

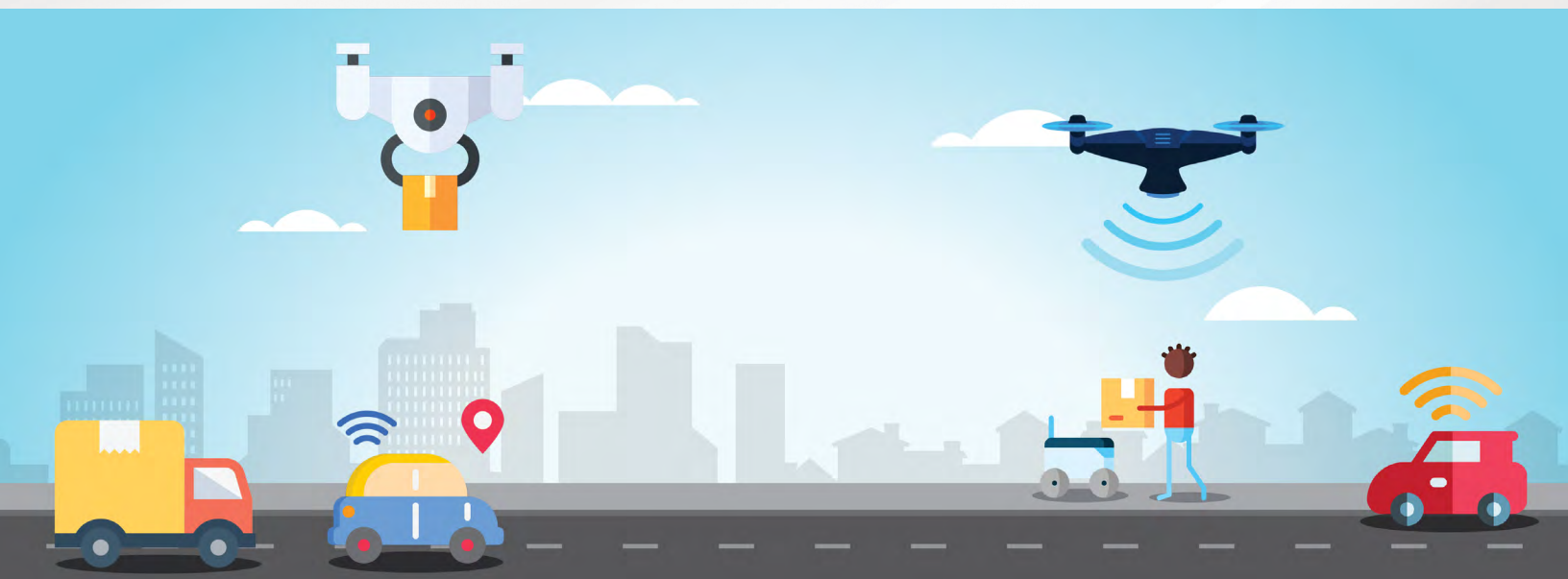


Connecting **North Texas** Communities
with Emerging Transportation Technologies

AV2.1

Project Engagement Report

The North Central Council of Governments (NCTCOG)
June 2022



North Central Texas
Council of Governments



KITTELSON
& ASSOCIATES

Hummingbird



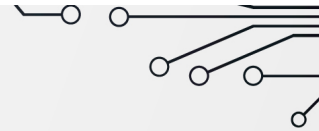
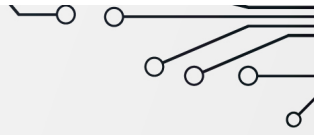


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Executive Summary

Transportation technology is evolving, so the North Central Texas planning process must evolve to keep up with the changes in mobility, land use, and travel behavior. Local agencies need guidance on how to address these impacts and uncertainties in their local plans, policies, and investment decisions.

In March 2021, the North Central Texas Council Governments (NCTCOG) the first phase of a three-phase initiative to gather data, exchange information with stakeholders and the public, and to analyze impacts in planning for Automated Vehicle (AV) technology. The purpose of the AV2.1 Planning project is to provide agencies with guidance on planning for emerging transportation technologies and their impacts.

This AV2.1 Planning Phase served as an opportunity to hear from the public and the local governments. The NCTCOG sought to understand transportation and mobility challenges facing North Central Texas so that they could identify ways emerging transportation technologies can address those challenges.

The three-phase AV2.0 program was created to advance planning, partnership, and investment into AVs in North Central Texas.

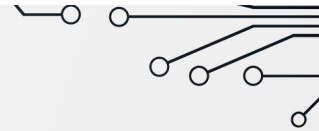
- **Planning (AV2.1)** - *Connecting North Texas Communities with Emerging Transportation Technologies* - Helping North Texas communities plan for the arrival of emerging transportation technologies, such as automated vehicles (AVs)
- **Partnerships (AV2.2)** - Funding to help North Texas communities build effective partnerships with the AV developers when they deploy AVs in the community
- **Investment (AV2.3)** - Making strategic investments as a region in AV service to explore use cases that are important to the region but not being adequately addressed by the private sector

By proactively planning, North Central Texas communities can create unified plans to use technology to solve local and regional transportation needs.

This document summarizes all outreach activities identified through the first phase of the initiative, AV2.1. The 15-month project was led by Kittelson & Associates, and it was supported by three public and stakeholder engagement firms: Hummingbird Firm, the Consumer and Market Insights (CMI) Group, and Public Information Associates (PIA).



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AV2.1 stakeholder and public engagement was comprised of the following components:

Timeframe	Initiative
March 2021 – May 2022	Project Advisory Committee (PAC) Meetings
May 2021	Project Website Launch
August 2021	Virtual Public Meeting #1
August 2021	Public Survey
October – November 2021	Regional Focus Groups
February 2022	Virtual Public Meeting #2
February 2022	Lesson Plans (for Grades K-12)
June 2022	Final Outreach Reporting

Project Advisory Committee

A Project Advisory Committee (PAC) was created to exchange information with local government leaders, AV pioneers and researchers, and additional public leaders whose input was valuable to the process. Eight PAC meetings were conducted throughout the project period, and the PAC served as a guiding board of professionals whose input was valuable to the project. **(Chapter 2 provides PAC meeting minutes.)**

Project Website

A project website was launched in May 2021 to help reach a broader audience and to expand the stakeholder base. The project website is: www.connectnxfutures.org. Furthermore, the website served as a location for important meeting details to be



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provided, as well as supplemental information, and AV technology lesson plans for those teaching K-12.

Virtual Public Meetings

Two virtual public meetings were conducted during the AV2.1 planning project. The first meeting was held on August 24, 2021. There were 57 attendees. The purpose of the first meeting was to gain baseline understandings of needs (and wants) by members of the public when it came to AV technology. The second virtual public meeting was conducted on February 24, 2022. Fifty people participated in this meeting, which included a panel discussion. During the public meeting, the project team shared resources. One was a set of [lesson plans](#) for K-12 students that could be used throughout the region and nation to help develop a strong workforce. The [presentation slides](#) were made available on the project website.

Public meeting and website promotion was conducted through a variety of methods, as shown below:

- [Flyer](#)
- [News Release](#)
- Emails
- Phone calls
- [Dallas Examiner](#)
- [Community Impact Newspaper](#)
- Social Media posts via NCTCOG
- Facebook ads

The image to the right is an outreach example.

(Chapter 3 provides public meeting minutes.)

Lesson Plans

The project team prepared a set of lesson plans to engage K-12 teachers and students in the conversation around automated vehicles and related technologies. The lesson plans include a general lesson plan that challenges students to think about what we need to do to prepare for emerging transportation technologies, subject-specific lesson plans, and a FIRST Lego League lesson plan that incorporates Lego building and computer coding. Other resources are shared at the end of the document.

- Preparing for Emerging Transportation Technologies
- English - Same Message, Different Audience
- Social Studies - A Review of Transportation Policy
- Math - Avoid the Crash!





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- Science - Pavement Markings and the Science of Retroreflectivity
- First Lego League (WeDo 2.0 Software) - Blind Spot Monitoring
- Other Transportation-Related Lesson Plans

Public Survey

The survey was 15 questions long and was intended to gather insight from residents of the 16-county North Central Texas region. The purpose of the "Survey on Transportation Technologies in North Texas" was to gauge the current use of transportation modes, current use of transportation-related technologies, and perspectives on future transportation technologies.

The survey was divided into five sections:

- Introduction
- "Your Transportation Now" (current forms of transportation)
- "Current Transportation Technologies"
- "Emerging Transportation Technologies"
- "General Information (demographics)"

Section 1 was an introduction to the survey, providing a high-level overview of the project and the purpose of the survey.

Section 2, *Your Transportation Now*, consisted of three questions:

1. What **forms of transportation** do you currently use to travel in the Dallas-Fort Worth area?
2. What do you **LIKE** about the **forms of transportation** in the Dallas-Fort Worth area?
3. What do you **DISLIKE** about the **forms of transportation** in the Dallas-Fort Worth area?

Section 3, *Current Transportation Technologies*, was intended to gauge respondents' perceptions of and use of current transportation-related technologies. The technologies presented represent the building blocks for connected and automated transportation.

4. How do you feel about **advanced driver-assistance systems (ADAS) and related technologies**?
5. How often do you use the following **transportation-related apps**?



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Section 4, *Emerging Transportation Technologies*, asked the most critical questions, in terms of what information is most important for the project and development of technology scenarios for the North Texas region.

6. Would you and your household consider using the following **technologies** to support your travel needs **AROUND the Dallas-Fort Worth area**?
7. Would you and your household consider using the following **technologies** to travel **BETWEEN the Dallas-Fort Worth area and other Texas cities**?

Question 7 was like question 6, but the set of technologies was different. The technologies included: A - personal car, B - automated bus, C - high-speed train, D - Hyperloop, E - passenger airplane, and F - air taxi.

8. Which of the following **BENEFITS** do you believe will come with **emerging transportation technologies**?
9. Which of the following **CONCERNS** do you have with **emerging transportation technologies**?
10. Select the **option** that best applies for each **transportation statement**.

Question 10 was included to get a better understanding of the respondents' willingness to: use shared transportation and public transportation, pay for convenience, reduce speed to increase safety, and see a reduction in the number of lanes to accommodate bicyclists and pedestrians.

Section 5, General Information, presents demographics questions. In particular, the Team included this section, recognizing that the results could show how respondents' answers were related to their demographics.

11. What **county** do you live in? (The answer choices were based on the 12-county region but provided a place for respondents to specify "Other.")
12. What is your **age range**?
13. How would you **best describe your race**?
14. Are you of **Hispanic** or **Latinx** origin?
15. Which of these describes your **household income** during a typical year?

The survey was initially planned to be open for three weeks. Given that the number of responses were low (below the minimum required to have a statistically significant survey) at the three-week mark, the Engagement Team decided to keep the survey open through the end of September. By the end of the survey, there were a total of 483 survey responses.



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Several of the major survey takeaways are:

- While there was representation from each of the counties, a bulk of respondents were from Tarrant and Dallas counties.
- For the question: "Would you consider using the following technologies to travel around the DFW area?" there was a mixed response. While many people said they would use the technologies, a majority said "No" or "Not Sure". The study team marked this as an item to study further so that the gap can be closed.
- The study team looked at the percent of "Yes" selections to emerging transportation technologies by race. Those who are Asian said, "Yes" the most, followed by White or Caucasian and Black or African Americans. The study team was trying to identify why there is a difference in those numbers. It could be trust or familiarity of current needs.
- Older generations were less likely to be willing to use the technologies.

(Chapter 4 provides the survey report.)

Regional Focus Groups

Twelve focus groups were held throughout the 16-county region. The purpose of the focus groups was to gain a deeper awareness of the public's perspective on current, new, and emerging transportation technologies.

There is an alignment between the focus groups and the survey. The research insights into the public's perspectives are current technology and emerging and new technologies. The focus group helped answer a top question, "How do we help the public understand the technology options and awareness?"

The focus groups were conducted over three weeks in October through November 2021. There were 83 participants. Most comments offered a very good discussion. This insight will be instrumental in providing directions to assist agency planners and other stakeholder groups as they make plans to meet the needs of the community as it relates to current, new and emerging transportation technologies.

In the research findings, there were a few common use patterns. Personal cars are the primary daily transportation use pattern. Map apps are used by all groups except for one group of minorities that do not have smart phones. But they are open to using them. It was a cost concern.

Concerns and frustrations include the volume traffic and roadways, lengthy construction zones and slowdowns, internet connectivity, and dead zones.



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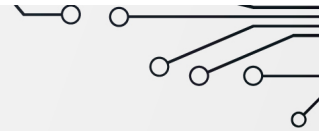
As for differences between the groups, the general population versus rural participants - rural participants said there are too few transportation options with no mass transit and limited ride share options. There is limited internet service and freight trains block major thoroughfares.

As for the differences between the general population and minorities - minorities were more excited about some future technologies, especially the African American group. But they were also the ones with the most apprehensions and doubts because they asked if the technologies will be fair and equitable. In addition, they questioned what the availability will be. They were also more concerned about seniors having the access and ability to learn. **(Chapter 5 provides the focus group report.)**

Conclusion

Stakeholder and public engagement were just one arm of the AV2.1 Planning Phase. The input and collected data will be used to provide guidance on adapting the planning process in North Central Texas to plan for the impacts of automation and related transportation technologies.

The outreach strategies were established to share best practices and funding opportunities for deploying emerging transportation technologies with local agencies.



Project Advisory Committee Minutes

Meeting Minutes

Project: NCTCOG AV2.1

Subject: Project Advisory Committee

Date: Friday, Mar. 12, 2021

Location: Virtual Meeting

Attendees:

Abby Morgan, Kittelson & Associates
Alonso Linan, City of Keller
Behruz Paschai, C&M Associates, Inc.
Brandi Bush, TxDOT
Caroline Mays, TxDOT
Chad Edwards, City of Fort Worth
Clint Hail, NCTCOG
Daniel Goff, Kodiak AI
Darcy Bullock, Purdue University
Denise Smith, Hummingbird
Elizabeth Gorman, Kittelson & Associates
Ernest Huffman, NCTCOG
Eric Griffin, Dallas Regional Chamber
Gibran Hadj-Chikh, Kittelson & Associates
Gregory Royster, DFW Airport
Abdulrahman Habib, UNT
Hans-Michael Ruthe, DART

Kerin Smith, City of Frisco
Khaled Abdelghany, SMU
Leigh Hornsby, PIA
Lori Clark, NCTCOG
Janille Smith-Colin, SMU
Jeremy Hutt, City of Cleburne
Jory Dille, ATG
Madeline Shepherd, Ford Mobility
Michael Rogers, City of Glenn Heights
Monsur Ahmed, City of Irving
Rachel Grosso, Kittelson & Associates
Rama Dhanikonda, City of Richardson
Royalyn Reid, CMI
Taylor Li, UT at Arlington
Tom Bamonte, NCTCOG

Start Time: The meeting began at 10:30 a.m.

The following are highlights from the Mar. 12, 2021 North Central Texas Council of Governments' (NCTCOG) AV 2.1 Project Advisory Committee (PAC).

Welcome/Review of Agenda

- Tom Bamonte, NCTCOG Senior Program Manager for Automated Vehicle Technology, welcomed participants to the AV 2.1 PAC kickoff meeting. He explained that a goal is to deeply involve PAC participants in the project process. He explained that he hopes the next generation will view this 18-month planning process to be something that will be a real benefit both professionally and to the region.
- The commitments for the PAC are to respect time and participation. He explained that the team wants this to be the PAC's process as we emerge from metro status to a major player on the national scene.
- Tom explained that following a rigorous procurement process, NCTCOG selected a team assembled by Kittelson & Associates. From there, he turned the presentation over to Abby Morgan, Kittelson Project Manager for AV 2.1.
- Abby provided an overview of the agenda, which included a project description, individual PAC member introductions, a study input session, a review of the engagement process, followed by an opportunity for attendees to provide more commitments and to ask questions. She explained that the team is combined of local and national experts who are conducting three distinct project components: Gathering information and assessing future mobility needs, developing and screening potential future scenarios, and identifying best practices and funding opportunities.

- Abby explained that Kittelson & Associates is a transportation engineering and planning firm, formed 35 years ago. The firm assists government agencies by helping them prepare for the impacts of technological advancements.
- In addition to Abby, team members are Gibran Hadj-Chikh, Kittelson Project Principal (automated vehicle route planning) and Yolanda Takesian, Kittelson Engagement Coordinator (public and stakeholder engagement). Local and national research experts are Janille Smith-Colin from Southern Methodist University (future mobility needs and impacts) and Darcy Bullock from Purdue University (automated vehicle hosting best practices). Stakeholder and public engagement is supported by Denise Smith with Hummingbird (virtual community engagement), Leigh Hornsby with Public Information Associates (stakeholder messaging) and Royalyn Reid with Consumer and Market Insights (focus groups). Local planning experts are Khaled Abdelghany with SMU (automated vehicle scenario development and evaluation), Behruz Paschai with C&M Associates, Inc. (travel demand modeling) and Jory Dille with Alliance Transportation Group (travel demand modeling).

Project Description

- Abby explained that the project need stems from evolving transportation technology, so the planning process must evolve to keep up. Therefore, the purpose of the project is to understand the region's mobility challenges, identify ways transportation automation and related technologies can address those challenges and recommend policies and best practices to achieve positive results for the region. The project involves key words, such as connection, communities, smart vehicles, automation, and more.
- Abby highlighted four categories that describe the future of transportation in the region. The first is Internet of Things (IoT), which is the internet and smartphone applications that affect travel demand. The second is Passenger Vehicle Technologies deployed in passenger motor vehicles. The third is Infrastructure Technologies deployed on urban ground transportation infrastructure, such as highways, rail and bus. And the fourth is Logistics Technologies, which focuses on goods movement vehicles, applications and logistics infrastructure. Abby explained that technologies with the greatest impacts usually overlap in two or more of these categories.
- NCTCOG's vision for automation in the region includes leading automated vehicle (AV) deployment, using automation to achieve the region's mobility goals, providing communities with AV planning and deploying resources, building effective partnerships with AV developers and strategically investing in the use of cases and communities overlooked by AV developers. Meanwhile, NCTCOG's goals are to improve safety and efficiency, share real-time travel information, improve the economy and prioritize quality of life.
- Abby said that this PAC and the accompanying study is just one part of a three-part AV program administered by NCTCOG. The entire program is named AV2.0 in which the objectives are to make future mobility planning resources available to stakeholders in the region, to provide resources for stakeholders to prepare for and support future mobility and to look beyond technology available today to plan for future scenarios and impacts. For the planning horizon, this particular study and PAC is project AV2.1, which is support for planning to the year 2045. AV2.2 is support for deployment costs between 2023-2025. And AV2.3 is the implementation of regionally strategic investments, also between 2023-2025.

PAC Roles, Responsibilities, Timeline and Members

- PAC members serve as liaisons between NCTCOG, the project team and individual communities. They represent a subset of the region's decision makers, and mentor the next generation of participating agencies. In fact, members are encouraged to ask a mentee from each of their organizations to participate in this PAC. And, finally, the role of the PAC is to envision the multi-generational planning horizon.
- The work of this study team and PAC is expected to answer six primary questions: How will transformational technologies affect regional decision-making? What are the potential future

scenarios for automation in the region? What are the best practices for hosting an AV deployment? What are the region's transportation technology needs and opportunities? How can agencies predict and monitor the impacts of transformational technologies? What are the funding opportunities to deploy new technology?

