CM²

**Cooperative Mobility for
Competitive Megaregions**

Coordination within a Megaregion for Freight Planning: Stakeholder Outreach

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16. Abstract This project builds off the work of TxDOT's Texas Connected Freight Corridors (TCFC) project with a goal of distilling lessons learned. TCFC is an effort to pilot safety and congestion management connected vehicle (CV) technologies in the field via collaboration between public agencies and private companies in the Texas Triangle Megaregion. TCFC was designed to be geographically broad because these roadways are key corridors for freight movement which experience a high volume of traffic. The project includes vehicle-to-infrastructure (V2I) applications which will be enabled using various communication tools. The TCFC project provides a unique opportunity to follow the planning of a CV project which will help to enhance freight mobility within a megaregion. This work captures the key methods which made stakeholder outreach successful along with lessons learned that can be applied to future projects undertaken by other megaregions.		
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Table of Contents

1. Introduction

As connected vehicle (CV) technology continues to mature and use becomes more widespread, public agencies have begun to consider their role in encouraging adoption. In freight planning, it is particularly important to consider a broader geographic region because connected economies rely on the movement of goods between them. Planning at the scale of a megaregion helps to encourage development of practices that can be sustained across jurisdictions and supports implementation that is cognizant of the larger freight ecosystem. The Texas Department of Transportation (TxDOT) has undertaken the Texas Connected Freight Corridors (TCFC) project, which will deploy vehicle-to-infrastructure (V2I) communication within the Texas Triangle Megaregion. Roadside units (RSUs) will be installed along the major interstates connecting the regions that comprise the Texas Triangle and up to 1,000 commercial vehicles will be instrumented with technology that enables them to communicate with RSUs. The TCFC project aims to build a CV ecosystem that will outlive the length of the project and provide a structure for others who are looking to pursue more CV deployments.

A critical component of planning and implementing a project at the megaregional scale is stakeholder outreach. Megaregions cross many jurisdictions, which can bring challenges to coordinating stakeholder outreach. The four-year length of the TCFC project means that stakeholders must be engaged early on and connections must be sustained over a long period, so that their input can be incorporated in every process from planning to design to implementation to evaluation. Within TxDOT's TCFC project, there was a concerted effort early on to ensure that stakeholder outreach is comprehensive and leverages the variety of perspectives within the megaregion. Through stakeholder mapping, message targeting, and diverse communication methods, the TCFC project was able to demonstrate a feasible methodology for executing stakeholder outreach across a megaregion.

This paper discusses how stakeholder outreach developed and changed over the course of the first year of the TCFC project, and provides the key findings applicable for other megaregions undergoing similar endeavors.

2. What is TCFC?

2.1. Description

In 2017, Texas received a grant as part of the Advanced Transportation and Congestion Management Technologies Development (ATCMTD) program. The TCFC project will deploy a sustainable CV environment within the Texas Triangle megaregion. TxDOT is leading the project with support from Southwest Research Institute (SwRI), Texas A&M Transportation Institute (TTI), and the University of Texas Center for Transportation Research (UT CTR). Four to eight vehicle-to-vehicle (V2V) and V2I applications focused on freight safety and mobility will be demonstrated along I-10, I-30, I-35, and I-45. These applications will equip commercial vehicle drivers with up-to-date information on roadway conditions including work zones, weather, queues ahead, and more. The TCFC project kicked off in April 2019 and has included a robust public and private sector stakeholder engagement process, which will continue throughout the project.

2.2. Motivations

In Texas, one in sixteen jobs is "directly supported by freight transportation."[1] Demographics, changes in global trade patterns, changes in technology, and growing energy demand are all expected to increase the amount of freight moving through the state in the coming decades, most of which will rely on the state's trucking infrastructure. As an intrastate megaregion, Texas provides a laboratory for testing large-scale strategies for smoothing megaregional freight movements with fewer coordination problems than its interstate counterparts. The TCFC project takes advantage of Texas's place as a prolific freight trip generator to test how some new technologies can reduce the congestion and safety risk brought about by large-scale trucking movements. As other megaregions grow in tandem with Texas, the use of such technologies will necessitate planning practices that can handle freight projects passing through multiple transportation jurisdictions. This project examines the lessons learned from TCFC, and how they can be applied to megaregional planning around the implementation of innovative trucking technologies.

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[1] Texas Department of Transportation. "Texas Freight Mobility Plan 2017." 2017. link accessed 25 March 2020

2.3 Scope

The TCFC project's regional scope extends across a large portion of Texas with planned implementation from the U.S.-Mexico border in Laredo to the Dallas/Fort Worth (DFW) region. This scope largely overlaps with the Texas Triangle Megaregion. Over the course of four years, the project team will design, develop, and implement select CV applications (choosing four to eight of twelve potential applications). These applications, shown in Figure 1, will be utilized by equipped commercial trucks that operate along the Texas Triangle. TxDOT Districts with jurisdiction over project roadways will be responsible for installing, operating, and maintaining the CV equipment in their region. Engagement of public agencies and private sector companies is essential to develop an understanding of what CV applications and deployment locations will be most valuable to Texas.

