FEDERAL TRANSIT ADMINISTRATION (FTA)

Considerations for Partnering on Emerging Public Transportation Technology Projects

U.S. Department of Transportation
Federal Transit Administration

1. INTRODUCTION

As public transportation agencies explore applications for new transportation technologies, they frequently partner with private sector technology companies on pilots and demonstration projects. These partnerships enable transit agencies to access and learn about new technologies and give private sector vendors insight into the needs of passenger transportation systems. However, they may also encounter challenges, as partners often have different assumptions and practical constraints. This paper provides a brief overview of challenges identified and lessons learned from transit vehicle automation pilots and demonstrations conducted between 2018 and 2022.

To support the development and deployment of automated bus transit services, the FTA developed the Strategic Transit Automation Research (STAR) Plan. The STAR Plan is a five-year strategic plan that outlines FTA's research agenda on automation technologies. This paper was prepared by a team from the U.S. DOT Volpe National Transportation Systems Center in support of the STAR Plan's ongoing knowledge transfer activities. The team conducted a literature review and stakeholder interviews between October and December 2021.

To learn more about emerging technologies such as transit automation, public sector agencies often partner with private sector companies who are involved in the research, development, and commercialization of these technologies to test new vehicle platforms, service concepts, or capabilities in a pilot deployment. Public agencies may partner with one private sector company or several different partners, each of whom may be responsible for a unique aspect of a pilot. These pilots are often on new routes or heavily modified routes, and are rarely equivalent to "typical" bus service in terms of the route, speed, ridership, fares, etc. These pilots do offer many lessons learned, but they are not a true proxy for full deployment on fixed-route bus services, as key characteristics, including cost, may not be representative of operations at scale.

2. LESSONS LEARNED

This section discusses lessons identified from the literature and by public sector interviewees regarding their experiences in working with private sector partners on pilots and demonstrations of emerging technologies.

Technology Performance

When pursuing a new technology, agencies should have **realistic expectations for the technology performance**. However, this can be difficult in practice. Information available regarding performance for emerging technologies may be incomplete and is often highly colored by marketing materials created by the vendor. For example, there are many factors that determine the appropriate speed for a vehicle equipped with an automated driving system (ADS), but marketing materials generally give the high end of the range. While the top speed for a particular low-speed shuttle may

be 25 mph, for example, in actual operating practice, the top speed may be closer to 10 or 11 mph.[1] This is important information to understand in designing a pilot and selecting a vehicle, but it may be challenging for an agency to get a clear answer to what the speed could be for their project, as the vendor realistically would need to assess the route carefully and may need the input of a regulatory agency if exemptions or waivers are needed.

There are multiple strategies that agencies can use to mitigate this challenge. A **Request for Information (RFI)** can be useful in soliciting input, but there are limitations to an RFI—for example, when there are several RFIs on a topic issued during a short period of time, there can be diminishing returns as vendors experience RFI "fatigue". In addition, responses to an RFI may suffer from unsupported optimism and unrealistic expectations, sometimes due to an incomplete understanding of the agency's needs and operational environment. Another option could be for an agency to **host an Industry Day**, where private sector partners are able to gather together and discuss the technology collectively with the agency. If hosted onsite or in the project's general location, an Industry Day also offers the private sector vendors an opportunity to develop a clear understanding of the operational environment, which may enable them to be more direct with an agency on the capabilities of their technology.

One of the key strategies is for agencies to **reach out to their peers**. The best source of information on the reality of conducting an automated transit pilot is other agencies that have conducted a pilot previously. Multiple agencies have indicated that they have reached out to their peers about their experiences, and that they received helpful advice through these communication efforts.

Finally, it may be beneficial to **see operations in a realistic environment** prior to committing to any vendor or technology. Agencies often see operations on video, at a conference, or on a test track. These are often controlled environments that allow for ideal operating conditions for the automation technology—when operating on public roads and in traffic, vehicles may not perform as well as they do on test tracks. Agencies should endeavor to experience real operations to get a true sense of vehicle capabilities and should also consider that different technologies may not be at the same levels of maturity.

Procurement

The success of any automated vehicle pilot is highly dependent on the procurement process. The selected vendor and vehicle, as well as the type of contract and the stipulations therein, lay the foundation for the project and accordingly may be the source for resolving any challenges that may arise. Procuring an appropriate vehicle and technology package for a pilot project is often more challenging than agencies anticipate. There is **a limited set of vendors** active in this field, meaning agencies are limited to the options available on the market rather than, for example, releasing a list of requirements that vendors build to meet. The choice of vendor may be severely limited, meaning that in practice the

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[1] Not all vehicle types or ADS operate at these slow speeds, and some ADS-equipped light-duty vehicles operating in suburban environments have operated at speeds of 30-65 mph. ADS-equipped transit buses can also operate at these high speeds as well—for example, the 40' CTfastrak buses will operate at 40 mph, and the cutaway bus operated by University of Iowa has reached speeds of up to 65 mph.

agency may not be able to find a vendor who will match all their specifications perfectly. This also means that **the procurement will often not result in the exact proposal originally envisioned by the agency**.