- Abby explained that this is an 18-month project that is scheduled to end in June 2022. The team is currently in the phase of gathering information and assessing future mobility needs. A PAC workshop will be scheduled for July, along with the first public meeting. This will launch the development and screening process for potential future scenarios. An additional workshop will be conducted this fall, along with a PAC interim meeting and a second public meeting. This leads into the process for identifying best practices and funding opportunities. In February through April 2022, two more workshops will be conducted, along with the third public meeting. This leads to the final stage and preparation of a final report. The last PAC workshop is scheduled for June 2022, along with a Regional Transportation Council (RTC) presentation and community follow up.
- Key deliverables for the project include the identification of stakeholders for this committee. The second deliverable includes the PAC meetings and workshops. The subsequent deliverables are: An existing needs assessment and market analysis, future scenario development tool identification and evaluation, funding mechanism and resources, AV hosting best practices, and a final report with guidance and recommendations.
- Following a review of the schedule and project timeline, Abby opened the floor to an interactive exercise in which participants viewed a series of photos ranging from drones to hyperloop technology to vehicles and mobile phones. Participants were asked what photo best describes their aspirations for automation technology. A majority of participants (55 percent) named the mobile phone. Forty percent listed the vehicles. A follow-up question led 47 percent of participants to concern over autonomous vehicles and the privacy or safety related to it.
- A follow-up exercise asked participants to select a word or short phrase that sums up transportation automation concerns that participants hear from others. Some aspirations were another person's concerns. Primary, repeating words included safety, privacy, impact on labor, and too much technology.
- Next, Abby opened the floor for participants to introduce themselves and provide information as to what interests them most about serving on this PAC. Responses follow:
 - Ernest Huffman, NCTCOG, said to align the interests of automated vehicles on the ground with those folks in the air so we can share some of those resources.
 - Lori Clark, NCTCOG, said to reduce emissions and hopefully not add emissions from the air quality perspective.
 - Jeremy Hutt, City of Cleburne, said to understand how this technology is going to change future capacity of roadways.
 - Chad Edwards, City of Fort Worth, said to explore ways to integrate technology into the existing infrastructure.
 - Kerin Smith, City of Frisco, said that as part of some of the city's autonomous vehicle projects she is able to see the potential in our smaller community and this initiative may be able to bring that to a regional level.
 - Michael Rogers, City of Glenn Heights, said to look at this technology in ways in which it can help us solve some of our community issues some of our problems that we do have in our in our communities.
 - Monsur Ahmed, City of Irving, said to learn how we close the gap among the applications.
 - Alonso Linan, City of Keller, said to make sure that we're not on the outside looking in and to integrate this into the existing system.
 - Rama Dhanikonda, City of Richardson, said to leverage technology to improve safety and mobility options in the city and see how we can incorporate that not by leveraging our current infrastructure and maybe determine what upgrades need to happen.
 - Eric Griffin, Dallas Regional Chamber, said to make sure that standards and policies are able to cross city and agency borders.
 - Hans-Michael Ruthe, DART, said to look at this from other angles as well as customer

interaction even within the agency and see how we would deploy this kind of technology in different transit modes.

- Gregory Royster, DFW Airport, said to focus on the land side or surface transportation and to see how that technology is changing -- looking at the obstacles and seeing how fast we can adapt to the new changing technology.
- Madeline Shepherd, Ford Mobility, said to view this as a partnership and understand that support has a vision of smart vehicles in a smart world, and they have been working with regions across the country not just an autonomous vehicle deployment but to be able connect mobility services.
- Daniel Goff, Kodiak AI, said to see how our technology can really best fit into regional priorities and strategies and how we can best partner and work together to make life a little better for everyone in the Metroplex.
- Brandi Bush, TxDOT – Dallas District, said to support efforts for new technology in this state and hopefully become leaders and innovation innovators for the nation.
- Abdulrahman Habib, University of North Texas, said to teach advanced data analytics so machine learning and AI technology is behind some of the technologies we will be talking about.
- Taylor Li, University of Texas at Arlington, said to apply automated vehicle technology from planning to deployment.

Stakeholder and Community Engagement

- Denise began the public engagement discussion by explaining the use of an engagement nest, which includes six steps: Situational analysis, relationship building, process framework, communication mechanisms, headline mitigation and periodic review. Situational analysis is the information the team needs to know to provide a strong foundation for effective engagement. Relationship building is how the team can leverage existing relationships and build new relationships to further and deepen the outreach. Process framework is the actual plan to engage stakeholders and the public. Communication mechanism are the ways to engage stakeholders and the public and how the team will communicate the technical concepts. Headline mitigation is how the team will help keep the project in a positive light. And periodic review is how the team will gauge the effectiveness of the efforts and communicate updates to both NCTCOG and the PAC.
- The team plans to use a three-phase approach in their plan to engagement stakeholders and the public. Phase 1 is public perspective of the current transportation system, as well as strengths and weaknesses. Phase 2 is public education and automated transportation technologies. Phase 3 is public envisioning and benefits and costs possible from automating the transportation system.
- Prior to beginning any public and stakeholder engagement, the team has worked to create a Public Engagement Plan that details the process that will be used to identify different groups and how the team will work with representatives and members of those groups to customize the public engagement audience. And the team plans to conduct various focus groups, interviews, partnerships, workshops and virtual public meetings.
- By reaching out to these groups, the team will implement a five-prong approach. The approach includes informing and updating stakeholders; feedback and input, getting input from stakeholders; events, hosting digital and in-person events; outreach, using a variety of tools to increase participation such as surveys; and incentives, encouraging participation.
- Leigh and Royalyn reviewed the stakeholder agencies identified by the team, to date. The team divided stakeholders into two groups. Group A is elected and public officials and includes agency staff and officials from NCTCOG and the 12-county area, mobility organizations, technology developers, and representatives from the freight logistics industry. Group B includes workers and employers in fields likely to change, as well as users of transportation infrastructure and community members who will experience changes in the cost of transportation, accessibility to destinations, vehicle ownership verses transportation services and those in the built environment. Group B has representatives from those who represent

aging adults, workforce and educational institutions and equity groups.

- Next, Leigh and Royalyn opened the floor to receive additional stakeholder recommendations and/or suggestions to those presented in Groups A and B. Lori recommended additional organizations in freight, such as groceries. Examples are Pepsico and HEB. They tend to be at the top of their fields. Michael recommended the auto manufacturers in our region. Chad recommended Hillwood Developments, which are part of Alliance and have connections with industry partners and are far ahead in pushing for technology. Ernest recommended the North Texas UAS Safety Initiative, which includes more than 300 organizations working on drone technology. Ernest represents that group and can assist. Additional technology developer organizations, such as self-driving associations were recommended, too. And business improvement districts were recommended, in order to help with problem solving issues.
- Participants provided suggestions in the Chat forum, as well. Lori recommended the southern Dallas Inland Port and said the Texas Municipal League (TML) may be better. In addition, she said some of the transit providers who specialize in mobility for the underserved are options. An example is Catholic Charities. She supported Chad's recommendation regarding Hillwood Developments. Furthermore, the Transportation Management Association from the inland port in southern Dallas was named. Rachel Grosso, Kittelson & Associates, recommended the opposite from aging adults -- young and unlicensed/nondrivers. Eric said he was not sure if the North Texas Center for Mobility Technologies falls under the auspices of NCTCOG, but that he suggests listing them as a resource, as well as workforce representatives. He also supported Lori's recommendation for the TML. Chad recommended we add Texas Wesleyan University in Fort Worth. Alonzo recommended law enforcement.

Open Discussion

- Abby opened the floor for an open discussion. Chad asked what type of information or feedback will be sought from the public? Because this is a very technical and very challenging project, how will we communicate what we need to the public and receive informed decisions back? And how do we do that as a PAC?
- Abby said the team plans to speak to the public with plain language, so we ensure the users safely utilize the technology. There will be an educational piece of the communication. The team realizes that not everyone will be savvy. But the general public will be the users. So, we need to ensure stakeholders and the public are brought to the table to understand if they even have access to the technology. If the public does not have access to technology, then we are already identifying an issue. And there are other things we might not be aware of that we need to glean from the public. Rosalyn explained that we want to build upon the platform as to where the public's knowledge level really is.
- Chad asked a follow-up question, "Is there an opportunity to engage and continue to engage certain members of the public?" He wants to ensure that the same people are participating throughout the project and not different people along the way. He asked if we could engage and reengage the same people? This will help with an informed decision.
- Abby said she thinks the team is on the right track and plans to evaluate and regroup with those who participated along the way.
- Eric said there is a real need for the general public to understand the importance of having a digital footprint. There is a real component with a digital life. Part of the public education part should be what a digital life is and should be.
- Abby said we are seeing some communities helping educate their residents. We will look for ways to provide that best practice guidance.
- Taylor asked if we could invite Silicon Valley experts to the PAC at some point in the future to help make our planning more realistic. Abby said we have experts on our PAC, but we can also reach out to other national experts. She added there is a total of six PAC meetings planned.
- Daniel said he is happy to play the role as an expert where he can and reach out to colleagues who are experts.

- Via the Chat forum, Lori said that when it comes to citizen education and explaining what it means to live a digital life – a key item is to take the “scary” element out of AV and help make people aware of all the AV elements they probably already have in their existing vehicles. Some of the simple things like lane departure warnings are things that a lot of people are acclimated to but don’t at all associate with being an AV. However, there are still plenty of people with vehicles that didn’t have basic cruise control, so it will be important to acknowledge/not underestimate that lots of people will find even those very basic AV capabilities foreign.
- Abby thanked the PAC for participating in the meeting. She recapped the purpose for this meeting. It is to help participants better understand what this study is about. In the future, we will focus on ways that we can develop ideas on how to communicate this information to the public. We want to provide attendees with the guidance and resources to help prepare for automated technology. PAC members are liaisons to their own organizations. Members should help the study team learn what the needs and opportunities are from their own organizations. PAC members will select the evaluation tools and establish how tools can be modeled. Members should also provide input into the study team’s final recommendations to NCTCOG. Finally, this is an opportunity for participants to mentor and potentially select a mentee for the rest of the project.
- Tom thanked all participants for their time and interest. Abby committed to sending out a calendar invite for the next meeting in the near future.

Next Meeting: May 2021

Adjournment: The committee meeting adjourned at 12 p.m.

Meeting Minutes

Project: NCTCOG AV2.1

Subject: Project Advisory Committee Workshop #1

Date: Wed., May 26, 2021

Location: Virtual Meeting

Attendees:	Abby Morgan, Kittelson & Associates	Kerin Smith, City of Frisco
	Abdulrahman Habib, UNT	Kevin Overton, City of Dallas
	Amy Johnson, NCTCOG	Khaled Abdelghany, SMU
	Behruz Paschai, C&M Associates	Kirk Houser, City of Frisco
	Brandi Bush, TxDOT	LaKesha Raynor, Dallas College
	Brendon Wheeler, NCTCOG	Leigh Hornsby, PIA
	Brian Moen, City of Frisco	Lori Clark, NCTCOG
	Bryce Grame, Kittelson & Associates	Lyndsay Mitchell, City of Arlington
	Caroline Mays, TxDOT	Madeline Shepherd, Ford Mobility
	Chris Klaus, NCTCOG	Marian Thompson, NCTCOG
	Clay Lipscomb - City of Plano (Guest)	Matthew Hotelling, City of Flower Mound
	Clinton Hail, NCTCOG	Matthew McCarty, TxDOT
	Courtney Blohm, NCTCOG	Monsur Ahmed, City of Arlington
	Dan Goff, Kodiak Robotics	Natalie Young-Williams, Paul Quinn College
	Darcy Bullock, Purdue University	Paul Paine, NCTCOG
	David Garcia, NCTCOG	Phil Dupler, Trinity Metro
	Elizabeth Gordon, Kittelson & Associates	Rachel Grosso, Kittelson & Associates
	Eric Griffin, Dallas Regional Chamber	Rama Dhanikonda, City of Richardson
	Ernest Huffman, NCTCOG	Royalyn Reid, CMI
	Ezra Pratt, NCTCOG	Sakoat Hossan, Kittelson & Associates
	Hans-Michael Ruthe, DART	Taylor Li, UTA
	Jamie Zech, TCEQ	Thomas Bamonte, NCTCOG
	Janille Smith-Colin, SMU	Tim Porter, City of Wylie
	Jeff Hathcock, NCTCOG	Yolanda Takesian, , Kittelson & Associates
	Jeremy Hutt, City of Cleburne	Yvette Flores, TxDOT
	Jory Dille, Alliance Transportation Group	Zeke Reyna, TxDOT

Start Time: The meeting began at 10:02 a.m.

The following are highlights from the May 26, 2021, North Central Texas Council of Governments' (NCTCOG) AV 2.1 Project Advisory Committee (PAC) Workshop #1.

Welcome/Review of Agenda

- Abby Morgan, Kittelson Project Manager for AV 2.1, welcomed attendees and briefly reviewed protocols, which provide participants an opportunity to raise their hands to offer questions and comments and by providing a chat forum in which participants may provide supplemental information.
- This was the first workshop for this project, and it served as an expanded meeting of the PAC in which additional professionals were invited to attend and share expertise. The purpose of the meeting was to help answer the following questions: What are transformational technologies? How will they impact transportation and land use? And how can participants get involved? Meanwhile, objectives for the workshop were to introduce participants to the many transportation technologies available. Abby noted that this extends well beyond automated vehicles, as it includes additional items such as land use. NCTCOG established the objectives to make future mobility planning resources available to stakeholders in the region.
- Abby provided an overview of the agenda, which included a project overview, a technology overview, different perspectives and ways in which participants can get involved. She said there would be five presenters during the workshop – all of whom will address the different perspectives. Presenters were Darcy Bullock with Purdue University, Eric Griffin with the Dallas Regional Chamber, followed by Dan Goff with Kodiak Technologies, Madeline Shepherd with Fort Mobility and Thomas Bamonte with NCTCOG.
- There are three phases to this program, and AV2.1 is the one that was discussed for the workshop. The program team is in the first planning level phase, and the objective is to answer four questions: How will transformational technologies affect regional decision making? How can agencies predict and monitor the impacts of transformational technologies? What are the potential future scenarios for automation in the region? And what are best practices and funding opportunities for AV deployments?
- Abby thanked the PAC members for their participation in this process and stated that their roles are to serve as liaisons between NCTCOG and their communities; to represent a subset of the region's decision makers and technology uses; to mentor the next generation of planners and engineers participating from various agencies; and to envision multi-generational planning horizons.
- The study duration is approximately 13 months. The program team is in the gather information and assessing future mobility needs phase. This will continue through July 2021. Three steps will follow, which include the develop and screening of potential future scenarios, the identification of best practices and funding opportunities and the final report. A full stakeholder and public engagement process complements each step.
- In addition to Kittelson & Associates, the study team is comprised of local and national experts. Team representation includes, Southern Methodist University, Purdue University, Hummingbird, Public Information Associates, Consumer and Market Insights, C&M Associates, Inc. and Alliance Transportation Group.

Automated Transportation Technology Overview

- Abby explained that emerging technologies have many impacts, including land use, VMT and congestion, data management, transit, safety, multimodal system and curbside management. Regional mobility impacts replace the need for personal travel, enable better use of system resources and support better management of systems. She added that technology is transformational when it is successful in a marketplace; that it is successful when it is a superior

or a cheaper service; and it also has unknowns, which are sustainable price ranges for the technological applications. Transformational technologies cover a broad range and have a potential to show how people can update land use, and while the program team is primarily looking at roads, there are opportunities for impacts to rail and air.

- Abby highlighted four categories that describe the future of transportation in the region. The first is Internet of Things (IoT), which is the internet and smartphone applications that affect travel demand. The second is Passenger Vehicle Technologies deployed in passenger motor vehicles. The third is Infrastructure Technologies deployed on urban ground transportation infrastructure, such as highways, rail and bus. And the fourth is Logistics Technologies, which focuses on goods movement vehicles, applications and logistics infrastructure. Abby explained that technologies with the greatest impacts usually overlap in two or more of these categories.
- NCTCOG's vision for automation in the region includes leading automated vehicle (AV) deployment, using automation to achieve the region's mobility goals, providing communities with AV planning and deploying resources, building effective partnerships with AV developers and strategically investing in the use of cases and communities overlooked by AV developers. Meanwhile, NCTCOG's goals are to improve safety and efficiency, share real-time travel information, improve the economy and prioritize quality of life.
- An additional technology up for discussion is vehicle technologies, also known as ACES: Automated, connected, electric and shared. Connected vehicles (CV) allow communication between other vehicles, as well as bicyclists, pedestrians and others. It is often referred to as V2X, i.e. vehicle connected. An example is in the state of Wyoming where the U.S. Department of Transportation as a connected vehicle pilot project deployment to address safety, mobility and public agency efficiency. Information is sent elsewhere and captured by potential future motorists to or in the state so they may be warned of traffic tie-ups due to winter weather or other issues. In pilots such as this sensors are used to help transmit information. Another project is the National Highway Transportation Safety Administration (NHTSA) AV Test Initiative. It provides a test tracking tool online and details are available online at <https://www.nhtsa.gov/automated-vehicle-test-tracking-tool>.
- Next, Abby returned to IoT and discussed Mobility as a Service (Mass). Through the sharing of current situational information that is directed to a Mass model managed by application, there is an enabling of better uses of system resources in which there is a decrease in car ownership and parking demand and an increase use of transit, leading to efficiency.
- Abby reviewed advances in traffic signal technology by which CV data is used to adjust signal timing, request preferential treatment and report performance measures. There is now the capability to program controllers that adjust signal timing cycle-by-cycle, operate V2I equipment and convert high-resolution data into planning-level information. In other words, what the car knows can make the road safer by managing accelerometers, sensors, traffic control, lane departure and sign reading.
- The next item Abby covered was logistics technologies. This can be in the form of parking management, truck or trailer sharing applications and data integration systems. Logistics technologies support better management of systems by monitoring mobility performance, prioritizing investments and informing decision making. For example, drone crash investigations save time, reduce resources and improve accuracy.
- Following an overview of the technologies, Abby discussed the impacts of technologies. Metropolitan areas, also known as SMART cities, have lower travel costs with increased land values on the fringe and increased overall attractiveness in the region. For manufacturers, this can mean lower labor costs, lower travel costs and increased competition from lower labor cost areas. Meanwhile jobs are associated with this but have higher travel costs in rural areas and increased disparity in those same areas. Capacity impacts are based on capacity adjustment factors for connected and automated vehicles in the Highway Capacity Manual (HCM).
- Abby ended her presentation by listing some main issues, such as some of the technologies that cause problems today; some that are desirable technologies that may not succeed without public agency help; and other technologies may cause problems in the future. The greatest uncertainty is the sustainable price point of new technologies, but no one knows enough yet to assign probabilities to potential future scenarios. She said the best approach is to monitor and

acquire more data on day-to-day impacts of new technologies. She provided a matrix that addressed the monitor impacts of new technologies. Those impacts are growth, land use and location, early indicators of code and plan problems, parking demand and travel demand. Next, she addressed metrics that can be associated with each of those impacts, as well as sources for obtaining information regarding those impacts.

- A big question is what can agencies do? First and foremost, be nimble by developing technology-agnostic regulations, regulate through incentives, create flexible plans, empower staff and communicate across silos.
- Next, Abby provided information on two upcoming webinars on May 27 and June 8.
- Finally, Abby opened the floor to ask participants about the main issues that need to be planned., as there are still many unknowns. In addition, she asked attendees to provide their contact information in the chat forum.
- Having no questions, Abby introduced Darcy Bullock from Purdue University to discuss project innovation.

Presentation by Darcy Bullock

- Through his work at Purdue University, Darcy is part of the Joint Transportation Research Program. He collaborates with government and industry to research and implement technology that improves the safety and operation of transportation systems. He opened his presentation by showing a clip of his testimony at Congress and provided a link in case additional people wanted to research it: https://science.house.gov/imo/media/doc/Bullock_Testimony.pdf. He said that the message he wanted to leave with participants is that vehicles know more about our infrastructure than you think they do.
- Components of his presentation included: 1. Connected Vehicle Data is readily available now and very valuable for managing/prioritizing infrastructure investments; 2. Traffic Signal Performance Measures are low hanging fruit; 3. Public Safety colleagues are critical partners in early adoption. Connected vehicle data is powerful tool for assessing incident management...and leading to some great cross cutting innovation; and 4. He is happy to do a deeper dive at a later date in any of these topics.
- He stated that we need to be strong partners with public safety agencies. At Purdue University, they are able to review crash data in connected vehicle data. There are enhanced traffic signal performance measures in a national pooled fund study (PFS) with 11 states, including one in College Station at 22 intersections. Darcy presented a matrix which showed the level of service, arrival on green, split failures and downstream blockages related to particular Texas intersections in an effort to show how traffic data can be viewed and used to tell a variety of factors.
- Darcy provided another example in which technology can be used to share and inform public safety agencies. He identified a fatal crash outside of Indianapolis on I-65 that was closed for nine hours south of Lafayette. A secondary crash occurred as a result but through there system, they were able to determine speeds as a result and identified the point and cause of that crash. They were able to provide an Orthomosaic image and subsequent reconstructions. An Orthomosaic image is a geometric ariel image that is a combination of images. They were able to show that a vehicle was on cruise at 65 mph and failed to slow down. In addition, they were able to determine subsequent next steps and reactions for neighboring vehicle.
- He wrapped up the presentation by providing information regarding a crash scene mapping workshop held in collaboration with a police department in which technologies were shared.

Presentation by Eric Griffin

- Eric began his presentation by reviewing the pillars in the chamber's mission, which are economic development, education and workforce, public policy and a new and important one, diversity, equity and inclusion. While mobility technology is not specifically listed, it is an important part of the pillars.