The project team identified nine local TxDOT districts along interstate corridors who will serve as the primary public partners in this project. A key part of early outreach for this project was determining which applications will be implemented in each district. The project team is working closely with the TxDOT districts and other regional stakeholders to understand their priorities. Alongside engagement of the public sector, private sector outreach focuses on understanding the issues and pathways for solving issues faced by drivers. Part of this process will be equipping up to 1,000 vehicles that operate within the Texas Triangle, and monitoring their operations to develop a system that can be maintained both during and after the TCFC project.

For reference, Figure 2 shows a map of the eleven megaregions identified by America 2050.

Queue Warning

Provide alert for a queue of vehicles up ahead.

Advanced Traveler Information Systems

Provide route information and congestion updates.

Road Weather Warning

Advise driver of hazardous road conditions ahead.

Truck Parking Availability

Give drivers updates regarding parking options.

Emergency Electronic Brake Light Warning

Warn drivers of hard braking ahead.

Border Wait Times

Provide real time data on wait times to cross US/Mexico border.

Work Zone Warning

Advise drivers of upcoming work zones and lane closures.

Wrong Way Driving

Warn drivers of nearby wrong way drivers.

Truck Signal Priority

Instrument an intersection to recognize and prioritize freight vehicles.

Low Bridge Height Warning

Advise drivers of upcoming bridges which they cannot pass under.

Eco-Dynamic Routing

Provide routing recommendations based on emission reduction.

Pedestrian/Animal Warning

Alert drivers to the presence of a pedestrian or animal on the roadway.

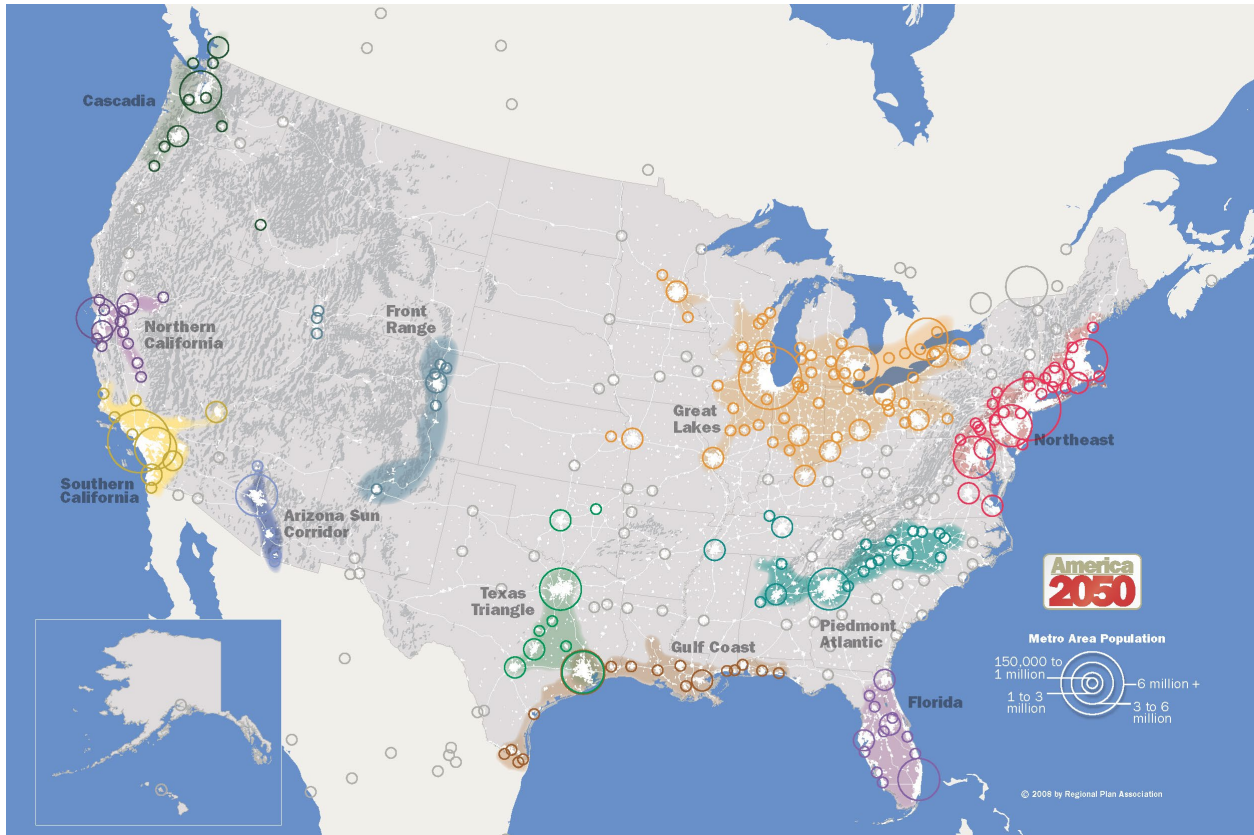*Figure 1: Twelve Applications Originally Proposed for Development in TCFC*

