the use case or problem being addressed, a disconnect here could result in a deployment that fails to meet community needs or expectations.
- Establish data sharing agreements (or regulations) that ensure the public has timely access to the necessary data to monitor performance – particularly as it relates to public safety.

Public-Private Collaboration

- Transparency and trust are critical to effectively collaborate.
- Clearly defining roles and responsibilities between the public and private sectors helps mitigate confusion and ensures accountability in managing infrastructure, regulations, and public safety.

Operations and Maintenance

- Sustainable deployment requires consideration and funding for operations and maintenance.

Be Sure to Document

In the AV industry, there is a notable shortage of publicly available deployment data and information. Efforts are underway to address this gap by documenting experiences, outcomes, and lessons learned from both public and private AV deployments. One such initiative is the NCHRP Domestic Scan 23-02, which focuses on Recent Experiences in Advancing and Deploying Automated Vehicle Technologies and is located in NCHRP Research Report 1034: Guidelines on Collaboration and Information Security for State DOTs. This scan analyzes a diverse sample of ADS

tests, pilots, and full deployments to identify success factors and extract valuable lessons for future implementations.

Looking ahead, it is crucial for AV deployment partners to prioritize enhanced documentation practices to advance the industry effectively. Key aspects to the document include a clearly defined needs statement, details of collaboration between public and private sectors – including roles, responsibilities, and stakeholders – and comprehensive outcome and performance measures. By systematically capturing and sharing this information, stakeholders can promote informed decision-making and foster continuous improvement in AV deployment strategies.

Deployment is Not the End Goal

AV operations have gone through a series of pilots and demonstrations and have experienced some limited full deployment. But getting to deployment is not the end goal; achieving a meaningful impact on safety, mobility, and accessibility in communities through sustainable operations and commercialization is the ultimate goal. To reach that goal, deployments need to rely on the AVs to function and reach a sustainable business model. Deployment may still rely on subsidies, but a continuous funding stream needs to be secured to avoid a one-off demonstration.

Conclusion

This Framework for Public-Private AV Deployment is intended to provide considerations for successful collaboration among public and private sector entities to encourage the safe, responsible, and inclusive deployment of AVs. Successful collaborations and partnerships will be vital to maximizing the benefits of AV deployment while reducing risks and improving the likelihood that this technology will serve the needs of communities in which it is deployed.

ITS America AV Community

ITS America provides an extensive network of public and private sectors partners that can support the development of public-private partnerships to deploy AVs. Some of these entities with AV experience and willingness to guide their peers and share lessons learned include:

Name	Email	Organization	Partner Type	Use Case Addressed
Preeti Choudhary	Preeti.choudhary@drive.ohio.gov	DriveOhio/Ohio DOT	Public – State DOT	Passenger shuttle, Logistics, Utility
Jeff Kupko	jeffrey.kupko@mbakerintl.com	Michael Baker International	Private – Consultant	Passenger shuttle, Readiness Assessment
Darran Anderson, Erika Kemp, Brandi Bush, Zeke Reyna, Lauren Frericks	darran.anderson@txdot.gov	Texas DOT	Public – State DOT	Passenger shuttle, Logistics, Utility
Katie Clothier	Katieclothier@aribo av.com	ARIBO	Private – Consultant	All automated applications and phases of planning and deployment
Aliza Paz	Aliza.paz@sfcta.org	SFCTA	Public – City/County Agency	AV shuttle deployment
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