- He explained that the unemployment rate for the Dallas region was 6.5 percent in March 2021, down .3 percentage points from February 2021. Unemployment was down by 2.5 percent in March, which is the second lowest rate among the 12 biggest metro areas. And consumer spending was up in March by 20.7 percent. Fort Worth spending increased 19 percent. The increase is compared to pre-pandemic spending. One of the spending jolts occurred after the most recent economic stimulus checks.
- For employment by industry, year over year, it is of no surprise that leisure and hospitality were most impacted.
- To better show the importance of mobility technology in the Metroplex, 140 corporate headquarters relocated to DFW since 2010. And the DFW is recognized as a Top 5 North American Metro for industries ranging from aerospace (which is #1) to transportation and logistics. Furthermore, the metro area is an innovation hub with an ecosystem that provides a Top 10 digital infrastructure and environment among global metros, as well as one of the hottest startup communities in the U.S. and important logistics hubs.
- In 2020, the population was estimated at 7.7 million and is expected to grow to 10.2 million by 2040.
- The Metroplex comes in second for new high-tech jobs created in the last five years, second only to Seattle. It is the Number 1 region in Texas for both higher ed enrollment and degree completion and with more Carnegie-designated R1 and R2 research universities than any other Texas metropolitan area.
- As for recruitment, 110 projects considered a move or expansion to the Metroplex pre-pandemic, for the first six months of the pandemic and last eight months.

Presentation by Madeline Shepherd

- Madeline opened by explaining her company's position in that it is clear that they will need to build smart cars but that those must be accompanied by smart roads, parking public transportation system and more. The current mobility model will not work tomorrow.
- She described initiatives by Ford. One is the City:One program, which is designed to explore mobility questions around equity, accessibility, safety and sustainability using a community-centered lens. So, they have hosted City:One Challenges, which are community-centered innovation initiatives that match entrepreneurs with local communities to develop and deploy new mobility solutions.
- Ford developed an award-winning traffic safety analytics platform designed to help enable smarter decision-making that ultimately improves road safety. In fact, a Metro Detroit pilot project last year was successful and involved 10 public agencies.
- Madeline explained that Ford is identifying the best policies for the environment, customers and businesses. Examples include electrifying their areas of strength, helping customers transition and E-transit.
- She described additional people mover solutions, such as on-demand public, dockless e-scooters to supplement existing transit options for commuters and agency-owned, flexible micro transit full-scale operations that let transit agencies match resources to ride demand.
- Ford will launch a self-driving service to move people and goods, as part of the transportation ecosystem. Testing is ongoing with a project partner, Argo AI. Self-driving can range from no automation to driver assistance to partial automation, conditional automation, high automation and full automation. High automation is when the vehicle performs all driving tasks within a defined area.
- Ford has pursued autonomous vehicle technology for more than a decade. They want to create a trusted technology that makes people's lives better. And Ford will launch a best-in-class AV service that will address multiple people movers and goods. A couple of the initiatives will require strong collaborations with cities, such as and owned and operated exclusive fleet and an optimized supply and demand network.
- In preparing for an autonomous operation, Argo AI maps the roads where they intend to test to build the self-driving systems knowledge of the area. Mapping includes road edges, speed

limits, crosswalks and related information.

- Madeline discussed self-driving vehicles as a service, too. Ford believes that people and packages can move more safely, efficiently and affordably in the self-driving future and that enhanced ride-hail and delivery services extend availability and affordability, which improving safety, reducing congestion and improving the quality of life.

Presentation by Dan Goff

- The title of Dan's presentation was, "Everything you want to know about autonomous trucks but were afraid to ask." He began by defining, "What is an autonomous truck." In technical terms it is SAE L4. The L4 represents driverless in some operational design domains and there is a focus on long-haul. While there are various forms and degrees of autonomous vehicles, autonomous trucks require high automation. The vehicle is capable of performing all driving functions under certain conditions. But the drive may have the option control the vehicle.
- Dan explained that autonomous trucks can solve a number of problems for industry and commerce, including safety in that autonomous trucks will soon be safer than traditional trucks; issues with driver shortages; provide 24/7 operations; and technology in that highway driving is a more constrained problem than city driving because there are no impediments such as bikes, children and pets. And finally, he said it is better suited for today's technology.
- Next, Dan provided a brief history regarding Kodiak Robotics. Founded in 2018, a testing and operations hub opened the following year in Lancaster. It was the first autonomous trucking startup to build operations in Texas. So far, they have 10 trucks and are preparing for expansion. But they remain in the testing phase as they have two people in each vehicle.
- Dan explained that autonomous trucks can assist with a variety of issues by safely navigating cut ins, construction, heavy traffic and vehicles on the shoulder.
- There are many companies building autonomous trucks, especially in Texas, which has a great combination of freight density and a positive regulatory environment. In regard to regulations, he said there are not specifically any right now but regulations are in motion. The Federal Motor Carrier Safety Administration (FMCSA) is focused on adapting rules to address issues and law enforcement is working to develop inspection regimes.
- Autonomous trucks also will have an economic impact by providing new jobs, as well as changing jobs. There will be less congestion, lower emissions (about a 10 percent reduction in diesel), land-use changes and lower costs.
- In reference to safety, the industry talks about building a safety case, which is an argument that your vehicle is safer than the average human driver. At Kodiak, Dan described a series of pillars that provide their safety case. Those pillars are simulations, functional safety analysis, real-world driving and scenario benchmarking.

Presentation by Thomas Bamonte

- Thomas provided a briefing for the overall AV program, including two related projects AV2.2 and AV2.3.
- In October 2018, the Regional transportation Council approved AV 2.0, with three sections. AV2.1 is the regional planning exercise for future mobility technology (\$1.5 million). AV2.2 is AV deployment support for local partners (\$10 million). And AV2.3 is strategic investments in AV services (\$20 million). In September through November of 2020, Funding availability was announced, and the RTC approved selection criteria. Currently, information is being presented to the RTC.
- Thomas provided an overview of six identified initiatives of a local AV project. The first is the Cedar Valley AV Cluster+Workforce Development. Service will operate in an area bounded by I-20 on the north, Lancaster-Hutchins Road on the east, Belt Line Road on the south and N. Houston School Road to the west, with a possible extension to the UNT Dallas campus to the north. Transportation services would be provided to the campus, high school, community centers and neighborhoods using approximately four automated vehicle. This would be part of the AV2.2 and AV2.3 projects.

- Another project initiative is the Eastfield Campus Community Connector+Workforce Development. Service will operate in an area up to five miles around the Eastfield campus. Alternate description: U.S. 80 on the south; I-635 on the east; Buckner Avenue on the west; and a line east from Buckner/Garland Road intersection to I-635 on the north. This would include: 1. Curriculum development; 2. Technology and lab infrastructure; 3. Education activities, including outreach, to develop interest and promote participation in surface transportation careers; and 4. Development, implementation, and management of internships and apprenticeships.
- A third initiative is the Paul Quinn College Community Food Delivery Bot Service. It will operate in an area bounded by Ledbetter on the north, I-45 on the east, I-20 on the south and Lancaster on the west. This includes AV delivery service of produce from the PQC garden to destinations, approximately 250 at a time, in the service area. Project includes equipping approximately 500 households over life of project with Internet access, and training necessary to access bot delivery service and valuable resources that will support community economic stability.
- A fourth example is the DART Love Link AV. Service will operate between Inwood Station and Love Field Airport with intermediate stops. Buses will originate out of the Northwest Operations Facility. Transportation service would connect Inwood Station with Love Field using a fleet of four automated electric buses.
- A fifth initiative is the Richardson CAV Test Bed and Community Connector. All project activities will occur in an area bounded by Waterview Drive on the west, Campbell Drive on the north, Jupiter Road on the east and Belt Line Road on the south. This initiative includes the creation of an automated/connected vehicle technology district to optimize intersection via technology to protect vulnerable road users and optimize the operation of automated vehicles; and provide transportation services using automated vehicles to connect a diverse group of residents with destinations including rail transit station, community service center, city hall, and Innovation Quarter with the automated vehicles being used in the CAV district.
- A sixth initiative is the Tarrant AV Truckport in Tarrant County. This would build and operation the nation's first AV truckport on I-35W at SH 170. Alliance provides Fort Worth with land for seven years. At the end of seven years Alliance gets land back and pays Fort Worth the FMV of all improvements funded by grant funds. FW reimburses USDOT for anything owed. If Fort Worth gets a "windfall" it devotes those funds to transportation improvements. After 7 years, property may continue functioning as a truckport or Alliance can remove pavement and use land for other purposes.
- Next steps for this initiative are to present the item to the RTC and STTC with approval by July 2021. TxDOT agreements are expected by summer 2022 with project implementation by early 2023.

Concluding Remarks

- Abby provided a link and QR Code for participants to use in order to complete an online survey regarding their organizations' statuses for utilizing automated transportation technologies. The program team is seeking information on plans, policies, partnerships and deployments. The survey will remain open through June 16, 2021.
- The program team will conduct more workshops through the 13-month period. In July 2021, the workshop will focus on how to engage the public on transformational technologies. In September 2021, the workshop will focus on future mobility needs and assessments and scenario development. In February 2022, it will focus on future scenario evaluation, followed by AV hosting guidance and funding mechanisms in March 2022. The last workshop will be held in May 2022 and focus on planning and implementing automated transportation.
- In summary, the workshop defined transformational technologies, how to prepare for the impacts, which is to monitor, and how to participate in the survey and future workshops.

Next Meeting: July 2021

Adjournment: The committee meeting adjourned at 12 p.m.

Meeting Minutes

Project: NCTCOG AV2.1

Subject: Project Advisory Committee Meeting #2

Date: Wed., May 26, 2021

Location: Virtual Meeting

Attendees:	Abby Morgan, Kittelson & Associates	Leigh Hornsby, PIA
	Khaled Abdelghany, SMU	Taylor Li, UTA
	Behruz Paschai, C&M Associates	Lori Clark, NCTCOG
	Brandi Bush, TxDOT	Lyndsay Mitchell, City of Arlington
	Caroline Mays, TxDOT	Madeline Shepherd, Ford Mobility
	Clinton Hail, NCTCOG	Matthew McCarty, TxDOT
	Daniel Goff, Kodiak Robotics	Monsur Ahmed, City of Arlington
	Denise Smith, Hummingbird	Rachel Grosso, Kittelson & Associates
	Elizabeth Gordon, Kittelson & Associates	Rama Dhanikonda, City of Richardson
	Eric Griffin, Dallas Regional Chamber	Royalyn Reid, CMI
	Ernest Huffman, NCTCOG	Gregory Royster, DFW Airport
	Hans-Michael Ruthe, DART	Janille Smith-Colin, SMU
	Jeremy Hutt, City of Cleburne	Thomas Bamonte, NCTCOG
	Kerin Smith, City of Frisco	Yolanda Takesian, , Kittelson & Associates

Start Time: The meeting began at 2 p.m.

The following are highlights from the May 26, 2021, North Central Texas Council of Governments' (NCTCOG) AV 2.1 Project Advisory Committee (PAC) Meeting #2.

Welcome/Review of Agenda

- Abby Morgan, Kittelson & Associates Project Manager for AV 2.1, welcomed attendees and briefly reviewed protocols, which provided participants an opportunity to raise their hands to offer questions and comments and by providing a chat forum in which participants may provide supplemental information.
- This is the second AV2.1 session of the day. The first one was the workshop. Abby said she hoped most participants were able to attend the morning workshop. As for the afternoon agenda, she sent the draft document via email to the PAC for review.
- Abby continued by stating that in the kick-off meeting (PAC Meeting #1), participants shared some specific contacts. The project team will begin reaching out to those groups. Abby said she wanted to follow up with the discussion from the morning workshop. She explained that this initiative is so

much more than just automation. The project team wanted to see if participants have any feedback or questions regarding the morning session.

- The third agenda item is a repeat of the public agency survey. The project team is working on a needs assessment for the region. Part of that comes from the engagement side. The project team want to make sure that the PAC has the most up-to-date information. This meeting with a couple of project updates, and participants will review potential training opportunities.
- Abby said she would like to hear any feedback participants might have regarding the Public Engagement Plan (PEP). Before that, Denise Smith, project team member from Hummingbird, provided a brief document overview. She began by presenting the schedule graphic to show how the engagement phases of the project tie into the regular project phases. The first phase is gathering information and assessing future mobility needs. The second phase is developing and screening potential future scenarios. The third phase is identifying best practices and funding opportunities, and Phase IV is the final report.
- The project team wanted to gain an understanding the of public's perspective on transportation needs and opportunities and to educate the public about opportunities as they relate to automated technology applications. This is all in the first phase. Engagement Phase 2 is having the public envision what the transportation system could be like. And Engagement Phase 3 is sharing insight with the public about the anticipated impacts of the future technology scenarios, best practices and deployment. Denise explained that there are five-prongs of engagement activities – information, feedback and input, events, outreach and incentives. The project team want to use the local government to leverage outreach opportunities. And incentives.
- Carolyn Mayes, Texas Department of Transportation (TxDOT) Director of Freight, Trade and Connectivity, said the PEP appears to be focused more on the general public, as opposed to agencies and the private sector. How will the team reach them? And will those strategies be a little different? Denise said the PEP is aimed to the public, but the project team has two other groups in information will be distributed, while including surveys and conducting interviews and listening sessions with thought leaders in the area. Carolyn said she did not see a component on education and awareness about the technologies of this project. Denise said the project team will be using info graphics and plans to add context into the surveys that explain the technologies. She said the team will provide call-in options, as well as printed options. In addition, the project team will use explainer videos. She said the team welcomes other thoughts on how to education and engage the public. Carolyn said self-education prior to meetings will be helpful. She said story maps are also important. Denise said the project website will provide definitions and context, too. Abby said an additional item that will be incorporated on the website will be resources that other groups and industries have put together. Those resources will help education the public. It could even include information for teachers to help educate their students.
- Hans-Michael Ruthe, DART Project Manager, asked what is meant by supplementary activities, as listed on the engagement activities charge. Denise said this is an area in which the team wants to hear PAC feedback. It helps ensure that the team is meeting the objectives of the client and identifying activities that could either be bumped up or added. Hans-Michael said in his industry, it is all focus groups. Hans-Michael said he completed the survey. It was onerous and very much a thinking survey. But with focus groups, the benefits are much more evenly split among participants. It is much easier to take an hour of someone's time.
- Royalyn Reid, project team member from Consumer and Market Insights (CMI), said the team plan to have focus groups that span all the counties. They are going to be very, very focused. An example is gathering information to see what people's thought processes are prior to the educational part. Denise will work to educate *before*, and the focus groups will be used to collect

information *after*. Denise said the PI team can go back to see what the focus groups will look like in Phases 2-3.

- Abby said the team is really trying to identify and understand barriers to the technologies. Abby asked PAC members if they added focus groups to any of their deployments and if so, they are encouraged to provide that information in the chat forum.
- Madeline Shepherd, Ford Mobility Strategist, said she was not specifically involved in focus groups in the cities in which technologies were deployed, but she will ask those employees who were involved in those activities. She said there are points at which participants see friction between the environment and the implementation of technology, itself. How are people doing who had technology implemented in their neighborhoods?
- Daniel Goff, Kodiak Robotics Head of Policy, said the best way for people to become familiar with these technologies are events in which people can see these items in person. Denise said she really likes the idea and that the team previously discussed implementing pop-up events.
- Lori Clark, NCTCOG Program Manager, said she saw information in the PEP about a meeting-in-a-bag. She offered that information could or should be presented beforehand so it is not just the meeting but an elaboration with the virtual aspects. Lori said a lot of the communities do Earth Day events and that could be something strategic next spring, but there are some events in the fall.
- Abby asked that the PAC members to continue to keep the feedback coming throughout the meeting. She said the team understands that we are asking for a lot of input through participants, but the team wants to really understand local plans, policies and technologies.
- Abby opened the floor to feedback regarding the morning session. And she thanked those members of the PAC, who presented information during that session. Were there any technologies that were new that participants did not hear about previously?
- Carolyn said it was interesting to hear from the Dallas Regional Chamber of Commerce as chambers are not usually involved in the roles of technology, so she was impressed by that. Otherwise, there wasn't any new. She mentioned that the cost of technology is something the team will need to address and identify going forward. Abby agreed and said they can follow up with more information.
- Ernest Huffman, NCTCOG Aviation Planning and Education Program Manager, said there is an effort to find synergy between air and ground pieces. He will brief information to the PAC when that program comes to fruition. In addition, they just signed an agreement with NASA but those kickoff meetings do not begin until next year. Ernest provided a link in the chat forum regarding the program: <https://www.nasa.gov/aeroresearch/programs/iasp/aam/nasa-to-help-local-governments-plan-for-advanced-air-mobility>
- Lori recommended a review of airport studies. There is one that is connected to autonomous. Abby said the team has a number of studies from the airport but she will follow up with Gregory Royster, DFW International Airport Senior Airport Planner. Abby mentioned that they have advanced initiatives with curb strategies.
- Abby reminded attendees that the project team launched a survey on Wednesday that will remain open through June 16, 2021. The project team wants to learn more about plans and policies by participants, and she encouraged attendees to complete it.

- Two additional webinars are coming up. One is a free webinar on May 27 on the basics of connected and automated vehicles. An additional webinar is scheduled for June 8 regarding catching up on low-speed automated vehicles used in high-speed transit. Abby provided links to the information in the chat forum.

Concluding Remarks

- Prior to wrapping up the meeting, Abby presented an update on next steps. The project team completed the PAC Workshop #1 today. In July, the PAC will meet again, and the team will have a second workshop, much like we did today. Also in July, the project team will host the first public meeting. In July, we will begin discussing future scenarios and assessing the needs and opportunities.
- By fall, the team will determine the region's future technology scenarios for long-range planning.
- The last two decisions by the PAC will be the AV deployments for case studies and provide input and review the final report and recommendations.
- Abby said she appreciated everyone's time and input. She encouraged participants to continue to follow up with her.

Next Meeting: July 2021

Adjournment: The committee meeting adjourned at 2:48 p.m.

Supplemental Information

*The following comments were provided in the chat forum during the meeting:

- Thomas Bamonte, NCTCOG Senior Program Manager Automated Vehicle Technology, stated, "I recall Kodiak wowing a Girl Scout troop in San Antonio with an AV truck tour – yielding much good will, education and maybe inspired some of the girls to go STEM."
- Lori Clark, NCTCOG Program Manager, stated, "...recommend targeting some of the physical messaging/yard signs at the "town center" type mixed-use developments around the region as they typically attract a good amount of foot traffic as gathering places."
- Lyndsay Mitchell, City of Arlington Strategic Planning Manager, stated, "The Arlington RAPID project is using focus groups throughout the deployment to elicit feedback on the project."
- Thomas Bamonte, NCTCOG Senior Program Manager Automated Vehicle Technology, stated, "Per Purdue comment that vehicles know much more about roadways than cities/DOTs do, see this Inrix study that uses data harvested from connected vehicles to do a performance review of the US traffic signal system – thousands and thousands of signals: <https://inrix.com/signals-scorecard/>."
- Hans-Michael Ruthe, DART Project Manager, stated, "The quick answer is 'maybe' – to the extent this project is interested in transit trips Origins and Destinations, customer demographics, and trip planning habits..."
- Hans-Michael Ruthe, DART Project Manager, stated, "Our NCTCOG colleague Arash M. is working with you on a survey of DART consumers. Might that study have helpful data for this project."
- Clinton Hail, NCTCOG Transportation Planner III Automated Vehicle Technology, stated, "Caroline, you're exactly right – we're eager to understand costs+benefits/ROI and use that information as a meaningful tool in future benefit-cost analysis for projects. Very glad that came through!"
- Lori Clark, NCTCOG Program Manager, stated, "...another pop-up event opportunity for public

engagement could be Clean Air Action Day, August 4 ... quite a few of our local governments do some sort of a gathering for that day.”

*Not all chat forum comments are provided in this document.

Meeting Minutes

Project: NCTCOG AV2.1

Subject: Project Advisory Committee

Date: Tuesday, July 13, 2021

Location: Virtual Meeting

Attendees:

Abby Morgan, Kittelson & Associates
Clint Hail, NCTCOG
Daniel Goff, Kodiak AI
Denise Smith, Hummingbird Firm
Elizabeth Gordon, Kittelson & Associates
Gregory Royster, DFW Airport
Kerin Smith, City of Frisco
Leigh Hornsby, PIA
Jeremy Hutt, City of Cleburne

Jory Dille, ATG
Madeline Shepherd, Ford Mobility
Marisa Carter, Hummingbird Firm
Oyemwenosa Avenbuan, Hummingbird Firm
Rachel Grosso, Kittelson & Associates
Rama Dhanikonda, City of Richardson
Royalyn Reid, CMI
Tom Bamonte, NCTCOG
Yolanda Takesian, Kittelson & Associates

Start Time: The meeting began at 2 p.m.