Figure 2: Map of Megaregions from America 2050[2]

[2] Regional Plan Association. "America 2050: Megaregions." 2014. link

3. Stakeholder Selection Process in TCFC

Early on, the project team undertook a stakeholder identification process with the goal of determining what groups, with the bandwidth for participation, can provide valuable insight for the project. Due to the broad nature of the project scope and region, the project team elected to complete initial outreach efforts in stages. The project team had an initial set of stakeholders that helped create an understanding of what perspectives were missing. Building out the stakeholder map helped to generate a reference of involved stakeholders and ensure the outreach efforts were robust. Once the stakeholder mapping was complete, the project team began onboarding various stakeholders to begin the project outreach efforts.

3.1. Stakeholder Types within TCFC

In recognition of the significant influence that outreach has on the outcomes of the TCFC project, the project team developed a diverse set of stakeholders. Figure 3 provides a broad overview of the current stakeholders that have been engaged by the project team. One of TCFC's highest priorities was to gather a unique group of perspectives to ensure the success of the project. At a high level, each stakeholder is categorized as either a public or private entity. From there, stakeholders are broken out into groups with similar work functions. Breaking down the stakeholders in this format makes it easier to understand the outreach needs for each group.

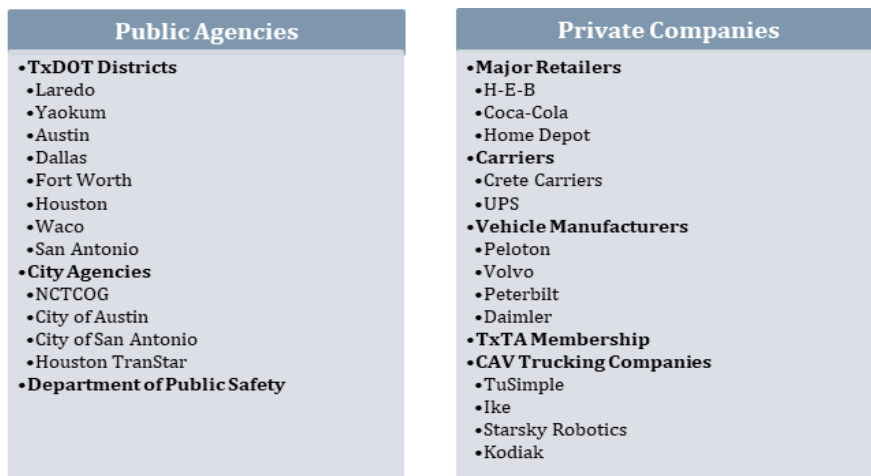| Public Agencies	Private Companies
•TxDOT Districts	•Major Retailers
•Laredo	•H-E-B
•Yaokum	•Coca-Cola
•Austin	•Home Depot
•Dallas	•Carriers
•Fort Worth	•Crete Carriers
•Houston	•UPS
•Waco	•Vehicle Manufacturers
•San Antonio	•Peloton
•City Agencies	•Volvo
•NCTCOG	•Peterbilt
•City of Austin	•Daimler
•City of San Antonio	•TxTA Membership
•Houston TranStar	•CAV Trucking Companies
•Department of Public Safety	•TuSimple
	•Ike
	•Starsky Robotics
	•Kodiak

Figure 3: Stakeholder Categorization for TCFC

3.1.1. Public Stakeholders

The project team worked hard in Phase I to establish rapport with public agencies located in the project region. The public sector stakeholders played an important role in identifying key issues and prioritizing applications accordingly. In this project, it is especially important that regional priorities are understood because the goal is to develop a sustainable CV environment that the public sector will maintain after the end of the TCFC project. When the TCFC project kicked off in April 2019, the project team briefed nine TxDOT districts that would be acting as starting points in each region with other agencies—cities, regional mobility authorities, and councils of governments—included where appropriate. TxDOT districts were a high priority because the CV deployment will occur on roadways owned and maintained by TxDOT. Other regional agencies were engaged to provide a broader view of priorities across the region that may align well with the TCFC project. For example, the North Central Texas Council of Governments (NCTCOG) heard about TCFC and understood the opportunity to align their plans for a technology corridor in the region. NCTCOG has made an additional $1 million in Surface Transportation Block Grant (STBG) funds available for projects in alignment with TCFC. Austin, Houston, and San Antonio, among others, have also worked with the project team to identify opportunities for alignment with TCFC and helped with the application prioritization process. The two key takeaways for outreach are that (1) public agencies primarily care about how TCFC will benefit their region and (2) it is important to clearly establish the role of agencies in supporting the project. In return, public agencies offer important insight into regional challenges and assets, which helps the project team determine the optimal deployment strategy.