There are a variety of methods of procurement, and agencies should consider all options and avoid simply defaulting to an RFP. One interviewee expressed that a request for quotes allowed them more freedom in their vendor selection process, as they were not strictly tied to the lowest-cost proposal. Another pilot project found, in retrospect, that a performance-based contract would have been better suited to the project as opposed to the fixed-price contract that was used. Agencies should research the procurement processes that have worked and not worked for other agencies who have conducted these types of automated vehicle pilots, and then **select the most appropriate procurement strategy for their planned project**.

Agencies should also **proactively consider the possibility of a partner going out of business, being acquired, or dropping out of the project** for a variety of reasons. Multiple pilot projects in the U.S. have experienced challenges through needing to re-enter the procurement process after the loss of a vital project partner. Agencies may want to develop strategies to prepare for the possibility of needing to go through the procurement process multiple times.

Federal and State Requirements

Public transportation agencies would benefit from ensuring that all partners **understand applicable Federal and state requirements in advance**. This is particularly true if there is some aspect of the project which is new to the private sector partner, including the specific project location or the use case. ADS developers new to passenger transportation have had an uneven understanding of accessibility regulations, for example. Even for partners with relevant experience in another country or state, there may be local requirements that private sector partners are unaware of for a particular project. Agencies are advised to verify that their vendor meets all requirements, as there have been cases where a vendor has been out of compliance with certain regulations, causing delays to the project timeline to allow for necessary changes to achieve compliance. It is highly recommended that agencies and vendors work together proactively to research all possible relevant requirements.

Pilots have experienced a variety of challenges related to Federal and state requirements, but some of the specific ones have included compliance with the Federal Motor Vehicle Safety Standards (FMVSS), the Americans with Disabilities Act (ADA), and Buy America. In some cases, vendors did not fully understand the regulatory requirements; in others, partners may have had unrealistic expectations for receiving exemptions or waivers.

Even if a pilot complies with all Federal requirements on these items, **there may be state or local laws that need to be accounted for**. For Federal laws, agencies should reach out to U.S. DOT if needed to ask for clarification on various requirements; and for state and local laws, agencies should reach out to the relevant governing bodies to ensure they fully understand the requirements. Interviewees suggested addressing this early in the process to avoid delay. Agencies may help connect their private sector partners to the relevant points of contact at various local and state regulatory

agencies. If regulatory waivers or exemptions are needed, agencies should discuss the process and the risks associated with it with their private sector partners.

Data Requirements

Automated vehicle pilot projects typically involve some degree of evaluation that relies on certain data metrics. However, data collection is often a point of contention between public transportation agencies and their private sector partners. There are concerns about data ownership and privacy, but there is also simply a mismatch between the data elements that interest a transit agency and the data elements that interest the technology provider.

Accordingly, a lesson learned is for agencies to **establish data requirements, formats, and specifications very clearly up front**. More specifically, possible recommendations include:

- add a data table with detailed information on frequency and format in the RFP;
- consider asking bidders to sign a data-sharing agreement before proceeding to procurement; and
- develop a data plan in advance—having a plan for how to use the data may help ensure that data requests are not excessive, that the appropriate format is identified, and that private sector partners can see how their data will be used.

To aid in clearly establishing the data requirements, agencies should **clearly think through how they will use any data that they acquire through a pilot**. Often, agencies may request data without considering how they will use the data. This can create multiple challenges for both the agency and the private sector partners, as the partners may be overburdened with data requests for items that the agency may not ultimately use, and the agency may receive data in a format that does not align with how they ultimately decide to use the data. The project may also become more attractive to private sector partners if they clearly understand how an agency will use their data.

Goal Setting

There were two distinct lessons learned related to project goals:

- understand the alignment—or lack thereof—between project partners' goals to help ensure project success and avoid friction; and
- identify priorities among goals in advance, in case not all goals are achievable.

The first lesson learned—**understanding alignment between project partners goals**—is due to the sometimes-significant differences between the goals of public sector agencies and private partners. Public sector agencies' goals often relate to testing a technology to see if it can serve a public transportation need, whereas a private sector partner's goals may relate more to promoting their technology or service. This can create a conflict where the private sector partner has a natural interest in downplaying the system limitations that a public sector agency is interested in discovering. Additionally, the business goals or strategies of private sector partners in an emerging technology sector

may change frequently. Public entities can consider requesting regular updates from their partners on their goals through the lifecycle of the project.

Differing alignment can also create tension around branding and marketing—who "owns" the project, and who controls the messaging around the project? This may be influenced in part by how the project is created. Some transit automation pilots are conceived by the public transportation agency, who then solicits proposals from vendors, while other pilots arise from a vendor approaching an agency. Clarifying how project messaging will take place may help prevent conflicts.