The following are highlights from the July 13, 2021, North Central Texas Council of Governments' (NCTCOG) AV 2.1 Project Advisory Committee (PAC) Meeting #3 / Workshop #2.

Welcome/Review of Agenda

- Abby Morgan, AV2.1 Project Manager, Kittelson & Associates, opened the meeting by asking attendees to mark a regional map indicating where they are located. Most provided information identifying Dallas, Tarrant, Johnson and Collin counties. Next, Abby provided an overview of the meeting purpose and agenda. The purpose of the meeting was to discuss the role and value of public and stakeholder input throughout the study, to share learned experiences among participants, then share the next steps in the outreach process and to hear participant ideas to reach and engage the public. The agenda included a recap of what the study team has learned, a discussion of plans for the next phase and purpose of outreach, and an overview of strategies to target groups and identify outreach tools. Finally, she stated that the meeting would end with an open dialogue to address any questions. Abby said this workshop is for the PAC and other public agency members from across the region.
- Abby talked about the four phases of AV2.1 project. The first phase dealt with stakeholder surveys. She stated that the team is on the second phase to develop and screen potential future scenarios and that this is the long-range transportation phase. The second phase includes the third PAC meeting and second workshop. For today's meeting, the PAC and workshop are combined. The third phase is to identify the practices and funding opportunities, and the fourth phase is to inform final guidance and review the final report. The project is expected to conclude next summer, 2022.
- Identifying the progress to date, Abby said that the PAC is providing the study team with industry knowledge and insight from the public sector. The technical team has been reviewing plans, policies and infrastructure limitations, and government stakeholders have been sharing priorities and institutional readiness insight.

- The study team is writing an existing conditions report to summarize the current transportation system needs in the North Central Texas and what new technologies member agencies are planning for programming. There are five key areas where local agencies have focused their planning and programming of new transportation technologies and impacts. The areas are personal mobility, equity, safety, infrastructure readiness and resiliency and freight movement. Abby explained that like many agencies, the study team is still waiting for real-world data to understand how these technologies will be used outside of pilot testing. She said the team can predict the impacts, but it is difficult to put hard numbers to the estimated impacts until we see more real-world applications.
- The technology innovation cycle is much faster than traditional policy and planning cycles, which is forcing the study team to rethink the planning process. PAC participant input helped the team understand what efforts agencies were already pursuing in the region as part of the team's existing conditions analysis. Next, the study team will begin a market analysis to understand which technologies are most feasible in the region and which will help solve the existing needs. With this information, the study team is developing future technology scenarios that NCTCOG could consider for long-range planning. The next PAC workshop will focus on these existing needs and scenario development.

PAC Input and Survey Results

- Abby explained that stakeholder and public input is important for identifying existing conditions such as needs and challenges, emerging technologies, market analysis and scenario development and evaluation. As part of the stakeholder input process, the study team launched a survey during the previous PAC meeting. As of the meeting date, 36 individuals participated. But Abby said that there is still an opportunity to share information and that the survey will remain open for a short while longer at: www.surveymonkey.com/r/AV2.
- Abby provided a brief update on key information from the survey to date. She stated that 87% of responses received by agencies indicated knowledge and awareness of automated transportation technology and 85% have initiated environmental sustainability objectives. She said 68% reported funding as the top obstacle to Automated Transportation Technology. Sixty percent of responding agencies are using some type of software management system. Many of these agencies are thinking ahead and starting to plan for impacts and resource needs. Next, the study team needs to understand how individual communities in the region are being prepared and how this project can help agencies prepare their communities for the impacts of new technologies.

Public Involvement

- Yolanda Takesian, Project Team Member, Kittelson & Associates, opened the floor to an interactive activity - one of several for the meeting. She asked attendees to share what issues or opportunities for automated vehicles do participants believe are most compelling for people living in their jurisdictions. By far, accessibility was a top response. Additional responses included safety, affordability, privacy, easier access, less pavement/parking, seniors, readiness, smartphone, infrastructure, disabled and commuting.
- Next, Yolanda said the website will launch in a couple of weeks. She said there are 12 focus groups planned for scenario development. She stated the first public meeting is scheduled for August 24th and will be virtual. This meeting will share project information, needs and concerns. Yolanda said focus groups are being set for September for validating scenario assumptions.
- Royalyn Reid, Project Team Member, Consumer and Market Insights, talked about the purpose of focus groups and public surveys for deeper insight into behavior trends, opinions, values, challenges

and choices for stakeholders and the public. She talked about the outreach methods, the different stakeholder and resource groups. The next steps in the study team's engagement are public facing: a public survey, a public meeting and focus groups. The work should help to bring people into the conversations to build understanding and ensure that future planning meets their needs.

- The public survey will provide current travel choices, trends, and challenges, and opinions on different technologies, what matters to them, what they care about. The focus group questions (and targeted groups) will be informed by the results of the public survey and will help the study team get enough detail about the behavior trends that the team is seeing in order to use that information to alter the model assumptions that will be built into the scenarios.
- Royalyn said the stakeholder engagement will be concurrent with the public meeting process and that they will inform each other. A second public meeting will possibly be in November and will help share scenarios and use those to inform best practices, funding needs and guidance that will be developed. The third public meeting will share best practices, types of projects and funding opportunities.
- Next, Royalyn talked about the strategies for best use of the 12 focus groups by locations and combined counties. She mentioned this is why the study team needs participant feedback because PAC members know their own communities and groups.
- Yolanda discussed the previous information gathered and shared a list of the most important groups to connect with and obtain insights from. Participants were given an opportunity to rank groups in terms of which was most important to least, #1 through #8 options. The scores were: #1 Transit & Active Transportation Users, #2 Workforce and Education Institutions, #3 Older Adults, #4 Hourly/Shift Workers; #5 Ethnic Groups, #6 Millennials, #7 Spanish-speaking and #8 High School/School Age Young Adults/New Drivers.
- Denise Smith, Project Team Member, Hummingbird, talked about the project website [connectNTXfutures](#) launching in the beginning of August to serve as the project's information hub for the public and stakeholders. She said the website will give access to the public and stakeholders to learn about the project, have access to resources and ways to get involved. Denise stated the website will include surveys and map accessibility and will include information on upcoming event locations. Denise said there will be other ways of outreach by Meetings in a Bag with printed materials to give out to small group venues with support.
- The public survey will be released in August online with a paper option and Spanish-language option. From there, Denise provided information about current broadband services in the region. She reviewed county percentages of county populations using internet at 25 Mbps or above (Ten counties have less than half of their population with access to higher speed internet connections):
 - Wise, Navarro: 11%
 - Somervell: 14%
 - Erath: 17%
 - Hunt, Palo Pinto: 25%
 - Johnson, Ellis: 35%
 - Parker 39%
 - Kaufman 42%
 - Hood 59%
 - Tarrant 60%
 - Dallas 61%
 - Rockwall 71%
 - Denton 78%
 - Collin 93%

- To summarize the public outreach discussion, Yolanda asked participants what the most effective option is for outreach. Organizing staff to work a booth at local festivals/events and getting an agenda item on the council agendas tied for first and sending email blasts to participate in public conversations was a distant third.
- Yolanda reminded attendees that the website will tentatively launch August 2nd; the virtual public meeting will be August 24th and focus groups, popup events and meetings in a bag will be in September and October. Yolanda encouraged participants with any questions to contact Leigh Hornsby at leigh@piacommunications.com.
- Abby concluded the meeting and thanked everyone for their participation.

Adjournment: The committee meeting adjourned at 2:50 p.m.

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Meeting Minutes

Project: NCTCOG AV2.1

Subject: Project Advisory Committee #4 +
Workshop #3

Date: Wednesday, Sept. 8, 2021

Location: Virtual Meeting

Attendees:

Abby Morgan, Kittelson & Associates
Alonso Linan, City of Keller
Ann Foss, City of Arlington
Behruz Paschai, C&M Associates, Inc.
Caroline Mays, TxDOT
Chad Edwards, City of Fort Worth
Clint Hail, NCTCOG
Denise Smith, Hummingbird
Ernest Huffman, NCTCOG
Eric Griffin, Dallas Regional Chamber
Kerin Smith, City of Frisco

Khaled Abdelghany, SMU
Leigh Hornsby, PIA
Md Sakoat Hossan, Kittelson & Associates
Jeremy Hutt, City of Cleburne
Jory Dille, ATG
Madeline Shepherd, Ford Mobility
Michael Rogers, City of Glenn Heights
Rachel Grosso, Kittelson & Associates
Rama Dhanikonda, City of Richardson
Royalyn Reid, CMI
Taylor Li, UT at Arlington
Tom Bamonte, NCTCOG

Start Time: The meeting began at 3 p.m.

The following are highlights from the Sept. 8, 2021, North Central Texas Council of Governments' (NCTCOG) AV 2.1 Project Advisory Committee (PAC) #4 and Workshop #3.

Welcome/Review of Agenda

Following an interactive icebreaker, Abby Morgan, Consultant Project Manager, Kittelson & Associates, welcomed participants and provided an overview of the agenda, which included a project overview, as well as reviews of the schedule, existing conditions, public meeting, and public survey. She said the meeting would conclude with a look at the development of future scenarios, followed by next steps.

Project Overview and Schedule

Abby explained that the project centers on the evolving technology for transportation and that transportation planning needs to evolve with it. The purpose of this project is to understand the region's mobility challenges; identify ways transportation automation and related technologies can address those challenges; and recommend policies and best practices to achieve positive results in the region.

The NCTCOG's vision for automation in the region is to lead automated vehicle (AV) deployment; use automation to achieve the region's mobility goals; provide communities with AV planning and deployment resources; build effective partnerships with AV developers; and strategically invest in the use of cases and communities overlooked by AV developers. Project goals are to improve safety and efficiency; share real-time travel information; improve the economy; and prioritize quality of life.

Abby explained that the project began in the spring. To date, the team has continued to gather information and assess future mobility needs, as well as starting to develop and screen potential future scenarios. Next, the team will work to identify best practices and funding opportunities. To continue moving forward, the objective of this PAC meeting is to review and prioritize future technology scenarios for evaluation. The project is scheduled to end in summer 2022.

Existing Conditions Report

Abby said the project team has evaluated existing conditions based on personal mobility, freight movement, equity, safety, and infrastructure readiness and resilience. She said there are quite a few items that stood out and that are documented in the report. She began by reviewing the items that are considered *good*. First, there are many pilot programs, especially multimodal ones. Examples include AVs, delivery bots, and unmanned aircraft systems (UAS). In addition, a connected signal pilot is coming soon. Another example is the GoPass, which provides a regional integrated transit payment system that is quite popular. Furthermore, managed lanes might provide opportunities for AV-only lanes. As far as research, there are quite a few studies taking place that include, but are not limited to, broadband expansion, regional high-speed rail, a traffic signal update program, a truck parking availability system, on-demand transit pilots, urban air mobility planning and local complete streets priorities.

In addition to things that are good, Abby outlined things that may not be needed and are not so good. Items that may not be needed include digitizing conditions of roads, sidewalks, signs, and curbs for AV and connected vehicle (CV) use and AV sensors to collect and map this data. Public agencies can purchase this data, rather than independently collecting it. For those items that are not so good, congestion, as it will increase even with all planned capacity-building projects; demographic estimates requiring revisions by NCTCOG; and continued auto-centric mobility and capacity-building projects.

After providing an existing conditions overview, Abby opened the floor to input. She asked if the PAC agreed with what she outlined. More specifically, she asked if the team's plans account for the region's future population, employment, and mobility needs.

Through a Slido interactive application, participants responded:

- 0% Yes, we nailed it.
- 0% No, we are way off.
- 50% No, but we have data to fix it.
- 0% I think we're off, but we don't have data to prove it.
- 50% I'm not sure.

Abby presented a follow-up question., "Do our plans continue to prioritize auto-centric transportation and land use? This is a summary of responses:

- 22% Yes. Please, bury me with my car.
- 78% Yes, but we're making progress.
- 0% No, we have many mobility options.

Continuing with Slido, Abby presented a third question, "What is the greatest challenge to future

mobility?” Participants responded with the following:

- 100% Funding
- 0% Outdated infrastructure
- 0% Not enough capacity
- 50% Not enough mobility options
- 0% Uncertainties in cost
- 0% Uncertainties in population growth (location, amount)

Abby summarized the existing conditions by discussing the things that are missing from local and regional plans and policies, which include:

- Teleworking at the scale we are using today, as no one predicted the rapid shift;
- Targeted local agency goals and plans for safety (Vision Zero) and environmental (emissions, noise);
- Cybersecurity plans for local agencies (ex: traffic signal system management);
- Electric Vehicle Charging Infrastructure policies and incentives;
- Parking and curb management plans (control current demand; incentivize the use/demand you want);
- Micro-mobility pilot policies for mobility, safety, and equity, as well as street design for micro-mobility (lanes, storage); and
- Integrated data monitoring and management plans to inform project prioritization.

Abby opened the floor to questions. (A summary of Chat forum questions is provided at the end of this document.)

Madeline Shepherd, Head of Mobility Engagement, Ford Mobility, said that land use and zoning need a workaround because they are not necessarily supportive of autonomous vehicles. She said there needs to be consideration around ancillary charging, too. Some markets may allow for five percent of charging parking. Abby thanked Madeline for her input and said it will be noted.

Public Meeting and Public Survey

Denise Smith, Consultant Team Member, Hummingbird Firm, provided a recap of the public meeting conducted on Aug. 24, 2021, and she provided an update on the public survey. A total of 57 people participated in the public meeting, and the focus was on the three phases of the AV program. It was an interactive virtual meeting.

Participants joined from: Arlington – 3, Atlanta, “Cowboys’ Country”, Dallas – 2, Denton County, DeSoto, Florida, Fort Worth, Grapevine, Las Colinas, McKinney, Maryland, Midlothian, Plano – 2, Richardson – 3, San Antonio, the University of Texas at Arlington, and various planning organizations.

Denise continued to review input from the participants, as outlined below.

What is the first thing that comes to your mind when you hear the word *transportation*?

- Accessibility
- Car Interchanges Big Data

- Cars Commuting Infrastructure
- Cars Commuting Stress
- Challenges Expensive
- Congestion
- Congestion air pollution
- Congestion Mobility Safety
- Connections
- Getting around - Bikes Walking
- Highways Trains Cars
- Mobility
- Mobility
- Mobility
- Movement
- Moving jobs help
- Moving Walking Bikes
- Public Private Uber
- Roads
- Roads Vehicles Traffic
- Roadway trains airplanes
- Safety
- Safety Fast
- Traffic Operations ITS Safety
- Vehicles Movement Highways
- Way to get around

Which of these technologies and services do you currently use?

Type of Technology	Number of Selections
Lane keeping assist	5
Shared scooters and bikes	7
Adaptive cruise control	7
GoPass	7
Blind spot detection	10
Same day delivery	14
Grocery delivery	18
Ride hailing/sharing	20
Work/School from home	25

Which of these technologies could you see yourself using in the future?

Type of Technology	Number of Selections
Air taxi	12
Robot delivery	12
Automated ride-hailing services	14
Automated cars	15
Hyperloop	17
Connected cars	18
Drone delivery	19

Automated buses or shuttles	22
High-speed train	24

What topics would you like to learn more about?

- Access
- Adoption timeline land use impacts who provide services
- CAV Deployment Pros-Cons of deployment adoption rates
- Changes to daily life
- Creative public funding
- Design standards
- Ecosystem development
- EJ
- Environmental impacts
- Equity impacts
- How it works – How it will actually help
- Increased job force
- integrated communications
- Job Creation
- New AVEV vehicle types
- Partners who will collaborate
- Public perception
- Safety of AV
- Scenario development
- System integration
- System integration
- Who creates design criteria?

Next, Denise reviewed survey input to date. As of Sept. 7, 2021, 120 people participated in the survey, and Denise said the team would like much more participation. She thanked the PAC for their continued effort to help share this information and encouraged them to continue sharing. She provided a slide presenting the areas in which there was participation. Survey participation was presented by county:

- Collin County 19
- Dallas County 47
- Denton County 8
- Ellis County 3
- Hood County 1
- Palo Pinto County 1
- Parker County 2
- Rockwall County 2
- Tarrant County 22
- Wise County 1

She said the survey will remain open through the end of September and may be accessed at www.ConnectNTxFutures.org.

Transportation Automation Scenario Development

Khaled Abdelghany, Consultant Team Member, Southern Methodist University (SMU), presented

eight transportation automation scenarios. The project team will review the scenarios with NCTCOG's modeling team to compare and assign scenarios to model by the AV2.1 study or Long-Range Transportation Plan.

Scenario 1 is AVs' impact on roadway networks. The anticipated impacts are that there will be more AVs in the traffic mix enhancing the overall roadway network capacity, due to improved traffic stability and throughput. The second anticipated impact is that trips made by AVs will generally have a longer distance because of the enhanced driverless travel experience.

Scenario 2 is connected vehicles at traffic signals. There are three anticipated impacts. The first is that connected vehicle-intersection systems improve the intersection capacity and reduce vehicle delays. The second is that the technology enhances traffic safety at signalized intersections. The third is that these connected intersections will be distributed in the region to ensure equity.

Scenario 3 is the AV/CV impact on population and employment. The anticipated impacts are that the introduction of AV/CV in the system will increase the opportunities for urban sprawl because of the reduction in total travel cost and increased comfort. In addition, AVs are likely to reduce the needs for parking facilities in city centers.

Scenario 4 involves autonomous shuttles at the first mile and last mile in connecting to transit. The team identified three anticipated impacts. The first is that autonomous shuttles enhanced connectivity to the regional transit system, and they could ultimately result in a mode shift (e.g., less dependency on private cars). The second anticipated impact is that autonomous shuttles run on high frequency rates, while considering their expected low operation cost. Finally, autonomous shuttles travel at a low operating speed to ensure safety.

Scenarios 5 is AV/CV dedicated lanes and impacts on trucks. The anticipated impacts include the introduction of AV/CV technology lanes for us by AV trucks that impact the routing of trucks in the region. Furthermore, technology lane use will impact the routing of statewide traffic through the region.

Scenario 6 is the AV/CV effect on the trucking scheduling. The anticipated impacts include the introduction of AV/CV in the network because it will change the hours in the which truck trips are made. In addition, there will be shifts to nighttime delivery that will impact the routing of statewide traffic throughout the region.

Scenario 7 is long-distance, high-speed mass transit service. The anticipated impact is that the introduction of AV/CV-based long-distance passenger travel modes will shift the mode used for long distance travel, reduce cost, and possibly increase the number of trips.

Scenario 8 is Urban Air Mobility (UAM) systems for people and goods transportation. There are two anticipated impacts. The first is vertiports that are strategically distributed in the region (e.g., connecting business districts and the airports); and the second is drones that are used for last mile package delivery, reducing the number of truck trips and traveled across the region.

The floor opened for input from participants by asking the following question, "How would you rank these scenarios for the AV2.1 project?" The top six scenarios were identified by participants, as follows:

#1 AV Impact on Roadway Network	5.29
#2 CVs at Traffic Signals	4.86

#3. First Mile/Last Mile Automated Shuttles	3.71
#4 AV/CV Effect on Population Growth and Employment	2.86
#5 AV/CV Dedicated Lanes and Impacts on Trucks	2.71
#6 AV/CV Effect on Truck Scheduling	1.57

Participants were asked if there is any key scenario that the project team is missing? None was identified.

Next Steps

Abby reviewed the next steps in the AV2.1 project. She said that the project team will submit the final existing conditions report and summarize public survey responses in the upcoming weeks. In October and November, the team will conduct focus groups to dive a little deeper into public technology-related mobility needs, as well as write both the future scenarios report and the market assessment report. A PAC interim meeting will be held in October to help make a decision regarding the scenario evaluation tools.

Next Meeting: October 2021

Adjournment: The committee meeting adjourned at 4 p.m.

Chat Forum Questions, Answers, and Comments

Eric Griffin, Managing Director, Research and Innovation, Dallas Regional Chamber, said: I see NCTCOG demographic data will be updated in the report - I was curious why we used 1970-2010 population growth in the intro instead of 2020 (another 1.2M people makes a big difference for planning)?