3.1.2. Private Stakeholders

A handful of private sector companies participated in the development of the TCFC project proposal. Companies expressed an interest in the project's goals and a desire to participate in support of Texas. The initial list of companies included H-E-B, Coca-Cola, Home Depot, Peterbilt, Peloton, Crete Carriers, Trinity Logistics, Volvo, and the Texas Trucking Association (TxTA), which includes representatives from shippers, OEMs, and technology developers. Since the official kickoff, the project team worked to expand the number of stakeholders to include a more diverse set of industries and business uses. Some new additions include Kodiak, Ike, Starsky

Robotics, TuSimple, Ford, UPS, and Uber Freight. In Phase II, the project team will develop an official onboarding process for project partners, which will involve structured agreements between TxDOT and each company. This process will ensure that expectations are clearly communicated and require companies to commit to a specific number of equipped trucks. Outreach to private sector partners is ongoing; currently there is an Expression of Interest (EoI) form being used to attract more potential partners. The private sector is profit driven instead of public driven, which strongly influences their outreach needs. The project team will need to communicate a business case for why companies will benefit from participation, and clearly establish the role for the private sector in the TCFC project. In support of the project, the private sector will be able to provide key insight into the design of the human-machine interface (HMI) of the on-board unit (OBU), as well as their perspective on priority applications and deployment locations.

3.2. Message Targeting

The project team considered various communication strategies when developing specific messages for the TCFC project. By nature, some key messages are broadly applicable for a wide array of stakeholders, but other messages require tailoring for a specific audience. Considering the wording of outreach communications for different stakeholders allowed information to be communicated more efficiently and helped stakeholders understand their role in the project. The project team decided to use audience profiles to map the unique perspectives amongst the various stakeholders. Audience profiles are a format created to analyze how outreach messages can be designed for each stakeholder group. An example of an audience profile is shown in Table 1. An audience profile was generated for each group of stakeholders with unique communication needs. Whenever the project team develops new outreach materials, these profiles are referenced to determine which stakeholders need to receive this information, and to check whether any rephrasing may be worthwhile.

Table 1: Example of an audience profile used in TCFC

Retailers, Carriers, and Texas Trucking Association (TxTA)	
Know	TxDOT is working to instrument the Texas Triangle roadways with CV technology and wants to work with freight companies to pilot the system.
Believe	The TCFC project provides a unique opportunity at relatively low cost to test out new technology that could bring a competitive edge to businesses. Businesses who participate will be recognized in the market as innovative and will be able to help the state prosper.
Do	Partner with the TCFC project, participate in outreach activities, provide insights and feedback on efficacy of the technology, identify methods to improve the system, and instrument vehicles operating in the Texas Triangle.
Challenges	Companies have many competing interests and are focused on immediate benefits. It may be challenging to convince many companies to instrument their vehicles and provide data for analysis. In addition, companies may be working alongside their competitors, which requires close collaboration towards a common set of goals.
Key Theme	The TCFC project is a unique opportunity to bring together the public sector and private sector to benefit the State of Texas. This project will allow companies to try innovative technologies and be involved in the planning process.

3.3. Other Potential Stakeholders

In any stakeholder outreach process, some perspectives are prioritized while others are left out. A comparison to the three deployments in New York, Wyoming, and Florida highlighted a notable gap in the TCFC project: engagement of the general public. While the TCFC project will influence the passenger cars traveling on project roadways, that influence will be indirect, and thus the project has prioritized other stakeholder groups. Even within the categories considered, more stakeholders could potentially be engaged on either side. As an example, within the public sector is a border control presence in Laredo that could have been engaged to provide insight into border wait times for freight traffic. Outreach to private sector companies is challenging because finding

communication channels to effectively distribute materials can be difficult, particularly given the many competing interests.

3.4. Lessons Learned

The stakeholder identification process made clear that managing stakeholder relations across a megaregion with a variety of perspectives comes with some unique challenges. Hopefully, the experience gained in developing this statewide deployment will be useful for other megaregions who would like to instrument their roadways with CV technology. A key realization was that the TCFC project scope could not exactly match what was laid out in the proposal and that initial project expectations would have to be tempered to meet with the new scope. Additionally, important lessons were learned about managing stakeholders with various perspectives and the need to find a primary point of contact within each organization.