The second lesson learned—**identify priorities among goals in advance**—is particularly important for agencies that may have a variety of goals they hope to achieve in a specific project. Sometimes, not all project goals will be achievable, given the limitations and constraints of a pilot project. Agencies may be interested both in testing a technology as well as testing a new type of transportation service, but these two goals may be incompatible in certain situations.

An agency can ensure that their key priorities are met by identifying their dealbreakers in advance. If priorities are not identified up front, an agency may mistakenly end up addressing lower-order goal areas at the expense of addressing the highest-priority goal areas. Immature technologies are unpredictable, and it can be particularly challenging to assess both the technology's capabilities, as well as the success of a new transportation service independent from the technology.

Team Composition

Pilot projects often have large teams managing them, as there are multiple project partners, each of whom may have several employees spending at least some amount of time on the project. Understanding the composition of project teams can influence the success of the working relationship between partners, as well as the general success of the project.

Automated vehicle projects sometimes have separate vendors for the technology and the operations—although this is relatively standard in the industry presently, this does lead to potential concerns where the operator lacks a full understanding of the technical limitations and capabilities. This can cause a delay in communication where the transit agency asks questions of the operator, the operator must in turn ask the technology provider, and then relay what they learn back to the transit agency.

Conversely, **if the technology vendor is also serving as the operator, they may have a limited understanding of the operational aspects of a passenger transportation service**. One interviewee gave the example of having a standard operating procedure in case a passenger leaves a bag on the vehicle. While an operator with experience in transporting passengers will generally have these in place, a technology vendor may have to develop procedures during the project.

Agencies should strive to remain aware of the skills and limitations of their private sector partners. A successful team will ensure each partner's strengths are highlighted, and that a partner is not solely responsible for areas outside of their expertise.

Additionally, **agencies should be prepared to deal with the possibility of personnel changes and vendors dropping out of the project**. There is always a possibility of losing key team members during a project, particularly if the project spans multiple years from conception to completion. As with any project, no singular team member should be indispensable such that their departure would severely impact project success. Vendors also can and have gone out of business, been acquired, or changed direction during a project, and therefore dropped out of the pilot. Agencies may want to be proactive with back-up plans in the event of a major change to the project partners.

Communication

Communication is a broad category that includes communication between employees in the public transportation agency, communication between the agency and their private sector partners, and communication with other agencies who have conducted pilot projects. As has been noted throughout this report, improved communication is an effective strategy to avoid a variety of potential challenges.

Multiple interviewees indicated that **holding regular meetings between project partners** was vital to the success of the project. Some projects had meetings between all partners as well as smaller, more targeted meetings on specific project elements with relevant partners. For example, a project might hold an overall weekly check-in meeting with all partners, a smaller weekly meeting specifically focused on communications and marketing, and a quarterly meeting for both public and private sector leadership. Regular check-ins ensure that all project partners remain aware of their distinct roles and responsibilities. Holding regular meetings sounds like a simple task, but it can have a significant impact on the overall success of the project.

3. CONCLUSION

Partnerships between public agencies and private sector companies are a necessary part of transit automation research, demonstrations, and deployments. As transit providers continue to explore new opportunities to improve transit service, partnerships for these pilot demonstrations are likely to become more common. Many agencies have reported having successful and mutually beneficial relationships with their private sector partners, but other agencies have experienced numerous challenges. Transit agencies will benefit from carefully studying the lessons learned and recommendations described in this report and applying them to future transit automation projects. Recommendations include:

- have realistic expectations for the technology performance, by engaging with industry, reaching out to peers, and seeing operations in a realistic environment;

- select the most appropriate procurement strategy for the project;
- plan ahead for the possibilities of personnel, partner, or vendor changes;
- understand all applicable Federal, state, and local requirements in advance;
- plan for how data from pilots will be used and clearly establish data requirements, formats, and specification up front;
- understand where agency goals align – or do not align – with the partner's goals, including on branding and marketing;
- identify priorities among goals in advance;
- understand partners' experiences and roles in transportation operations vis-à-vis technology; and
- hold regular project partner coordination meetings.

APPENDIX I: REFERENCES

The literature review considered the following sources:

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APPENDIX II: LIST OF INTERVIEWEES

Five semi-structured interviews were conducted between October and November 2021. The five organizations and their relevant characteristics can be seen in Table 1.

Table 1. Interviewees

Organization	Location	Automation Project(s)
Rhode Island DOT (RIDOT)	Rhode Island	Little Roady shuttle (2019–2020)
DriveOhio	Ohio	Smart Circuit shuttle (2018–2019)
Minnesota DOT (MnDOT)	Minnesota	Rochester Automated Shuttle Pilot (2021 — 2022); More projects forthcoming under CAV Challenge
Contra Costa Transportation Authority (CCTA)	Contra Costa County, California	Rossmoor Senior Community First Mile / Last Mile Shuttles (In Planning); County Hospital Accessible Transportation Shuttles (In Planning); Personal Mobility on I-680 Corridor (In Planning)
Utah Transit Authority (UTA)	Utah	Automated Shuttle Pilot (2019– 2020)

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