Tom Bamonte, Senior Program Manager for AV Technology, NCTCOG, responded: The reach of the GoPass platform in region is far from complete--e.g., DCTA on-demand service has its own app (<https://www.google.com/search?q=DCTA+on+demand+app&og=DCTA+on+demand+app&ags=edge..69i57j0i333.6972j0j1&sourceid=chrome&ie=UTF-8>) and Arlington's VIA service is on VIA app, not GoPass. I believe Trinity Metro's integration into GoPass is limited too.

<https://www.sciencedaily.com/releases/2020/09/200901112210.htm#:~:text=In%20our%20research%20we%20examine,28%25%20decrease%20in%20fuel%20consumption.>

Rama Dhanikonda, Assistant Director for Transportation and Mobility, City of Richardson, asked: Can I suggest H3 for Scenario 1: Will AVs increase vehicles on roads?

Tom wrote: "In our research we examine how, with proper regulations, a very small number of AVs can improve the overall traffic flow significantly, through cooperation," says Dr. Goldental.

Quantitatively, the authors report a substantial increase of up to 40% in traffic flow speed with up to a 28% decrease in fuel consumption. Also, traffic safety is enhanced as traffic becomes more ordered and fewer lane transitions occur. The study shows that these improvements can be achieved without a central agent that governs AVs and without communication between AVs using current infrastructure."

Tom asked: Are you considering mode shifts caused by AVs with respect to shorter distance trips?

Caroline Mays, Director of Freight, Trade and Connectivity, Texas Department of Transportation (TxDOT) asked: Did you all look at potential impact of AV impacts to increase AADT and VMT?

Taylor Li, Assistant Professor, UT Arlington, said: It would be good if AV impact on infrastructure, the "low-tech" part should be investigated. Low-tech means, lifespan of pavements, curbside part, available utilities for road-side sensors, etc.

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Meeting Minutes

Project: NCTCOG AV2.1

Subject: Project Advisory Committee #5

Date: Wednesday, Oct. 27, 2021

Location: Virtual Meeting

Attendees:

Abby Morgan, Kittelson & Associates
Brandi Bush, TxDOT
Behruz Paschai, C&M Associates, Inc.
Caroline Mays, TxDOT
Chad Edwards, Trinity Metro
Clint Hail, NCTCOG
Denise Smith, Hummingbird
Eric Griffin, Dallas Regional Chamber
Gibran Hadj-Chikh, Kittelson & Associates

Jory Dille, ATG
John Hicks, Kittelson & Associates
Khaled Abdelghany, SMU
Leigh Hornsby, PIA
Lori Clark, NCTCOG
Madeline Shepherd, Ford Mobility
Royalyn Reid, CMI
Taylor Li, UT at Arlington
Tom Bamonte, NCTCOG

Start Time: The meeting began at 3:01 p.m.

The following are highlights from the Oct. 27, 2021, North Central Texas Council of Governments' (NCTCOG) AV 2.1 Project Advisory Committee (PAC) #5.

Welcome/Review of Agenda

Abby Morgan, Consultant Project Manager, Kittelson & Associates, welcomed participants and provided the objective of this meeting. She said it is to approve Task 4 model scenarios and to agree upon an evaluation tool. For the agenda, Abby stated that the project team would provide a Task 4 overview, reasons for modeling, transportation automation high-priority scenarios and an introduction to travel demand modeling (TDM) at NCTCOG.

Scholarship Opportunity

Before reviewing items regarding Task 4, Abby opened the floor to Madeline Shepherd, Head of Mobility Engagement, Ford Mobility, who discussed Women's Transportation Seminar (WTS) scholarship opportunities. As a member of WTS, she said a variety of scholarships are available to deserving high school, undergraduate, master's and Ph.D. level students in the DFW area. Participants could learn more by visiting www.wtsinternational.org/chapters/greater-dallas-fort-worth/scholarships. The applications deadline is November 5, 2021.

Task 4: Future Technology Scenario Modeling

Prior to explaining the modeling, Abby brought attendees up to speed on the overall AV2.1 project schedule. There are seven tasks that are part of the initiative. She explained that Task 3.1: Existing Needs Assessment and Task 4.1: Scenario Development are complete. Task 3.2: Market Analysis is in the final stage, and a draft will be distributed to the PAC next month.

There are three tasks for Task 4. Task 4.2: Evaluation Tool Selection is the focus of today's meeting, and Task 4.3: Future Scenario Evaluation will be the focus from November 2021 through March 2022 with the next PAC meeting planned for March. Task 5: Funding Mechanisms and Resources will be a focus in March, and Task 6: AV Hosting Best Practice Guidebook will be the focus for April 2022. Task 7 is the final report with guidance and recommendations with a planned completion date in June 2022.

Next, Abby reviewed Task 4 needs and goals. She explained that agencies need guidance on how to plan for uncertainties. For example, what is the sustainable price of new technology or services? What is the timeline and adoption rate? How will people use the technology outside of structured research and testing? In addition, agencies need guidance on what data to monitor to track trends. As for goals, Abby identified three. The first is to develop sketch-level regional impacts of connected and automated vehicles. The second is to show the potential contribution of future technology scenarios on achieving regional goals. And the third goal is to learn where automation can help or where it could create new problems without policies.

The project team will deliver two primary items. The first is outlining a process for conducting scenario evaluations of connected and automated vehicles, and the second is identifying the data cities can collect to support future modeling inputs.

Abby explained the AV2.1 modeling efforts planned for NCTCOG by stating that the project team is not changing the NCTCOG regional travel demand model (TDM) or building a new one. The team is identifying limitations of the NCTCOG TDM in modeling future automation scenarios, as well as identifying performance metrics to monitor and track trends and impacts.

Looking back at the schedule and connecting the schedule to deliverables, Abby reminded attendees that scenario development was completed in September. This month, the team is selecting a tool for AV2.1 modeling from the Texas Department of Transportation (TxDOT) Statewide Analysis Model (SAM), NCTCOG regional TDM, sketch planning tools, Highway Capacity Manual (HCM) estimates, as well as microscopic and mesoscopic simulations. By March 2022, scenario evaluations will be conducted to outline processes for NCTCOG or local agencies to conduct scenario evaluations of emerging technology and to develop sketch-level regional impacts of the future automated scenarios.

Why Do We Model?

Jory Dille, Project Team Member, Alliance Transportation Group (ATG), explained the importance of modeling. Overall, measurements are conducted now to help set sights for future automated vehicles/connected vehicles (AV/CV) impacts on regional and local roadway networks. Furthermore, modeling is used to understand uncertainty about technology and changes from calibration data. It is important to understand the level of impacts these technologies could have, such as how their implementation might reduce or increase the need for other services. Quantifiable performance measures such as travel delay, level of service and congestion will help the project team understand potential economic and quality of life impacts. In addition, it is important to understand both beneficial and harmful impacts.

Looking toward the future by measuring now can help identify trends in telecommunications and logistics that could transform travel patterns in the future. The team will also look at the influence that the distribution of activities and travel patterns and trends may have. Furthermore, measuring freight movements in and out of the region can help in identifying needs for the future.

Jory turned to the infrastructure investments and policy decisions of modeling. Once you have model runs, you can begin to understand what you need to do locally, such as curbside management

adjustments or signal investments. Where can we have access to areas previously not accessible? Freight and goods movement is not only a measurement of the future, but it can also be an investment in our future policy decisions based on our future model runs.

Having these model runs and tools in place can help agencies understand a benchmark for possible impacts. Forecasting the impacts of AV/CV on transportation systems is a challenge. Planners need to be able to look 20-30 years down the road.

Abby took a moment to ask for input from participants. There were no responses.

Transportation Automation High-Priority Scenarios

Khaled Abdelghany, Project Team Member, Southern Methodist University (SMU), discussed the specific scenarios that will be modeled. He explained that it is important to have a look ahead and to have a model. The first step in the process is identifying the scenarios. These scenarios are a little different from traditional long-range planning scenarios because we are dealing with technology. Technology is new and changing, so there will be many assumptions and justifications. For example, what is going to be the amount of improvement? For this, you would need to assume and apply a modeling approach and logic. For any key modeling platform, what could be the main variables? Changing the parameters and/or variables widen the range of capacity and/or range. Afterwards, the measures of performance need to be identified. When we look at this type of problem, we recommend a sensitivity analysis to look at the different values. Instead of just one potential impact in the future, there will be a range, so model runs need to be conducted. These will be more like computer runs. We will summarize the modeling work with analysis and reporting.

Khaled reminded attendees that the project team shared a longer list of scenarios during the previous PAC meeting in September. Based on the rankings provided by the PAC, the team identified three top scenarios. The first is the AV/CV Penetration Scenario. The main input assumptions are enhancing network capacity and reducing the value of time for drivers. The second is a Connected Vehicle-Intersection System Scenario. The main input assumptions are improving intersection capacity and reducing intersection delays. The third is the impact of the AV/CV Effect on the Population and Employment Distribution Scenario. The main input assumptions are longer trips and increasing opportunities for urban sprawl. All scenarios must happen, as there will not be a Scenario #2 without Scenario 1. They are not independent of each other.

For the first scenario (AV/CV Penetration Scenario), there are two important variables: link capacity and link travel. For the second scenario (CV Intersection System Scenario), there are two variables: saturation flow and delay. For the third scenario (Impact of AV/CV on Population and Employment Distribution Scenario), there are three variables: value of time, origin-destination (OD) trip table and route choice behavior.

Abby took a moment to ask for input from participants. Caroline Mays, Director of Freight, Trade and Connectivity, TxDOT, said it did not look like the modeling fit into these scenarios when working with automated freight. Abby asked Behruz Paschai, Project Team Member, C&M Associates, Inc., to respond. He said there are certain things about the truck components the project team needs to know before specific modeling can occur. Specific inland ports, delivery ports and specific types of trucks are things that need to be known before there can be a truck scenario. All those details related to AV/CV could not provide apples to apples components just yet. A statewide analysis model can help, but that is built into all models. The top three scenarios have the least number of uncertainties with better comparisons. Caroline said she would like to challenge the project team as there is a perfect storm when it comes to freight movement. There is land use data from groups such as warehouse and

manufacturing distribution. She is sure NCTCOG has land use data. She does not want the project team to miss the opportunity to look at the freight AV side. Behruz said there are things the project team can look at and incorporate in the analysis. Caroline said it is not showing the full picture. Behruz said another caveat is that the project team is trying to stay within the model structure. In addition, truck-only lanes cannot be modeled. But there are certainly ways to see what we can do within the scenario.

Tom Bamonte, Senior Program Manager Automated Vehicle Technology, NCTCOG, thanked Caroline for her input and said they will give her input very serious consideration.

Madeline said there will be a timeline for the evolution of technology to be ready for various built-in environments. For example, some vehicles being tested in Austin are not high speed ready. How do things like that impact modeling? How do you plan to model vehicles in various test environments? Abby said this is where it got exciting. We wanted to show how the tools that are available could best be used. Will these different technologies increase capacity? Because there is not wide-spread data, we do not have all the answers. We want to be transparent and show what processes can be applied and what data we can collect so that we can move forward to see what future scenarios may show. We want to keep this as simple as possible. Behruz added that the project team is trying to conduct the modeling with the least number of assumptions as possible. If you increase your assumptions, the more questions there will be. We are trying to understand the trend rather than trying to make assumptions for scenarios. Abby said the project team will take the suggestions back to discuss.

Intro to Travel Demand Modeling

Behruz said he wanted to provide information on travel demand practices at NCTCOG. He walked participants through the inputs and showed how it all comes together. NCTCOG uses a four-step travel demand model, but there is actually a Step 0 that is performed outside the modeling platform, which is placement of population and employment in small-area geography, commonly referred to as Travel Analysis Zones (TAZ). Steps 1-2 look at people, households and jobs in the TAZ structure and generating the number of trips and their origins and destinations. The trips differ based on the characteristics of their origin and destination. Some start from home and go to work, some start from home and go to a non-work location (shopping and dining), and some trips happen between origins and destinations where none is a home location (lunch trip from work). Step 3 looks at splitting the trips between different modes of travel and is referred to the mode choice step. Step 4, commonly known as transit and traffic assignment, in which we take the trip tables and assign those to the roadway networks to see where the congestion lies.

Next, Behruz expanded on the main inputs of each modeling step, the inputs the team plans to modify as part of the scenario analysis, and final output for the steps. For Steps 0-2, main inputs include the regional population and employment control totals, historical patterns, area accessibility measures, land availability, historical maximum densities, available development plans, local reviews of proposed demographic data, trip generation rates by purpose and trip length distribution by purpose. A final output could be small area population and employment forecasts and person trip tables.

Main inputs for Step 3 include household income, household vehicle availability, transit network coverage and attributes, roadway network attributes and a mode choice model structure. The final output is the vehicle and transit trip tables by mode. Behruz noted that the trip tables will change in the modeling platform as a result of network attribute changes.

Main inputs for Step 4 may include transit network coverage, transit network attributes, roadway network attributes and driver attributes. The final output is the assigned volume on the roadway network

based on the minimum total cost of travel. He noted that the assignment results will change in the modeling platform as the result of adjustments made within the main inputs.

Project Outcomes and Opportunities

Identified project outcomes and opportunities are:

- Provide a framework for utilizing the travel demand model in evaluating the effect of AV/CV on roadway and transit networks
- Provide a framework for evaluating the potential need for future policy decisions
- Provide a framework for evaluating the regional and local AV/CV readiness
- Provide a framework for evaluating the required regional and local investments in technology in support of AV/CV

Concluding Remarks and Next Steps

Abby concluded the presentation by asking if participants had any additional questions or comments. Seeing none, she concluded the meeting.

The next PAC meeting will be held in March 2022, but now that an evaluation tool has been discussed, scenario evaluations will be conducted between November 2021 and March 2022.

The meeting ended at 2:03 p.m.

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Chat Forum Comments

- Madeline Shepherd (provided a web link to the scholarship information: www.wtsinternational.org/chapters/greater-dallasfort-worth/scholarships)
- Eric Griffin, Managing Director for Research and Innovation, Dallas Regional Chamber: Not modeling-related, but anyone interested in hearing from autonomous trucking experts (like Dan at Kodiak), join us virtually tomorrow at noon for a roundtable discussion by registering here: <https://web.dallaschamber.org/events/Autonomous-Trucking-Roundtable-6141/details>

@Tom, the recording will be on our YouTube channel

Meeting Minutes

Project: NCTCOG AV2.1

Subject: Project Advisory Committee #6

Date: Tuesday, March 22, 2022

Location: Virtual Meeting

Attendees:

Abby Morgan, Kittelson & Associates
Ann Foss, City of Arlington
Brandi Bush, TxDOT
Behruz Paschai, C&M Associates, Inc.
Chad Edwards, City of Fort Worth
Clint Hail, NCTCOG
Daniel Goff, Kodiak AI
Denise Smith, Hummingbird
Khaled Abdelghany, SMU
Gibran Hadj-Chikh, Kittelson & Associates

Gregory Royster, DFW Airport
Hans-Michael Ruthe, DART
Jory Dille, ATG
John Hicks, Kittelson & Associates
Kerin Smith, City of Frisco
Leigh Hornsby, PIA
Royalyn Reid, CMI
Taylor Li, UT at Arlington
Tom Bamonte, NCTCOG

Start Time: The meeting began at 3:02 p.m.

The following are highlights from the March 22, 2022, North Central Texas Council of Governments' (NCTCOG) AV 2.1 Project Advisory Committee (PAC) #6.

Welcome/Review of Agenda

Abby Morgan, Consultant Project Manager, Kittelson & Associates, welcomed participants and provided the objective of this meeting. She explained there are two topics for review. The first one is a review of public outreach initiatives. The second is a review of the preliminary scenario model results.

Abby began by reviewing the project schedule and timeline. She explained that the following parts of the project are now complete:

- Public and Stakeholder Engagement
- Existing Needs Assessment
- Scenario Development
- Evaluation Tool Selection

She said the following items are expected to be completed by June 2022:

- Market Analysis - The PAC received a draft on March 10.
- Future Scenario Evaluation - To be complete in April
- Funding Mechanisms and Resources - To be complete in March
- AV Hosting Best Practice Guidebook - To be completed in April
- Final Report with Guidance and Recommendations - To be completed in June

Next, Abby reviewed the timeline. Scenario development was conducted in September, and tool selection was conducted in October. The study team received the model from NCTCOG and has been model testing, troubleshooting, and preparing for scenario runs. Scenario evaluation is the next step and is already underway. This includes outlining the process to conduct scenario evaluations of CAV technology using the AV-TAFT model. It also includes developing sketch-level regional impacts of the future automation scenarios.

Public Meeting and Public Survey Recap

Denise Smith, Project Team Member, Hummingbird Firm, reviewed the second public meeting conducted on February 24, 2022. She said 170 people registered with 50 unique viewers. Some joined by phone. The panelists and attendees represented diverse groups of individuals.

She explained that during the public meeting, the project team shared resources. One was a set of [lesson plans](#) for K-12 students that could be used throughout the region and nation to help develop a strong workforce. The [presentation slides](#) for that meeting are available on the project website www.connectnxfutures.org.

Following the public meeting review, Denise reviewed the public survey. One of the questions was, “How were the counties in the 12-county region represented?” She said there was representation from each of the counties, but a bulk of respondents were from Tarrant and Dallas counties.

Another question led to a mix of answers. “Would you consider using the following technologies to travel around the DFW area?” While many people said they would use the technologies, a majority said “No” or “Not Sure”. Denise said the study team needs to see what can be done to close that gap.

She said the study team also looked at the percent of “Yes” selections to emerging transportation technologies by race. Those who are Asian said, “Yes” the most, followed by White or Caucasian and Black or African Americans. The study team was trying to identify why there is a difference in those numbers. It could be trust or familiarity of current needs. Furthermore, the older generations were less likely to be willing to use the technologies.

Focus Groups Recap

Royalyn Reid, Project Team Member, Consumer and Market Insights (CMI), reviewed Focus Group outcomes. Twelve focus groups were held throughout the 16-county region. The purpose of the focus groups was to gain a deeper awareness of the public’s perspective on current, new, and emerging transportation technologies.

Royalyn explained that there is an alignment between the focus groups and the survey. The research insights into the public’s perspectives are current technology and emerging and new technologies. Royalyn asked, “How do we help the public understand the technology options and awareness?”

The focus groups were conducted over three weeks in October through November 2021. There were 83 participants from the 12-county area. She explained that most comments offered a very good discussion. This insight will be instrumental in providing directions to assist agency planners and other stakeholder groups as they make plans to meet the needs of the community as it relates to current, new and emerging transportation technologies.

In the research findings, there were a few common use patterns. Personal cars are the primary daily transportation use pattern. Map apps are used by all groups except for one group of minorities that do not have smart phones. But they are open to using them. It was a cost concern.

Concerns and frustrations include the volume traffic and roadways, lengthy construction zones and slowdowns, internet connectivity, and dead zones.

As for differences between the groups, the general population versus rural participants - rural participants said there are too few transportation options with no mass transit and limited ride share options. There is limited internet service and freight trains block major thoroughfares.

As for the differences between the general population and minorities - minorities were more excited about some future technologies, especially the African American group. But they were also the ones with the most apprehensions and doubts because they asked if the technologies will be fair and equitable. In addition, they questioned what the availability will be. They were also more concerned about seniors having the access and ability to learn.

A full report has been created and will be made available.

Preliminary Scenario Results

Behruz Paschai, Project Team Member, C&M Associates, reviewed preliminary scenario results. In this section he discussed some of the “travel demand model run results” to help evaluate what will happen at the regional level. The model run summaries were presented for Scenario 1 (run 1 through run 6). These runs represent the effect of increased capacity and reduction in values of time (VOT) on the network performance for different ranges of AV/CV penetration rates.

Vehicle Miles Traveled (VMT) difference were captured. The results of 100-percent AV/CV penetration rate were presented in more detail. Daily VMT will go up by about six percent. He asked, “What does that mean to the roadway network?” In general, your freeway volumes will go up and the volume on the non-freeway facilities will go down. It is a very complex behavior. Due to a lack of capacity in the base scenario (no AV/CV), some of the people who could have taken the freeways, were taking the parallel arterials to bypass the freeway congestion. With increased freeway capacities, those diverting drivers don’t see a need to do it anymore. They will stay on freeways. It is a complete change of travel behavior due to an increase in capacity.

The effect of AV/CVs on Vehicle Hours Traveled (VHT) was also presented. A higher VHT means you will travel a longer number of hours. A lower VHT means less time traveled. If there is an increase in VMT, and a reduction in VHT, it means that the improvements resulted in a general increase in average speeds. The daily VHT under 100% AV/CV penetration rate goes down by about 10 percent. An increase in off-peak VHT may occur under a reduced VOT scenario since as a result the priced facilities will lose their attractiveness and we will see a shift of traffic to other facilities.