The project proposal that was submitted requested much more funding than what was awarded to TxDOT. Alongside insights gained from outreach, the project team has been able to pivot in a way that fits within the greater budget constraints and still provides value to Texas. A piece of this transition was the shift from planning for development of twelve CV applications to planning for development of four to eight CV applications. The project team realized that, within the limited budget, money would be better spent on building a comprehensive CV ecosystem that TxDOT can build upon in the coming years rather than limiting the project region to explore more applications. In general, determining where to place the RSUs across the project roadways has been a major challenge. The TxDOT districts have provided their knowledge on key freight bottlenecks and private sector companies have been able to communicate which roadways they use the most, but it is difficult to determine what RSU placements will provide the most return. It is important to spread RSU placement throughout the project area rather than restricting it to the major metropolitan areas; the project team will need to ensure the smaller TxDOT districts are still able to participate in the TCFC project.

The private sector provided an important insight during outreach activities, which led to another shift: truck drivers are not allowed to use their hands to interact with on-board technology and

most trucks already have a display screen on their electronic logging device (ELD). This ELD can be utilized for CV alerts instead of introducing a new screen. This insight has driven the project team to focus on developing an application program interface (API) that will not rely on touch input from drivers. In recognition of the importance of building a system that truck drivers can actually use, the project team has developed an HMI testing process to allow drivers to experience a simulated alert and provide feedback to the project team. The project team will continue to take advantage of the insights provided by the public and private sectors to strengthen the project.

4. Maintaining Stakeholder Relationships

Once the stakeholder network was developed, it was important to maintain regular contact with stakeholders to keep them updated on progress and to encourage their continued involvement. The project team developed several different engagement methods that were appropriate at various frequencies for different groups of stakeholders. The overall focus was to make use of stakeholder input where possible without having so many outreach activities that stakeholders would feel overburdened. This balance is achieved through varying the intensity and frequency of outreach activities.

4.1. Soliciting Input

The project team held one-on-one meetings with select stakeholders to solicit detailed input. For each meeting, the project team drafted a summary to capture key takeaways and action items. For the public sector, meetings were held with NCTCOG, the City of Austin, the City of San Antonio, and Houston TranStar. The main purpose of these meetings was for the project team to gain a greater understanding of the public agencies' existing CV and intelligent transportation systems (ITS) project inventory and to help assess possible alignment and collaboration with the TCFC project. For example, the City of Austin has tested CV equipment and city staff designated Riverside Drive as the main technology corridor in the city. The meetings provide more insight into how the project team can leverage existing work and how to make the TCFC project most valuable to each region.

For the private sector, the project team held meetings with a few companies to help guide the overall design of the TCFC CV applications. One meeting with Volvo aimed to help the project team better understand how the design of the in-vehicle component should blend with existing vehicle hardware. Since many freight vehicles already have an OBU, the project team decided to develop an API and an OBU so that vehicles can be instrumented more flexibly. The project team also met with H-E-B to understand training and integration of systems, and with Kodiak, Coca-Cola, and H-E-B to discuss what performance evaluation metrics are important to them.

4.2. Regular Meetings

Monthly conference calls with stakeholders are the most frequent method of communication. The calls are often attended by representatives from TxDOT divisions, TxDOT districts, FHWA, and other entities. The calls help the project team provide regular updates and allow the attendees to notify the project team of activities within their region. Recurring contact with the stakeholders is important because their knowledge and participation is an essential input to the project design process. Over the long run, the TxDOT district offices will have responsibility for ensuring the project's CV infrastructure is properly operated and maintained for the project to provide long-term value for them.

4.3. In-Person Meetings

For key milestones, the project team decided it would be valuable to convene large group meetings in person. The first in-person meeting was the Concept of Operations (ConOps) Workshop held in Austin at the end of July 2019. The ConOps Workshop was held to gather initial input on project design, explain the project to stakeholders, and allow stakeholders to engage with each other. This format was harder to schedule because it required the coordination of schedules across numerous stakeholder groups that are all busy. In return, holding this meeting allowed the project team to meet with a broad array of stakeholders without presenting the same material to each of them individually, allowed the stakeholders to take inspiration from the comments of others, and kept people more engaged than a web-based meeting would. While it is not feasible to bring together stakeholders on a frequent basis, at certain project milestones bringing together the broader group yields significant value. This is particularly important when the project team requires broad consensus on a topic and wants all stakeholders to feel their opinion was considered.

The next four in-person meetings are collectively referred to as the Texas Triangle Tour, which consisted of the project team traveling across the project region to visit the major cities involved. These meetings focused heavily on the public sector perspective. Private sector stakeholders were invited, but the meeting was not geared to their interests. The primary goals of these meetings were to finalize the priorities for each region and begin mapping-out possible deployment locations

for the priority applications. Bringing together stakeholders facilitated a larger conversation and required stakeholders to consider the broader scope of the project outside their priorities. At each meeting, stakeholders marked a map of the TxDOT district to indicate problem points for different CV applications, which the project team can use as inputs for future deliverables. Leveraging the existing knowledge of local representatives significantly reduced the need for the project team to spend time trying to find deployment locations. These meetings required less coordination because the groups were smaller. Also, they facilitate more detailed input by focusing the topic to a specific region. It is important to recognize when it is necessary to have input from the entire group and when it would be more valuable to have detailed input from smaller subsets.

4.4. Communication Tools

During the outreach process, the project team developed several communication and marketing materials to convey the purpose of the project to new stakeholders. Coming into the project, stakeholders often have very different levels of knowledge, so it is important to develop documents that communicate the key components of the project in an approachable manner. The material distributed most often is the one-page overview document communicating the primary goals of the TCFC project, the timeline, the project team members, a description of the technology being developed, and a selection of project participants that are already involved. This document was later supplemented with a second page containing an informational graphic to explain the twelve applications under consideration for the TCFC project (the full document is in Appendix A). Dissemination of this document provides stakeholders with key information in a format that is easy to process. The overview can be used for stakeholders to explain the project to members of their organization and is incredibly helpful when the project team is on-boarding new participants.

Beyond the overview document, the team has developed several slide decks for information that needs to be relayed to participants. Early in the project, the team worked to develop an introductory slide deck to assist in explaining the project during the first meeting with various stakeholders. During the development of the ConOps, the project team crafted two slide decks to provide a scenario-based illustration of how the CV ecosystem will work from both a driver's perspective and from a public agency employee perspective. Recently, the team built out a slide

deck for each stop in the Texas Triangle Tour to facilitate a summary of project progress and preliminary selection of deployment locations for high priority applications. Over the course of the project, communication tools will be developed in instances where the same information needs to be communicated frequently and broadly. Investing the time in these documents pays off with better engagement and understanding from stakeholders.

4.5. Qualitative and Quantitative Input

During stakeholder outreach, there is a need for both qualitative and quantitative feedback. Methods used for qualitative feedback have primarily been phone calls, emails, and in-person meetings. The only method for soliciting quantitative input has been online surveying. Thus far, this project has focused on qualitative input because it is hard to communicate high-level ideas in a quantitative way. For example, when public agency stakeholders are asked to rate their safety concerns, they will rate them all as top priorities. This is not disingenuous, but it is less helpful to the project team because relative rankings provide more value. In conversation, it is easier to dive into these nuances and understand the key priorities of a stakeholder. At the same time, quantitative feedback is needed at times when the project team needs to justify a decision that may not be unanimous. Within the TCFC project, the scope changed from the twelve CV applications listed in the proposal to the implementation of four to eight applications, as the awarded project had a smaller budget than originally requested. In response, the project team decided to utilize stakeholder input when deciding which applications are high priority and which can be delayed in development. It would be impractical to expect that all stakeholders (even within the public or private sector) would have the same priority ranking for the CV applications. Thus, the project team developed a survey where stakeholders were able to rank the twelve potential applications from highest to lowest priority for implementation. The results of the survey were combined with a consideration of technology maturity and a feasibility assessment to develop a three-tier ranking system. Tier 1 represents the highest priority; Tier 2 has some support, but it is less unanimous; and Tier 3 has the least support. This framework helps the stakeholders understand the likelihood of development for each application and they can communicate to the project team if they feel any application should be ranked more highly. It is important to recognize when the level of detail

provided in qualitative input is valuable versus the clarity of input gained through quantitative input.

5. Lessons from Multistate Coalitions

Aside from TCFC, several initiatives have provided test beds for connected freight technologies or serve as examples of the challenges megaregion-scale initiatives may face. Many of these examples are organizations that supported, or are continuing to support, CV projects, whereas TCFC is a project with a defined beginning and ending date.

5.1. I-10 Connects, the I-10 Corridor Coalition

The states of California, Arizona, New Mexico, and Texas formed the I-10 Coalition in 2016. The state DOTs are coordinating to implement CV technologies along the corridor. The coalition's goals include the following:[3]

- determine the challenges involved in multi-jurisdictional planning along the corridor and create a method for cooperation,

- pilot emerging technologies for both freight and passenger movements, including V2V and V2I technologies as well as technologies to automate or streamline truck permitting, parking, and inspections,

- develop standards for V2V and V2I technologies, and

- engage manufacturers in the process.

Unlike TCFC, the I-10 Corridor Coalition does not focus solely on freight transportation. Additionally, the coalition's multistate nature means it deals with coordination issues not present in TCFC. By working cooperatively, the member states hope to reduce administrative costs and provide interoperability.