When you compare the VMT against VHT, there is a 20-percent increase in overall network speeds. The total daily delays will experience a reduction of around 30 percent. In addition, the total delay includes congestion and traffic control delays combined.

Abby opened the floor for questions.

Tom Bamonte, Senior Program Manager, Automated Vehicle Technology, said NCTCOG is in the process of running the 2045 Plan. He asked if the study team is looking at the demographic forecast?

Abby said the team was using the 2045 model as the team’s base. This is as if we are doing nothing with technology. However, Behruz said it might have been before the final demographics getting approved. That came after the setup models. He will need to go back and see how it stacks up.

Taylor Li, Assistant Professor, University of Texas at Arlington, asked via the Chat forum, “I may have missed it. How the AV behaves differently from the human-driving vehicles in your model, like path finding, information?”

Abby said the study team applied the capacity adjustment factors from the new chapters of the *Highway Capacity Manual*, which assumes AV/CV has reduced following distance and cooperative platooning. Behruz said the logic behind their route choice selection is the same.

Greg Royster, Senior Airport Planner, DFW Airport, asked via the Chat forum, “Have the am and pm peak periods changed any as the result of hybrid work schedules and has that been accounted for in the modeling efforts?”

Behruz said the original NCTCOG AV-TAFT platform has the option to increase or decrease the number of trips due to AV/CV introduction in traffic stream. However, this element was not part of the study’s scenarios, but the technology is there.

Ernest Huff, Program Manager, Aviation Planning and Education, NCTCOG, asked via the Chat forum, “Is this information in that Market Analysis Report (MAR)?”

Abby said the MAR strives to provide an overview of the technologies we believe are feasible for the region, what those impacts could be, the impacts, and what the schedule could be. That information helps the study team form the scenarios we selected.

Ernest also asked via the Chat forum, “Were Air Taxi’s accounted for in the model?”

Abby said that the study team did not include air taxis, because NCTCOG is conducting more research into these technologies through its Unmanned Aerial System (UAS) program.

Tom asked via the Chat forum, “What are the implication of your scenario runs on the region’s transportation capital investment portfolio, e.g., shift more resources to expressway capacity or invest more in CV tech to optimize vehicle flow?”

Abby asked Behruz if the team has enough results yet. He said no, but they must monitor the performance of the transportation network carefully as the AV/CVs start to roll out. He said they will need to come up with rules, regulations, and new policies to ensure all capital investments are still being properly utilized when AV/CVs start getting into the traffic stream.

Abby said the study team will not just report out impacts but also provide guidance.

Chad Edwards, Vice President of Planning and Development, Trinity Metro, asked via the Chat forum, “Has there been any thought of applying these assumptions to a current year roadway network to compare future levels of investment needed as a result of AV/CV penetration rates?”

Behruz said Chad’s question is fundamental. The current network was developed over 50 years. We got to where we are based on what people are used to and where they are going. Once the study team works through the work through these AV/CVs we may see that people may realize that some of the road improvements aren’t needed. But having said that, the drivers will quickly realize where there is extra capacity and try to utilize it to improve their travel times.

Abby closed out the meeting expressing appreciation to the PAC.

The meeting ended at 4:02 p.m.

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Additional Chat forum comments:

- Tom Belmonte: The Market Analysis Report is a #GoodRead. Please get your comments back to Abby et al. soon.
- Leigh Hornsby, Project Team Member, Public Information Associates: As a reminder, here is the project website. Be sure to check it out as we post summary reports and much more.
<https://www.connectntxfutures.org>

Meeting Minutes

Project: NCTCOG AV2.1

Subject: Project Advisory Committee #7

Date: Tuesday, May 5, 2022

Location: Virtual Meeting

Attendees:

Abby Morgan, Kittelson & Associates
Ann Foss, City of Arlington
Behruz Paschai, C&M Associates, Inc.
Denise Smith, Hummingbird
Ernest Huffman, NCTCOG
Eric Griffin, Dallas Regional Chamber
Khaled Abdelghany, SMU
Gibran Hadj-Chikh, Kittelson & Associates

Gregory Royster, DFW Airport
Hans-Michael Ruthe, DART
Janille Smith-Colin, SMU
John Hicks, Kittelson & Associates
Leigh Hornsby, PIA
Lori Clark, NCTCOG
Madeline Shepherd, Ford Mobility
Rama Dhanikonda, City of Richardson
Tom Bamonte, NCTCOG

Start Time: The meeting began at 11 a.m.

The following are highlights from the May 5, 2022, North Central Texas Council of Governments' (NCTCOG) AV 2.1 Project Advisory Committee (PAC) #7, which is the final PAC meeting for this project.

Welcome/Review of Agenda

Abby Morgan, Consultant Project Manager, Kittelson & Associates, welcomed participants and provided the objective of this meeting, which is to review and discuss the financial report and final scenario modeling results.

She reviewed the schedule and said the following items have been completed:

- Existing Needs Assessment
- Market Analysis
- Scenario Development
- Evaluation Tool Selection

The following items are expected to be completed by June 2022:

- Future Scenario Evaluation
- Funding Mechanisms and Resources
- AV Hosting Best Practice Guidebook
- Final Report with Guidance and Recommendations

Financial Report Overview

John Hicks, Consultant Team Member, Kittelson & Associates, provided an overview of the financial report. He explained that the financial report provides a high-level assessment of how emerging transportation technologies may affect local entity finances. In addition, the report explores potential strategies to generate new revenue streams to supplement or replace funding streams affected by emerging transportation technologies. This includes cities, counties, public transit agencies, and airports.

John said that revenue sources vary by local entity. Parking represents the largest share of non-airline revenues for airports. Transit agencies rely primarily on sales taxes in addition to contributions from federal, state, and local governments, and passenger fares. Counties and municipalities mostly depend on property taxes, but also collect revenues from vehicle registrations, parking, and traffic citations.

He reviewed state and federal sources of transportation funds. The State Highway Fund includes state fuel taxes, the Federal Highway Fund, Propositions 1 and 7, Fuel Lubricant Sales Tax, and Vehicle Registration Fees. For FY 2021 Projected Revenue, the Federal Highway Fund accounts for \$5.25 billion, followed by state fuel taxes and Proposition 7, both at \$2.59 billion. Vehicle Registration Fees account for \$1.58 billion, Proposition 1 accounts for \$1.13 billion, and the Fuel Lubricant Sales Tax accounts for \$0.04 billion.

State and federal funding sources include regional toll and managed lane revenue, the Texas Mobility Fund, and local revenue, such as property taxes, sales taxes, parking revenues, and fines. The state earned \$546 million in Texas Mobility Fund Revenues for FY 21. 37 percent was from driver's licenses fees, 28 percent for certificate of title fees, 18 percent for vehicle inspection fees, 12 percent for driver record information fees, and motor safety violations and United We Stand licenses plates account for one percent and less than one percent, respectively.

John explained that emerging technologies, including more fuel-efficient vehicles, electric vehicles, shared mobility, and Automated Vehicles (AV), could threaten traditional funding streams. But there are opportunities for new revenue streams, such as increasing state and local taxes, charging for access to transportation data, establishing charging fees, updating registration fees, establishing curb space pricing mechanisms, adjusting non-transportation funding sources, implementing user-based fees establishing congestion charges, leveraging public-private partnerships, increasing development impact fees, and maximizing existing infrastructure.

Based on the information provided, John identified four action steps for agencies:

- Identifying existing funding mechanisms
- Assessing vulnerabilities and the potential impact of emerging technologies
- Identifying alternative funding streams
- Identifying a champion and gather public support

Eric Griffin, Dallas Regional Chamber, asked if there was any discussion in generating revenue with a parking garage fee or an impact fee for new car sales. However, he explained that with data monitorization, while a good idea, may not work as there may not be a lot of revenue in that. John said the data point is well taken. He said the parking garage fee is interesting but not specifically addressed in the report. The report does discuss the potential of impact fees in general to fund transportation infrastructure expansion needed to serve new developments. The report also discusses revenue from new car sales, which is included as part of Proposition 7 funds.

Madeline Shepherd, Ford Mobility, said the charge for accessing transportation data is unique. But she didn't think there is a strong desire for that. She said in the future, some AV operators will be looking to park their fleets overnight. Parking garages or fleets not used could provide good opportunities.

Hans-Michael Ruthe, Dallas Area Rapid Transit (DART), asked where John sees tolls. John said that they are discussed in managed lanes in the report but reminded participants that state law prohibits the tolling of current non-tolled lanes.

Both John and Abby reminded attendees to review the draft financial report and to provide comments back to the team by Friday, May 20.

Scenario Analysis Model Results

Behruz Paschai, Consultant Team Member, C&M Associates, reviewed the scenario analysis model results. He first reviewed the modeling assumptions or the six runs under Scenario 2. These runs represent the effect of increased capacity, reduction in values of time (VOT), and reduced delay on the network performance for different ranges of AV/CV penetration rates. He explained that the team always begins with a baseline of zero for the AV/CV Penetration Rate, Link Capacity Improvement, AV/CV VOT reduction, increased speed, as well as the increase of non-freeway saturation flow and lowered signal control delay. The six scenario runs are S2R16-S2R21. The matrix below represents the run definitions.

Scenario Runs	AV/CV Penetration Rate	Link Capacity Improvement	AV/CV VOT Reduction	Increase Speed	Increase Non-Freeway Saturation Flow Rate	Lower Signal Control Delay
Base	0	0%	0%	0%	0%	0%
S2R16	0.25	5%	0%	1.25%	5%	2.5%
S2R17	0.5	10%	0%	2.50%	10%	5.0%
S2R18	1	33%	0%	5.00%	33%	10.0%
S2R19	0.25	5%	35%	1.25%	5%	2.5%
S2R20	0.5	10%	35%	2.50%	10%	5.0%
S2R21	1	33%	35%	5.00%	33%	10.0%

- Notes:
 - 0% AV/CV scenario is defined with an input rate of 0.0001 in the [AVConfig.bin](#) file
 - 100% AV/CV penetration rate is defined with an input rate of 0.9999 in the [AVConfig.bin](#) file
 - The AV/CV penetration rates are equal for all income groups
 - The AV/CV VOT reduction is defined in the [AVConfig.bin](#) file
 - Link capacity increases are the same across all link functional classifications
 - Each run takes 22-24 hours of CPU time, with two feedbacks and warm start
 - Link capacity improvements are based on HCM's latest recommendations and equally applied to all time period
 - The model runs inherently assume a perfect implementation and performance of the AV/CV technology

The presentation continued with the review of the Vehicles Miles of Travel (VMT) results. For the interest of time, Behruz concentrated on a daily VMTs. He then provided a series of slides comparing the S2R18 run to the base to show the differences in the AM Volume, PM Volume, and Off Peak (OP) Volumes. The daily VMT will increase by about 8%. Most of the freeway facilities show an increase in volume, as do some of the secondary and local arterials as vehicles attempt to find ways back to freeways. But some local arterials will have a reduction in traffic potentially due to AV/CV-related capacity increases available on major arterials and freeways.

The effect of AV/CVs on Vehicle Hours Traveled (VHT) was also presented. A higher VHT means you will travel a longer number of hours. A lower VHT means less time traveled. If there is an increase in VMT and a reduction in VHT, it means that the improvements resulted in a general increase in average speeds.

Eric said the graphs are important and that there is a bleed over to the environmental efforts due to emissions. Behruz said as data comes in, the team will share more information from the model runs and that deeper dives can be conducted.

A good roadway network or construction project could increase the VHTs. For example, on a daily level there was a reduction of VHTs of 12-15 percent.

Behruz explained that there are scenarios in which they team reduced the Value of Time (VOT) of AV/CV vehicles. Sometimes motorists don't mind traveling a little longer to avoid congestion. He provided a comparison of S2R21 and S2R18 showing some motorists are no longer willing to pay for tolls and managed lanes under reduced VOT scenarios. The same patterns are in AM and PM timeframes. However, in off-peak (OP) periods, motorists are more prone to use non-tolled facilities. When congestion is lower and VOT is reduced by 35 percent, motorists are more apt to use non-toll and managed lanes. Therefore, there might be capacity along priced facilities that is not being utilized efficiently, especially in OP periods.

All this information comes together when the average speed difference is compared to the base scenario. In OP periods, the VOT is generally much lower compared to the AM and PM periods. Drawing attention to a graph, Behruz explained that there is an average speed increase of somewhere between 25 and 27 percent at a daily level. If you go to different time periods in the AM peak, you see something around 50 percent which is equal to around 7 miles-per-hour (mph) hour increases in AM and in the off peak it's much less. There is about a 30 percent increase in average traffic speed across the whole region in the PM, which is equal to about a three mph increase, so overall the AV impact is beneficial in that VMTs did go up, but VHT went down at a faster pace. This resulted in ratio of VMT over VHT to go up where there was an improvement in average speed.

Generally, no matter which AV scenario is run, the improvements get better. This is overall, including freeways.

The NCTCOG model has traffic control delay and congestion delays separated in their volume delay function. Behruz said the team summed it all up, and it represents a total delay which is anything above the free flow travel times that you experience in the network. There is a reduction in delay of about 40 percent at a daily level which is what translates into a reduced travel time and increased speeds.

Regarding the level of service (LOS), all the slides leading up to this contribute to the level of service. Presenting a bar chart, he explained that any green bar represents an improvement in LOS of A, B, or C. The AV/CV scenarios represent an increased LOS of A, B, or C in all time periods.

How does this impact travel time? The team created travel-time contour maps using DFW Airport as the origin or destination of the trips. The AM travel time from north of Denton to DFW Airport reaches 195 minutes in the no-AV/CV scenario. How much travel time savings could there be introducing AV/CV scenarios? You are saving 15 to 30 minutes traveling to the airport from north of Denton. With a 100 percent AV/CV introduction, there is a more substantial time saving. For the PM travel time, at a 50% AV/CV fleet penetration rate, travel times improvements are about 15 minutes with even more improvements at 100 percent AV/CV fleet penetration.

Behruz said there was a previous question from a PAC member wondering if the AV/CV scenarios could be added to the 2045 demand run on the existing network. Those runs are complete and will be in the final report.

Conclusion

Abby addressed a couple of questions in the Chat forum (information is listed as a supplement to this document). The team is currently finishing Scenario 3 model runs. A comparison of all model runs will be included in the Task 4 Scenario Evaluation Report. Additionally, in this report, the team may suggest some additional model runs for NCTCOG to consider conducting based on our analysis and on feedback from the PAC and other stakeholders. Abby then thanked everyone for their participation, and she reminded participants to provide their comments to the financial report, due by May 20.

The meeting ended at 12:00 p.m.

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Chat forum comments:

- Abby Morgan to Everyone (11:15 AM) Have any of your decision makers asked you about any of these potential impacts? What are they concerned about?
- Thomas Bamonte--NCTCOG to Everyone (11:15 AM) Isn't data strong that TNCs have eaten into transit ridership? Why not make same assumption for AVs?
- Hans-Michael Ruthe to Everyone (11:16 AM) Transit is getting crushed by a nationwide Operators shortage (CDL). Most senior transit leaders are therefore excited to see automation happen.
- Thomas Bamonte--NCTCOG to Everyone (11:23 AM) @Hans-Michael (1) aren't labor agreements a barrier to swapping in robot for human drivers? (2) Many folks believe that automation will not reduce demand for labor--will just shift drivers to new tasks--e.g., tele-monitoring of AVs, customer engagement, enhanced security. @Madeline Welcome back! Agree with low demand for public data. OEMs have their own sources--e.g., <https://www.smartcitiesdive.com/news/gm-inrix-safety-data-transportation-planners/623158/>
- Eric Griffin to Everyone (11:26 AM) And let's not forget our corporate partners. It may be one-time funding or a long-term investment, but relevant companies are absolutely primed to contribute dollars and sense (expertise).
- Hans-Michael Ruthe to Everyone (11:27 AM) @Tom: 1. Maybe, but that all will eventually depend on whether you are a right to work state or not. 2. That is the first I have heard of that. It is hard to conceive of new roles for all 1,500 - 1,900 of them.
- Eric Griffin to Everyone (11:37 AM) Fantastic, @Behruz. I just suggest doing these analyses proactively because some important constituencies may not know to ask - don't want to miss a partnership opportunity because someone else is in the dark.
- Thomas Bamonte--NCTCOG to Everyone (11:40 AM) Won't reductions in VHT function as a sort of an increase in capacity--when travel takes less time folks will take more trips or longer distance trips? Don't we know from experience that an increase in capacity is quickly utilized through more travel?
- Eric Griffin to Everyone (11:45 AM) Good question about change in speed going up. Another constituency to bring on board is the Toward Zero Death movement. Would be great to show their data according to our scenarios.
- Thomas Bamonte--NCTCOG to Everyone (11:48 AM) Same question re: delay reduction. From public's perspective is a delay reduction a de facto capacity expansion = more driving = delay rate returns to previous level (while VMT with attendant safety/environmental impacts increases).
- Ann Foss to Everyone (11:55 AM) I have to jump off a few minutes early, but this has been very interesting - I look forward to reviewing the full financial report, as well as the model scenarios when

ready. Thanks!

- Eric Griffin to Everyone (11:57 AM) On Tom's question, have we modeled scenarios where existing infrastructure gets REMOVED (e.g., the slow effort to do away with 345 in DT Dallas?)
- Thomas Bamonte--NCTCOG to Everyone (11:58 AM) Thank you.
- Denise Smith to Everyone (11:58 AM) Great presentation!
- Eric Griffin to Everyone (11:59 AM) See you again soon!



Public Meeting Minutes

Public Meeting Minutes

Project: NCTCOG AV2.1

Subject: Public Meeting #1

Date: Tuesday, Aug. 24, 2021

Location: Virtual Meeting via Zoom

Attendees:

Denise Smith, Hummingbird	Kebran Alexander
Abby Morgan, Kittelson & Associates	Kent Kacir
Allison Blazosky	Kevin Overton
Amanda Wilson, NCTCOG	Khaled Abdelghany, SMU
Ami Parikh	Kristina Hawkins
Ann Foss, City of Arlington	Lee Bryant
Anthony Andrews, City of Dallas	Leigh Hornsby, PIA
Behruz Paschai, C&M Associates	Liang Chen, C&M Associates
Brandi Bush, TxDOT	Lindsay Shigetomi
Bruce Bleakley	Lori Clark, NCTCOG
Caren Chambers	Madeline Shepherd, Ford Mobility
Carlos Balderrama	MaKara Rumley, Hummingbird
Chad Edwards, Trinity Metro	Marisa Carter, Hummingbird
Clint Hail, NCTCOG	Marvin Hurt, DART
Colton Claborn	Michelle Davis-Mohammed
Edward Morgan	Nicole Jolly
Ernest Huffman, NCTCOG	Oyemwenosa Avenbuan, Hummingbird
Evan Paret, NCTCOG	Paul McManus
Grace Darling	Randy Acosta
Hanan Boukhaima	Robert Brown
Harry Swanson	Royalyn Reid, CMI
Heather Dickie	Stephanie Turner
Heng Wang, TxDOT	Taylor Li, UTA
Janille Smith-Colin, SMU	Theresa Smith, DART
Jessica Hilscher	Thomas Bamonte, NCTCOG
John Song	Tiesa Leggett
Joshua Hoffmann	Victor Fishman
Karan Khosla	Wayne Corum
Karen Swirsky, Kittelson & Associates	

Start Time: The meeting began at 6 p.m.

The following are highlights from the Tuesday, August 24, 2021, North Central Texas Council of Governments' (NCTCOG) AV 2.1 Public Meeting #1. There were 57 attendees. Of that number, there were six representatives from NCTCOG and 11 representatives from the consultant team.

Welcome

Tom Bamonte, Senior Program Manager of Automated Vehicle Technology, NCTCOG, welcomed the virtual audience to the Connecting North Texas Communities with Emerging Transportation Technologies public meeting. He explained that the Dallas-Fort Worth (DFW) Metroplex is one of the largest in the nation and that it is NCTCOG's responsibility for planning transportation projects that will have impacts up to 30 years in the future.

Project Overview and Participant Input

Denise Smith, Consultant Team Member, Hummingbird, introduced herself as meeting host and provided instructions for meeting participation. (Throughout the evening, participants had opportunities to provide input through a system named Mentimeter. It is an online tool that calculates public input in real time and provides the compiled data onto the screen.) She stated that a Spanish translator participated in the meeting should translation services be needed or requested.

She opened the floor with the first two questions: "Where are you joining us from?" and "What is the first thing that comes to your mind when you hear the word *transportation*?"

(MENTIMETER RESPONSES ARE IN APPENDICES A-B.)

Denise reviewed the title of the project, stating that it is noticeably long. But instead of having a catchy project title with a nice acronym, Denise said the team wanted to have a title that really explains what the project is all about, and that is Connecting North Texas Communities with Emerging Transportation Technologies. This specific project is a part of a three-phase automated vehicle program, known in short as AV2.0. This part of the project is AV2.1 – planning. The next phases, AV2.2 and AV2.3 are partnerships and investments, respectively. NCTCOG's ultimate goal is to help North Texas communities plan for the arrival of emerging transportation technologies. Next, Denise presented a video that shows a variety of automated technologies already in place or previously piloted in Texas.

Denise opened the floor for input by asking two additional questions: "Which of these technologies and services do you currently use?" and "Which of these technologies could you see yourself using in the future?" Attendees viewed a visual guide showcasing a variety of technologies, ranging from route planning apps to the Hyperloop.

(MENTIMETER RESPONSES ARE IN APPENDICES C-D.)

Denise provided a screenshot of a public survey, entitled "Your Technology Now and in the Future," that is located on the project website, ConnectNTxFutures.org. The survey opened on Aug. 6th and closes in September. It is available in English and Spanish.

Following the screenshot slide, Denise presented one example of input the consultant team has received to date by way of the survey. She said the team is learning that while many people who have

responded are excited about new technologies, some are still hesitant to use automated vehicles. By engaging in this project, communities might be able to create opportunities to help people get exposed to automated vehicles and thereby learn more about them.

What the Team Has Learned So Far

Khaled Abdelghany, Consultant Team Member, Southern Methodist University (SMU), presented a summary of existing conditions for transportation in the region. The DFW Metroplex is the fourth largest region in the country and the largest region in the state. It has grown by approximately one million people each decade since 1970. In 2010, the population was 6.4 million. It is forecasted that the population will be 11.2 million by 2045.¹

Each day, vehicles in the DFW area travel 212,232,952 miles. These vehicles spend about 1,680,685 hours delayed in congestion each day. Every year, congestion in DFW costs \$12.1 billion.² In 20 years, congestion will make peak-hour trips take 41 percent longer. Even with planned projects, congestion will increase in the next 20 years. Technology might help reduce some congestion. Khaled said that 820 people died in traffic crashes in 2020 in the DFW area, which is 96 more than those who died in 2019.³

Why Do We Need this Study?

Abby Morgan, Consultant Project Manager, Kittelson & Associates, explained the reason for the study and the need for input. She said new technologies can make it safer, cheaper, and easier to travel. She said these new technologies are changing how we travel, how often we travel, and the cost of travel, for example, electric vehicles do not use gas. She said we need to get our roads and systems ready for these new technologies.

She explained that decision makers want to learn the best ways to bring new technologies to communities, and they want to hear about the challenges and what is of interest from the public. This input will help teach communities how to plan projects to meet residents' and motorists' needs.

Abby reviewed the project schedule. Now through February 2022, the study is learning about the DFW's future transportation needs and developing (imagining) future transportation technology scenarios. From February to April 2022, the team will create a best practices guidebook for local agencies on how to plan and fund transportation technology deployments. From April to June 2022, a final report will be developed to guide local agencies on planning for new technologies.

Next, Denise provided a series of questions to attendees: "What excites you about the emerging transportation technologies?" "What are your concerns about the emerging transportation technologies?" "What topics would you like to learn more about?" and "How did you find out about this meeting?"

(MENTIMETER RESPONSES ARE IN APPENDICES E-H.)

¹ Mobility 2045 Report: <https://www.nctcog.org/nctcg/media/Transportation/DocsMaps/Plan/MTP/3-Social-Considerations.pdf>

² Mobility 2045 Report: <https://www.nctcog.org/nctcg/media/Transportation/DocsMaps/Plan/MTP/8-Regional-Performance.pdf>

³ https://www.nctcog.org/nctcg/media/Transportation/DocsMaps/Quality/Safety/CrashFactSheet_2020.pdf

Denise thanked everyone for their attendance and participation. She reminded attendees that the public survey will remain in effect through August 31. Meetings in a bag will begin in September. Project Advisory Committee (PAC) workshops are ongoing. Focus groups will begin in September, and the next public meeting will be in January 2022.

There are several ways to stay connected and learn about the project: connectNTx@nctcog.org, @nctcogtrans, /NCTCOGtrans, and #ConnectNTxfutures.

Questions and Comments

The following list of questions and comments were made via Chat and/or the Questions forum. All Questions will be answered in an Frequently Asked Questions (FAQ) document and placed on the project website.

1. Will there be any discussion regarding having better use of existing infrastructure (ex. Use of rapid transit in urban centers over continuing sprawl)?
2. Will this exacerbate a disparity in wealth and prosperity across the region by creating levels of connection across the region?
3. How will we establish priorities of technologies and implementations?
4. What is your plan to make sure that low-income communities have access to these technologies?
5. Best practices against what local needs sounds great.
6. If it is true that fewer and fewer people are using public transit, is this likely to play out in the advanced technology arena, as well?
7. How has the area of big data or has big data changed the way planners think about the strategies of implementing these technologies?
8. How can the technology prevent and reverse economic stratification by encouraging job site centralization (i.e., central business district) rather than job site diversification?
9. Is there an opportunity to address "culture" with respect to transportation to help us all adopt and adapt more easily?

Adjournment: The committee meeting adjourned at 7:01 p.m.

(APPENDICES BEGIN ON THE FOLLOWING PAGE.)

APPENDICES

APPENDIX A: Where are you joining us from?

- Arlington - 3
- Atlanta
- Cowboys' Country
- Dallas - 2
- Denton County
- DeSoto
- Florida
- Fort Worth
- Grapevine
- HDR Inc. - Civil Engineering Consulting
- Las Colinas
- McKinney
- Md
- Midlothian
- Plano - 2
- Richardson - 3
- San Antonio
- Texas
- University of Texas at Arlington

APPENDIX B: What is the first thing that comes to your mind when you hear the word *transportation*?

- Accessibility
- Car Interchanges Big Data
- Cars Commuting Infrastructure
- Cars Commuting Stress
- Challenges Expensive
- Congestion
- Congestion air pollution
- Congestion Mobility Safety
- Connections
- Getting around - Bikes Walking
- Highways Trains Cars
- Mobility
- Mobility
- Mobility
- Movement
- Moving jobs help
- Moving Walking Bikes
- Public Private Uber
- Roads
- Roads Vehicles Traffic
- Roadway trains airplanes

- Safety
- Safety Fast
- Traffic Operations ITS Safety
- Vehicles Movement Highways
- Way to get around

APPENDIX C: Which of these technologies and services do you currently use?

Type of Technology	Number of Selections
Lane keeping assist	5
Shared scooters and bikes	7
Adaptive cruise control	7
GoPass	7
Blind spot detection	10
Same day delivery	14
Grocery delivery	18
Ride hailing/sharing	20
Work/School from home	25

APPENDIX D: Which of these technologies could you see yourself using in the future?

Type of Technology	Number of Selections
Air taxi	12
Robot delivery	12
Automated ride-hailing services	14
Automated cars	15
Hyperloop	17
Connected cars	18
Drone delivery	19
Automated buses or shuttles	22
High-speed train	24

APPENDIX E: What excites you about the emerging transportation technologies?

- Address Safety, provide flexibility, improve mobility, sustainable
- Better infrastructure overall
More capacity in transporting
- better safety
- Connected to everything and reliable assistant driving with me
- Control systems and feedback systems involved
- cool innovation
- Cost, Time to implement, availability to underserved populations

- Driverless vehicles. Are they safe?
- Ease of travel and shorten the travel time
- Easier commutes
- efficient
- Enhance safety
- environmental benefits
- Getting caught up with some other parts of the world
- Great for elderly/youth travel
- Hackers controlling vehicles and monitoring private persons' movements
- Hackers taking control of automated vehicles
- having to drive less
- increase travel time reliability
- Is not there yet
- Jobs
- Less congestion
- Safer roads
- Make space for more walking/biking
- Minimize congestion
- More access for more people
- Privacy
- Real time travel notifications
- Receive carbon emission
- reducing time cost of commuting
- Robot deliveries
- Safety applications
- Safety, Reliability, ease of use.
- Schedule benefits
- seeing family more
- Self-Drive Vehicles
- Slow adoption
- The transformation of the existing system to a more modern layout
- They are clean
- Traffic safety
- Reduced carbon footprint in the region

APPENDIX F: What are your concerns about the emerging transportation technologies?

- Coordinated technologies
- Costs
- Expense
- Expense
- Funding
- It's not there yet
- Liability - who pays?
- Mixing the existing system with a new, more modern adaption
- More empty cars on the road
- More sprawl
- More VMT
- Not enough to handle demand

- Private sector controls transportation
- Replacing jobs
- Rich get AVs—equity
- Slow adoption
- Slow adoption
- Sprawl
- Technology and policy not insync
- The cost and safety of the new forms
- The politics of getting it done
- The unknown
- Too dependent...

APPENDIX G: What topics would you like to learn more about?

- Access
- Adoption timeline land use impacts who provide services
- CAV Deployment Pros-Cons of deployment adoption rates
- Changes to daily life
- Creative public funding
- Design standards
- Ecosystem development
- EJ
- Environmental impacts
- Equity impacts
- How it works – How it will actually help
- Increased job force
- integrated communications
- Job Creation
- New AVEV vehicle types
- Partners who will collaborate
- Public perception
- Safety of AV
- Scenario development
- System integration
- System integration
- Who creates design criteria?

APPENDIX F: How did you find out about this meeting?

Type of Medium	Number of Participants
Email	17
Facebook	5
LinkedIn	4

Public Meeting Minutes

Project: NCTCOG AV2.1

Subject: Public Meeting #2

Date: Thursday, Feb. 24, 2022

Location: Virtual Meeting via Zoom

Project Team Attendees:

Abby Morgan, Kittelson & Associates	Kentrel Phillips, EISD
Behruz Paschai, C&M Associates	LaKesha Raynor, Dallas College
Clinton Hail, NCTCOG	Leigh Hornsby, PIA
Denise Smith, Hummingbird Firm	Royalyn Reid, Consumer Marketing Insights
Ernest Huffman, NCTCOG	Tom Bamonte, NCTCOG
Janille Smith-Colin, Hummingbird Firm	

Registrants:

Adlena	Jacobs	Edmond	Young	Melissa	Newland
Akibi	Archer	Eli	Engle	Mercedes	Bolen
Alan	Lecz	Emerson	Ojiaka	Miamauni	Hines
Alejandro	Garcia	Enghlab	Eftekhari	Micah	Baker*
Alexis	Puente	Erin	Curry*	Michael	Flusche
Alice	Grossman	George	Arrants	Michael	Hill
Ami	Parikh*	Goksel	Dedeoglu	Michael	Bryant
Amy	Schultz	H.	P.	Michelle	Jackson*
Amy	Moore	Hannah	Garside	Mike	Pool
Angela	Scott	Harprinderjot	Singh*	Mohammadhosein	Pourgholamali*
Angelica	Rios	Harry	Swanson*	Navid	Nadimi
Angelina	Razo	Irma	Gaines	Nelson	Lucius
Ann	Foss	Jackie	Beckwith	Nick	Weander
Anna Laura	Harmjanz	James	Moffitt	Nicole	Raphael
Ash	Duong	James	Hacker	Nicole	Jolly
Ashley	Hutto	Janet	Foreman*	Oscar	Enriquez
Ashok	Chandrasekaran	Jason	Williams*	Pam	Wash
Belinda	Pate	Jeffrey	James	Patricia	Smith
Ben	Hyde	Jenell	Strachan	Plamedie	Ifasso*
Beverly	Kuhn	Jennifer	Butcher	Rachel	Albright*
Beverly	Longfellow	Jennifer	Birdsong	Rahsirearl	Smalls
Bill	Kahn	Jennifer	Erdely	Ramanitaran	Kandiah
Bobbie	Mitchell	Jimmy	Hosch	Ranjan	Muttiah
Bobbie	Ibarra	Jo Anna	Cardoza	Ray	Gwin
Brenna	Lyles	John	Hicks*	Renaldo	Williams
Brian	Schultz	Joseph	Villescas	Renee	Parker
Brian	Dentry*	Josh	Peterman*	Roy	Plumlee

Candice	Mea	Josh	Vinyard	Ryan	Dufour
Candy	Slocum*	Joy	Paprskar	Sam	White
Caren	Chambers	Julia	Alessandra	Sandip	Sen
Carla	Ruge	Karan	Khosla	Santh	Sathya
Carlos	Contreras	Kathryn	Duffy	Scott	Shtofman*
Carolyn	Wright	Kaylan	Smith	Sergio	Lugo
Cathy	Kang	Keesha	Williams*	Shawn	Conrad*
Charlene	Stark*	Kelsel	Thompson	Sheen	Kang
Charles	Scoma*	Kerin	Smith*	Sierra	Jennings
Cherie	Gordon	Kim	Hunziker	Sonya	Burkins
Cheryl	Wright	Komaa	Narra	Soria	Adibi*
Chris	Fernando	Kristine	Williams	Stanley	Jaglowski*
Chris	McCahill	LaShaundra	Shaw	Stephanie	Manry
Christopher	Ash	Latoya	Smith	Steve	Montgomery
Colton	Claborn*	Laura	Freeland	Suzanne	Wright
Constance	White*	Leaca	Caspari	Syeda	Haque*
Crystal	Chism	Lexie	Woodward	Tai	Le*
Darryl	Brewer	Linda	Gray	Tassie	Gaither
David	Loggans	Liz	Morse	Taylor	Starr
David	Hall	Louanne	Noel	Thalia	Matherson*
David	McNabb	Malu	Devadasan	Thelma	Johnson
Debbi	Richards	Marcella	Klauser	Tiesa	Leggett
Debbie	Ruffu*	Maria	Brackenridge	Toni	Lott
Deborah	Burrell	Marian	Thompson	Tracy	Wallace
Denise	Smith	Mark	Lewis	Victor	Fishman*
Denise	Morris	Martin	Burrell	Wayne	Corum
Dev	Rastogi*	Marvin	Jackson	Wayne	Sanderson
Dhruva	L.	Mary Helen	Franko	Yousuf	Taqvi
Donna	Joubert	Matthew	Craig	Wayne	Corum
Durga	Murdeshwar	May	Yuan	Wayne	Sanderson

*Verified Attendee

Additional attendees: Deborah Mack, Victor Fishman

Start Time: The meeting began at 6 p.m.

The following are highlights from the Thursday, Feb. 24, 2022, North Central Texas Council of Governments' (NCTCOG) AV 2.1 Public Meeting #2. There were 50 attendees. Of that number, there were three representatives from NCTCOG, five representatives from the consultant team, and two guest speakers.

Welcome

Abby Morgan, Consultant Project Manager, Kittelson & Associates, welcomed the virtual audience to the Connecting North Texas Communities with Emerging Transportation Technologies public meeting. She explained that the project is creating guidance for local decision makers on how to bring technologies like automated vehicles to our communities, and how to make sure these new technologies improve safety, reduce congestion, and create new opportunities to connect our communities.

This initiative is the first phase of a three-phase Automated Vehicle (AV) program by the NCTCOG, which is the regional transportation planning agency. This project is the planning phase of the AV program. The other two phases focus on developing partnerships with local agencies and industry and on supporting investments into AV technology.

Abby explained that the project team started the study last August (2021). First, the team focused on learning about future transportation needs in the area -- using an online survey, focus groups, and a public meeting. The public helped the team imagine future transportation automation scenarios that local agencies will need to plan for. Right now, the team is busy creating a guidebook for municipalities on best practices for hosting AV and other emerging technology deployments. Next, the team will write a final report before our project wraps up in June 2022.

Panelists Discussion and Participant Input

Abby introduced Denise Smith, project team member, Hummingbird Firm, who served as moderator and helps the project team by:

- Increasing awareness of AV2.1
- Exploring challenges and opportunities associated with educating the future workforce
- Sharing AV2.1 educational resources

Using an online tool to poll attendees named Mentimeter, Denise asked a series of questions. The first question was, "Where are you joining us from." Nearly all participants said they were in the immediate DFW area and most in Dallas. (See Appendix A for feedback.)

A second question was, "What role do you plan in this discussion." While many indicated that they have varying levels of input, ranging from public officials to planners to those with minor interests, the goal of the exercise was to show that everyone has some type of role when it comes to setting AV goals, as well as allowing for the panelists to better know who they are communicating with. (See Appendix A for feedback.)

Denise introduced the panelists.

- LaKesha Raynor is Director of Workforce Development and Apprenticeships Relationship Management at Dallas College, Cedar Valley Campus.
- Ernest Huffman is Program Manager for Aviation Planning and Education, NCTCOG.
- Kentrel Phillips is Chief Academic Officer, Everman Independent School District (ISD).
- Janille Smith-Colin is Assistant Professor, Southern Methodist University (SMU).

Each panelist provided opening remarks. Ernest spent more than 20 years in the aviation industry and currently manages five distinct programs associated with transportation technology. LaKesha said her role at Dallas College is to build relationships and that they are about to deploy an AV grant provided by NCTCOG. Kentrel said that 95 percent of his students are considered economically disadvantaged. So, he advocates for students in his district to get the workforce development opportunities they need to establish successful careers. Finally, Janille teaches at SMU and conducts research regarding transportation technology, planning, and engineering. She is committed to building a pipeline for future career opportunities for students.

Denise asked the panelists the first question, "What would you say are the challenges and barriers for transportation technology, as well as equitable impacts and concerns?" Janille responded, first, as she works

in this area. She said the technology itself does provide opportunities. From an equity standpoint, she said they are concerned regarding implementation to ensure there are not disparities to communities. The idea is to provide access to those who have limited access. Transportation is an aging workforce, and it is primarily male. There are opportunities to build a more diverse transportation workforce, and it is important to have equal availability. They are also concerned about cost and pay ability. Another consideration is who has WIFI and the educational background to grow this field with economic mobility.

Denise responded to a question in the Chat forum. Attendee Michelle Jackson asked if it is true that algorithms for autonomous vehicles have problems recognizing those with darker skin tones. Denise said she has seen reports in which that is highlighted as a concern. Therefore, it is important to bring up these issues and address them.

Ernest provided an equity example and that is in the National Football League (NFL) in which there are equity concerns about league ownerships. With an emerging industry, there is an opportunity to have minorities get the ownerships they deserve.

Denise asked the second question, "What are the most pressing challenges and barriers in preparing the future workforce in a technology-driven job market?"

LaKesha said Dallas College looks at it holistically. The college merged seven independent colleges into one. In addition, they made certain that workforce development is premiere. How could they develop an industry perspective in education? They reached out to those industries to see what the college could be doing. For example, what could the college do to prepare for drone activity? They needed to make sure those committee meetings were ever evolving. Then, the college looked for grants. In addition, they created a diversity and inclusion department. Finally, those students with transportation and/or educational barriers can work in the areas that need the transportation.

Kentrel said that he works for a small school district, so they are at a disadvantage at gaining resources. They must be intentional in what they require of their students. They need to continue to expose their students to the emerging technologies. Next, they need to see how to adjust their approach with a fixed budget.

Ernest said one of the major challenges in emerging technologies is getting students interested in regular aviation careers. The pilots and aerospace engineers are aging. He said we don't even know what the criteria for the emerging technologies will be, yet. He said they are competing with YouTube and other applications when trying to get students focused on these technologies.

Denise asked the third question, "Can we say we are preparing our students for the emerging technologies job market?"

Janille said time will tell if we are prepared for this. We need to take a three-prong approach with academia, industry, and policy framers to support educators and define workforce needs and expectations. With that in place, we can be nimble enough. One of the biggest challenges is inspiring students. Hopefully, studies with NCTCOG and other similar ones can help.

Kentrel said that we are probably not preparing students for the emerging technologies job market. There is a great emphasis on skills, but those skills are changing and evolving. What are industry leaders looking for in future employees? There is still much work to do.

LaKesha said students may come in with a set of priorities by parents or others, so they want to broaden the perspective. How are we educating them on these emerging technologies? As educators, we want to expose students to an accurate Labor Market Information (LMI).

Denise reviewed a couple of questions in the Chat forum. The first question, “Are there industries the panel would prioritize for retraining in the workforce?”

LaKesha said there are opportunities to upskill and reskill. These individuals could be veterans or those previously incarcerated. It may include those from different affinity groups. The Texas Workforce Commission (TWC) has a grant to help people upskill and reskill. We can prepare them through education, but can we prepare them once they are in the jobs? This may include general communications regardless of the industry. These are transferable skills.