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[3] I-10 Connects. "Corridor Coalition Organizational Charter. June 2016. pp. 1-2. link accessed 25 March 2020

While the coalition coordinates with private stakeholders, only the four state DOTs are members of the coalition. All decisions pass through a committee composed of representatives of the four state agencies. Likewise, funding for the research comes from the four state DOTs.[4]

5.2. I-95 Corridor Coalition

The I-95 Corridor Coalition is one of the longest-running megaregion planning organizations, created in 1993. It represents over one hundred transportation agencies and has a very broad scope. The coalition originally focused on the testing of ITS technologies, but it eventually "embraced integrated deployments and coordinated operations."[5]

The coalition has several areas of emphasis related to freight transport. One such emphasis is truck parking—the coalition is facilitating the coordination of truck parking technologies throughout the corridor to aid in congestion avoidance, delivery smoothing, and operator rest requirements.[6] In partnership with the FHWA, the coalition is running a pilot program to demonstrate a real-time truck parking information system at public rest centers in Maryland and Virginia.

5.2.1 Differences with TCFC

While TCFC is a single-state endeavor focusing on multiple corridors, the I-95 Corridor Coalition is a multistate effort focused on a single corridor. In this way, the coalition is more like I-10 Connects. Additionally, the coalition is focused on maintenance and management of the corridor as well as technology implementation, while TCFC is primarily focused on technology implementation.

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[4] I-10 Connects. "Corridor Coalition Organizational Charter. June 2016. p. 3. link accessed 25 March 2020
[5] I-95 Corridor Coalition. "The Coalition." I-95 Corridor Coalition. 2020. link accessed 25 March 2020
[6] I-95 Corridor Coalition. "Truck Parking." I-95 Corridor Coalition. 2020. link accessed 25 March 2020

5.3. Smart Belt Coalition

The Smart Belt Coalition (SBC) is a partnership of the Michigan, Ohio, and Pennsylvania DOTs; the Ohio and Pennsylvania turnpike organizations; eight research universities or institutions in the three states; and the FHWA. It was formed so the partners may share resources, expertise, skills, and perspectives to build relationships and answer research questions related to connected and autonomous vehicles (CAVs). The organization's goal is ultimately to "increase the efficiency and funding opportunities" around CAV technologies.[7] According to the Ohio Turnpike executive director, one of the member organizations, the group's primary goal is to ensure "standardization in emerging technologies."[8]

5.3.1. Differences with TCFC

The members of the SBC are running separate projects but sharing the results so they may build off one another. For example, the state of Ohio, University of Michigan, City of Pittsburgh, and state of Pennsylvania have all started separate CAV projects. This is in contrast with TCFC, which is focusing on a single implementation—the two strategies might be thought of as bringing stakeholders together before the fact for unified collaboration, as in TCFC, versus sharing results after the fact, as in SBC. SBC's strategy allows for several different CAV technologies to be tested simultaneously, but it might not reveal as much interagency problem-solving as TCFC.

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[7] IBTTA. "Smart Belt Coalition (SBC): A Regional Connected and Automated Vehicle Collaborative." 12 September 2017. link accessed 25 March 2020

[8] McCauley, Ryan. "3 States Form Smart Belt Coalition to Collaborate on Autonomous Vehicle Development." Government Technology. 19 January 2017. link accessed 25 March 2020

6. Applicability to Other Megaregions

TCFC is nearly one-of-a-kind in being a large partnership focusing exclusively on freight CAV technologies at the megaregional level. Some other working groups, such as the aforementioned I-95 corridor coalition, have much broader scopes both regionally and in goals. While the I-10 coalition has a similar scope (focusing more exclusively on CAV issues), its work concerns a specific corridor rather than a tightly linked megaregion. The SBC works at a level like a megaregion, but it is not oriented to focus on a single project. Thus, the TCFC can provide unique insights to best practices in organizing stakeholders for CAV implementation at the megaregional level.

6.1. Alternative Stakeholder Categorizations

It is possible to organize a project like TCFC with entirely different stakeholder categorizations. For example, rather than separating stakeholders into public and private groups, it might make sense to separate according to geography, type of involvement, corridor, or industry.

One way to separate stakeholders might be by technology. For example, if both V2V and V2I communications technologies will be tested separately under a project, it might make sense to separate stakeholders according to involvement with each technology rather than into public and private entities.

6.2. Differences in Multi-State Coordination

One of the downsides to applying TCFC's findings to other megaregions lies in TCFC's intrastate scope. TCFC examines CAV collaboration within an intrastate megaregion, the Texas Triangle. Because of this, handling interstate stakeholder relationships is beyond TCFC's scope, and some of the other projects examined in Section 5 might be able to provide better insights in that regard.

In a multistate megaregion, one alternative way to organize stakeholders might be by state, if each state within the megaregion will have very different procedures affecting CAV implementation

under the auspices of the project. The SBC uses this type of model, with stakeholders roughly divided into each state in the coalition, and each individual project under the coalition fully contained within a state. This method of organization would streamline jurisdictional issues but might bring challenges when a project is being expanded in scope.

7. Conclusions and Follow-up

TCFC provides a setting to examine best practices for CV implementation within a megaregion. Compared to similar initiatives, TCFC provides a different perspective because it looks at multiple corridors and is freight focused. TCFC is also taking place within a single state, which means it deals with fewer regulatory hurdles. This might allow TCFC to accomplish more, but it means the project provides fewer insights into handling issues which may arise in an interstate megaregion.

During TCFC's stakeholder selection process, the research team identified several lessons applicable to future endeavors. Finding a single point of contact within each organization is crucial. Because stakeholder selection occurs at the beginning of most projects, constant communication as the project scope shifts ensures stakeholders remain on the same page about project aims. Along the same vein, initial communication with stakeholders can help shape the scope of the project by leveraging each stakeholder's unique perspective. For TCFC, initial contact with freight stakeholders changed the way the project approached HMI.

Over the course of the project, researchers learned the best ways to maintain communication with different stakeholders. Communication with different types of stakeholders should be geared towards their particular needs. For TCFC, the project team found that private and public stakeholders tend to prefer different frequencies of contact—for either type, contacting too frequently can lead to overburdening the stakeholder, but the stakeholder does need to be contacted frequently enough for them to provide input on the project. Developing a one-page project overview document proved useful in bringing new stakeholders into the project because it ensures everyone has the same perspective on the project's goals and the technologies that will be involved. Researchers also learned that qualitative feedback from stakeholders is more useful for communicating high-level concepts, while quantitative feedback may be better reserved for quicker and simpler surveys, such as ranking stakeholder preferences.

Because TCFC is a single-state project, applying its findings to other megaregions will likely provide new challenges and opportunities, but TCFC provides a groundwork for testing the implementation of new and innovative trucking strategies. TCFC is wrapping up the first of four years, which means that stakeholder engagement can be expected to evolve. This phase of outreach focused on building relationships with stakeholders, and the initial outreach focused on

high level goals for the project. As the project progresses, stakeholder involvement will be targeted towards more nuanced input on the system design and implementation. That nuance could provide more insight into best practices in dealing with CV stakeholders at the megaregional level. Additionally, the project team will begin the process of negotiating partnership agreements, which is likely to be a complex process that will involve TxDOT's legal team and the legal team of each project partner. As other projects such as the Smart Belt Coalition and I-10 Connects progress, there will be more information available about the best way to approach megaregional AV and CV implementation.

Appendix A: TCFC Overview Document for Stakeholders

TEXAS CONNECTED FREIGHT CORRIDORS (TCFC)
North Central Texas Council of Governments (NCTCOG) Partnership

PROJECT PARTNERS

Core Partners

Federal Highway Administration (FHWA)
Texas Department of Transportation (TxDOT)
Texas A&M Transportation Institute (TTI)
Southwest Research Institute (SwRI)
UT Austin Center for Transportation Research (CTR)

Public Partners

City of Austin
Travis County
City of San Antonio
Houston TranStar
Harris County
Houston METRO
City of Houston
North Central Texas Council of Governments (NCTCOG)
City of Arlington
City of Grand Prairie
Texas Department of Public Safety (DPS)

Industry Partners

HEB
Coca-Cola
Crete Carrier
Peterbilt
Home Depot
Peloton
NASCO

For more information, please contact Jianming Ma at:
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Project Background

Texas was one of the ten recipients selected for the 2017 Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) grants. The Texas Connected Freight Corridors (TCFC) project will deploy a sustainable connected vehicle environment along the Texas Triangle using I-10, I-35, I-45, and I-30 to showcase up to 12 vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) applications focused on freight safety and mobility.

Project Timeline

The project launched on April 1, 2019 and will continue for the next four years:

Planning (Year 1): Stakeholder outreach, development of concept of operations, and creation of other key support plans

Design/Deployment (Years 2 & 3): Detailed design development, application development, and system integration and testing

Maintain & Operate (Year 4): System operation and maintenance, data collection and analysis, and performance measure reporting

TCFC Goals

- Improve roadway safety for freight and passenger vehicles
- Increase mobility and efficiency of freight across the Texas Triangle
- Develop lessons learned for broader roll out of CV technology
- Evaluate CV communication devices side by side (DSRC/5G/Satellite/etc.)
- Utilize crowd-sourced data to reduce emergency response time

PARTNERSHIP & BENEFITS

Partnership Opportunities

By partnering with the TCFC project, companies will have an opportunity to gain valuable safety, mobility, and environmental insights while shaping the future of the Texas freight system. Opportunities include:

1. Receiving driver alerts and notifications by instrumenting trucks with connected vehicle technology
2. Participating in project workshops and contributing to the direction of the TCFC project
3. Gaining recognition as an industry leader and good corporate citizen who is open to new technologies

Improve safety by providing driver alerts to equipped vehicles

Mitigate congestion by sharing route and travel information

Accelerate economic growth by enabling just-in-time delivery

Project Website: https://www.txdot.gov/inside-txdot/division/traffic/freight-corridors.html

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