Denise pointed out another question from the Chat forum. What are organizations doing for trends for a more automated future? Denise said they are conducting project-based learning, as one example.

Janille said on the teaching side, they are doing what they can to expose students to the emerging technologies, in fact she is teaching a class on emerging technologies in the transportation space. Research is another opportunity for exposure, so some students can assist on research assignments. She said SMU is committed to exposing those who are not yet in college to the engineering disciplines.

Denise asked if the panelists have areas they should prioritize, such as civil engineering?

Kentrel said they obtain data to see what careers are in high demand and what they are learning. With exposure to those identified pathways, they hope to build interest very early. The reasons partnerships are so important are that employers need the workforce.

LaKesha said opportunities come from two different perspectives. First, how can we help students in K-12 for opportunities that are already out there? Partnerships to build apprenticeships, for example, are important. We also need to see what opportunities are coming out of these partnerships.

Denise asked for an example of pathways. LaKesha said depending on what the student direction may be, they adjust to help them achieve it. There could be the operational side of the transportation industry, or they may want to be on maintenance side, but it all begins with the introduction of AV.

Ernest said there are a couple of different programs available. He will go to career fairs and job fairs to talk about aviation-related jobs. His team also created a speaker's bureau in which employers can go into a classroom. As for adults, NCTCOG is a member of a consortium that is paired with workforce development centers to ensure all parties are communicating with each other. Another initiative is a task force with a center of gravity around the drone industry. On the diversity side, Ernest started a program for advanced training linking those in the industry with those in minority-owned businesses.

Prompted by a question in the Chat forum, Denise asked how working from home has changed things, especially for delivery services.

Ernest said the demand for drone deliveries has increased.

Janille said it is about setting expectations for the workforce. Her students are ready to get back out into the field. The point is getting students excited about transportation technology either by working from home or getting out into the field. It is important to set those expectations.

LaKesha said imagination and inspiration spark innovation. The innovation the industry produces will help education by putting students in the driver's seat for future technology and transportation careers. The driving force behind workforce development and education comes through relationships that respect academia's relationship with the industry and the results that come.

She explained that there are examples of what others are doing in terms of workforce development, including North Dakota, Fargo Community College, and Pima Community College. She has already teamed with Pima as part of the Pittsburgh economic development robotics industry where mobility is a \$30 trillion market. The innovation the industry produces will help educate and put students in the driver's seat for future technology and transportation careers. The driving force behind workforce development and education comes through the relationships we form, the respect academia gives to industry, and the results that come.

The panelists also addressed working from home. Ernest said that working from home is helping companies tackle diversity and/or accessibility issues as now people have the technology by which they can work from home. New mothers are an example. In addition, people may not need to move across the country for a new job, as they can oftentimes work from home because of new technologies.

Denise addressed an additional Chat forum question. "Are there state workforce programs that can assist with these initiatives?" By using Mentimeter, she was able to gather information from attends regarding related resources that might be available. Respondents provided the Skills Development Fund, Skills for Small Business, and Inland Port TMA at www.inlandport.org which provides transportation.

Next, Denise provided a link to K-12 lesson plans for educators regarding AV technology. The link is part of the project website and located here: <https://www.connectntxfutures.org/Resources>.

Denise said Preparing for Emerging Transportation Technologies can be part of many lesson plans. Examples are:

- English - Same Message, Different Audience
- Social Studies - Reviewing Transportation Policy
- Math - Avoid the crash!
- Science - Pavement Markings and the Science of Retro Reflectivity
- First Lego League (WeDo 2.0 Software) - Blind Spot Monitoring

Furthermore, she reviewed additional resources, including Know Before You Fly Your Drone Workshops, Kittelson's summer internship program, as well as fulltime opportunities, and several additional training programs.

LaKesha addressed a question in the Chat forum regarding articulation agreements between K-12 and Dallas College. She said the college offers dual credits, Career and Technical Education (CTE) programs, and partners with post-secondary programs for transferring credits. In workforce and advancement, they are reviewing how to transfer credits and to provide credits for those who have specific types of work experience.

Ernest said we need to address the older population, as they attend public and town hall meetings. To be on the aviation planning side, those are the ones who really come in with opinions. LaKesha said seniors are often on Dallas College advisory boards. And they may not be interested in retiring. So, how can they be re-engaged and change careers?

Denise read a few comments from the Chat forum. Computer coding is an increasingly essential skill. Coding may be easier to teach remotely to incarcerated populations or require lower capital costs than traditional hands-on mechanical maintenance.

Janille said coding was not always a part of our background or our core set of skills but even now we've had a shift in the curriculum. There are places where people are getting dual degrees in civil engineering and computer science because the idea is that the computer science students don't really understand infrastructure that supports emerging technologies. If we want to continue to service these transportations in technology, we need to address this. And computer science is now the most popular four-year degree.

Denise asked Janille where she sees her students going with a transportation engineering degree? Janille said they are going all over the place with a plethora of opportunities. It may include public and private sector organizations. There is a shift, too. Students are fully aware of the connective space and are being actively recruited.

In closing, Denise thanked the panel for an insightful discussion. She explained that there will be an additional public meeting and provided an email address for getting in touch with the project team, connectNTx@nctcog.org. In addition, she provided the website address, www.ConnectNTx@nctcog.org.

Tom Bamonte, Senior Program Manager of Automated Vehicle Technology, NCTCOG, concluded the meeting. He stressed four things happening at NCTCOG. He said they are making major investments in emerging technologies through demonstration projects, and they are focusing on those projects that are not being served fully by the private sector. They are investing in workforce development activities at the community college level. He said Ernest is doing great work at the primary and secondary high school level and at the university level through funding support for the North Texas Center for Mobility Technologies. They are trying to connect emerging technology companies with faculty and students to help with skill building and career building. They recently worked with the City of Dallas to put together an economic incentive package with Ford Motor Company that includes commitments from Ford to help support these workforce development items. Finally, NCTCOG is partnering with two global engineering firms to create a mobile innovation zone.

Tom said that NCTCOG has connected virtually, and they have discussed what that means. He said when you put together your curriculum, think of ways you can connect people through virtual transportation.

Denise thanked attendees for their participation.

Adjournment: The meeting adjourned at 7:27 p.m.

(Chat forum items are in Appendix B.)

(APPENDICES BEGIN ON THE FOLLOWING PAGE.)

APPENDICES

APPENDIX A:

The following matrix captures input from 27 public meeting participants with the exact terminology used.

Voter	Where are you joining us from?	What role do you play in this discussion?
1	Arlington	Air_Quality_Planner
2	Dallas texas	Transportation_planner Transportation_engineer Educator
3	Allen, Texas	research partnerships workforce
4	Fort Worth	Transportation_planner
5	Fort Worth, TX	Advocate
6	Plano	transportation_planner consultant
7	Dallas	Educator
8	Dallas, TX	Consulting_Firm Transportation Travel_Demand_Modeling
9	Dallas	Planner
10	North Texas	Transportation_planner
11	Allen, Wylie Texas	Transportation_Planner Air_Quality_modeling
12	Allen	transportation_planner parent
13	Dallas	Artist Administrator
14		Educator
15	East Texas	Lobbyist AV_enthusiast Texan
16		Transportation_planner
17	Desoto, Texas	Resources_for_youth
18	Dallas	Reporter
19	Michigan State University	Researcher_on_AV PhD_candidate
20	North Texas	DEI Owner Growth
21		Tarrant_County TSHL_Representative Senior_Texan_issues
22	Midlothian, tx	Transportation_planner
23	Westlake	Innovation Airports
24		Workforce_education
25	Dallas	Researcher
26	West Lafayette	AV_Researcher
27	Terrell	Labor_market_futurist

APPENDIX B:

The following captures input from the Chat forum. Exact terminology is used.

Michelle Jackson: I have read reports that algorithms for autonomous vehicles have difficulty recognizing pedestrians with darker skin tones. Is this true? Are they re-working the algorithms to correct this?

Abby Morgan (response): Thank you for submitting this question. Our panelists discussed several issues and strategies for addressing equity differences related to new technologies like automated vehicles. These technologies are still being developed. Different companies are taking different approaches to their system development. Now is the time to research and to educate. It is important for studies like the one you referenced to identify equity challenges and technology challenges to ensure these systems are developed in a safe and equitable way.

MJ: With the workforce increasingly working from home (WFH), how does that affect the transportation workforce which traditionally has gone into the field in order to work? It seems these young people entering the workforce prefer to work from home (WFH)?

Soria Adibi: Are there industries that the panel would prioritize for re-training to give existing workers/those excluded from the workforce (formerly incarcerated) opportunities for upward mobility?

Scott Shtofman: Are there state workforce programs that can feed these initiatives? What are ways that we can get these jobs on the funding track for education?

CS: When talking about inclusion, what effort has been made to include representatives from the largest segment of our population in the planning process? It is a fact that our US population under the age of 18 is smaller than those over the age of 65.

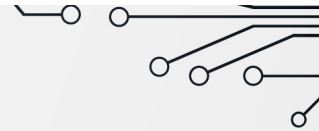
CS: Older Texans are working in areas that would be beneficial to the future of transportation. It is not unusual for professionals to work into their 70's

Victor Fishman: Thinking about the pipeline construct, when Kentrel raises awareness at the elementary level, do Dallas College and/or our universities have outreach programs that maintain student interest and a clear articulation agreement to move K-12 graduates to Dallas College and then on to universities, if they desire?

Victor Fishman: I have to drop off. Very good discussion and appreciate all of you coming together to share with the rest of us. Many thanks!

Abby Morgan: If you know kids who are interested in engineering or robotics, the FIRST program is a great way to get inspired at the elementary, middle, or high school levels! <https://www.firstinspires.org/>

Janille Smith-Colin: SMU Caruth Institute for Engineering Education summer camps: <https://www.smu.edu/Lyle/Centers-and-Institutes/Caruth/Youth-Programs-and-Camps>



Survey Report

Connecting North Texas Communities with Emerging Transportation Technologies

AV2.1 Public Survey Results

November 2021



Connecting North Texas Communities
with Emerging Transportation Technologies

1.0 Introduction

The North Central Texas Council of Governments (NCTCOG) launched AV2.1 (“Connecting North Texas Communities with Emerging Transportation Technologies”) to prepare the region for transportation technologies. As a part of this project, a public survey was launched during the first week of August. The survey was 15 questions long and was intended to gather insight from residents of the 16-county North Texas region. The purpose of the “Survey on Transportation Technologies in North Texas” was to gauge the current use of transportation modes, current use of transportation-related technologies, and perspectives on future transportation technologies.

The survey was divided into five parts:

- Introduction
- “Your Transportation Now” (current forms of transportation)
- “Current Transportation Technologies”
- “Emerging Transportation Technologies”
- “General Information (demographics)”

Section 1 was an introduction to the survey, providing a high-level overview of the project and the purpose of the survey.

Section 2, *Your Transportation Now*, consisted of three questions:

1. What **forms of transportation** do you currently use to travel in the Dallas-Fort Worth area?
2. What do you **LIKE** about the **forms of transportation** in the Dallas-Fort Worth area?
3. What do you **DISLIKE** about the **forms of transportation** in the Dallas-Fort Worth area?

Section 3, *Current Transportation Technologies*, was intended to gauge respondents’ perceptions of and use of current transportation-related technologies. The technologies presented represent the building blocks for connected and automated transportation.

4. How do you feel about **advanced driver-assistance systems (ADAS) and related technologies**?
5. How often do you use the following **transportation-related apps**?

Section 4, *Emerging Transportation Technologies*, asked the most critical questions, in terms of what information is most important for the project and development of technology scenarios for the North Texas region.

6. Would you and your household consider using the following **technologies** to support your travel needs **AROUND the Dallas-Fort Worth area**?
7. Would you and your household consider using the following **technologies** to travel **BETWEEN the Dallas-Fort Worth area and other Texas cities**?

Question 7 was similar to question 6, but the set of technologies was different. The technologies included: A - personal car, B - automated bus, C - high-speed train, D - Hyperloop, E - passenger airplane, and F - air taxi.

8. Which of the following **BENEFITS** do you believe will come with **emerging transportation technologies**?
9. Which of the following **CONCERNS** do you have with **emerging transportation technologies**?
10. Select the **option** that best applies for each **transportation statement**.

Question 10 was included to get a better understanding of the respondents' willingness to: use shared transportation and public transportation, pay for convenience, reduce speed to increase safety, and see a reduction in the number of lanes to accommodate bicyclists and pedestrians.

Section 5, General Information, presents demographics questions. In particular, the Team included this section, recognizing that the results could show how respondents' answers were related to their demographics.

11. What **county** do you live in? (The answer choices were based on the 12-county region, but provided a place for respondents to specify "Other.")
12. What is your **age range**?
13. How would you **best describe your race**?
14. Are you of **Hispanic** or **Latinx** origin?
15. Which of these describes your **household income** during a typical year?

The survey was initially planned to be open for three weeks. Given that the number of responses were low (below the minimum required to have a statistically significant survey) at the three-week mark, the Engagement Team decided to keep the survey open through the end of September. By the end of the survey, there were a total of 483 survey responses. This report provides a summary of those responses.

2.0 Outreach

A significant portion of the outreach in Phase 1 was centered around the public survey.

Outreach for the survey included:

- email blasts (via NCTCOG's Constant Contact),
- directed and targeted emails,
- phone calls,
- newspaper ads (these were the project launch ads, which directed readers to the website where they could access the survey),
- physical flyer postings,
- partnerships with community organizations, and
- incentives.

The audiences that were targeted throughout the survey period included:

- Cities and counties
- Chambers of Commerce and Business Associations
- Transportation and Planning Groups
- Transit, Mobility, and Freight and Logistics entities (public and private)
- Professional Organizations
- K-12 School Systems
- Higher Education and Workforce Development (including college organizations)
- Libraries
- Churches
- Advocacy Organizations
- Social Service Agencies
- Community Organizations
- NCTCOG personnel

The survey was initially planned to be open for three weeks. Given that the number of responses was low (below the minimum required to have a statistically significant survey) at the three-week mark, the Engagement Team decided to keep the survey open through the end of September.

Most of the responses seemed to have come as a result of NCTCOG's email blasts, City and County emails and social media posts, outreach to Chambers of Commerce, and a combination of incentives and outreach to organizations. Incentives in the form of Visa gift cards were used among the target equity groups to encourage participation.

Below is a table that shows the organizations that received incentives (totaling \$550). Over 20 organizations were offered incentives, but only the ones below made use of the incentives.

Organization	Number of Responses
National Society of Black Engineers (NSBE) Collegiate Chapters	5
Mi Escuelita (English survey)	7
Mi Escuelita (Spanish survey)	1
Society of Hispanic Engineers (SHPE) Collegiate Chapters	3
Empowering the Masses (English survey)	47
Empowering the Masses (Spanish survey)	2

Most notably, Empowering the Masses helped by getting nearly 50 responses. The organization, which is located in South Dallas, provides skills development and training and hosts soup kitchens. The push by the organization was critical in getting more responses from low-income, Black, and Hispanic residents. The Team recognizes Empowering the Masses as a trusted organization, and a community amplifier, boosting the Team's efforts by directly connecting with individuals in the community.

It should also be noted that some responses came from library staff; at least one of the eight library systems contacted (Burleson Public Library) posted the flyer to a physical bulletin board. The Team placed emphasis on reaching out to all of the counties (considering the 16-county region) and ensuring that there were also non-digital methods of learning about the survey.

3.0 Survey Results and Discussion

Question 1: What forms of transportation do you currently use to travel in the Dallas-Fort Worth area?

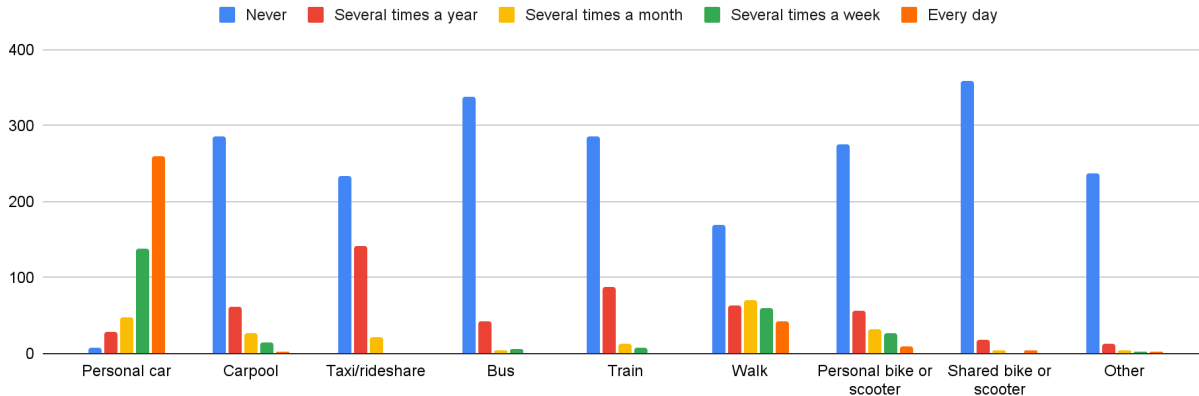
This question asked respondents to indicate the modes of transportation they currently use and the frequency they use the mode. The modes include:

- Personal car
- Carpool
- Taxi/rideshare
- Bus
- Train
- Walk
- Personal bike or scooter
- Shared bike or scooter
- Other

The bar graph below visualizes the responses. The mode that received the most responses was "personal car." Of the 481 respondents who indicated a frequency for "personal car," 54% reported using one every day. About 36% of those who responded to "taxi/rideshare" indicated using the mode several times a year. Only one person indicated that they use taxi/rideshare several times a week, and no one indicated that they use the mode every day.

Most of the respondents reported never using the various modes of transportation, with the exception of personal car. Furthermore, not every survey respondent indicated a frequency for all of the modes. Of the 324 respondents that answered to "shared bike or scooter," 92% reported never using it as a mode of transportation. Most of the 330 respondents who responded to "bus" (84%) reported never using it. Of the 328 respondents that indicated a frequency for "carpool," 73% reported never using the mode. It is likely that those who did not indicate a frequency for a particular mode do not use the mode; accordingly, the percentages associated with "Never" using a mode may be even higher.

Q1. What forms of transportation do you currently use to travel in the Dallas-Fort Worth area?



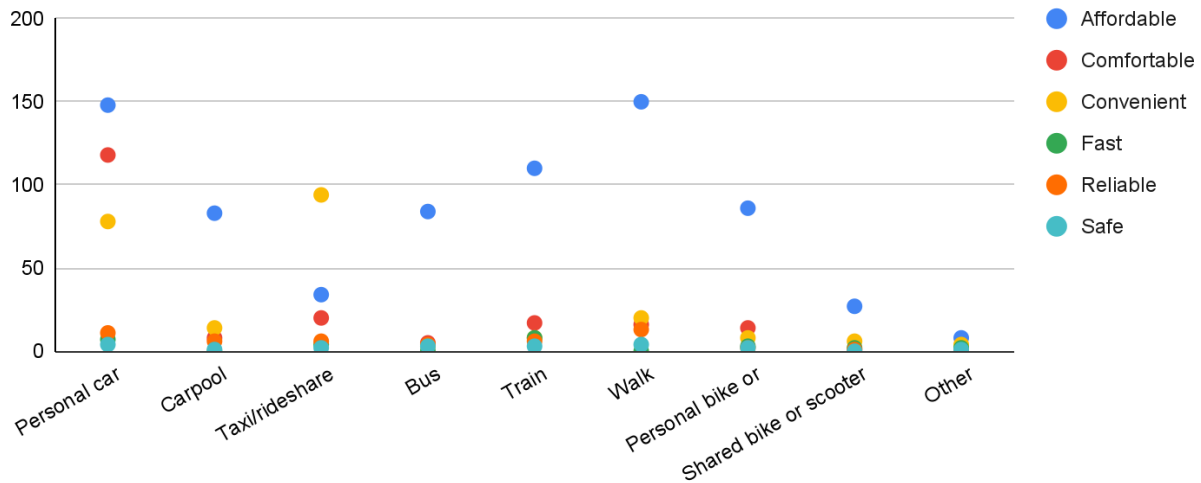
A total of 260 respondents indicated that they use “other” modes of transportation. Respondents had an option to write in what the other modes were. These other modes included motorcycle, disability assistance devices (e.g., wheelchair, cane), and air travel. Some indicated modes, such as “Lyft & Uber” and “Ride with a friend in their car,” that were included in the question, suggesting that they may not have understood some of the terms that were presented in the question.

Question 2: What do you like about the forms of transportation in the Dallas-Fort Worth area?

This question asked respondents what they like about the forms of transportation from Question 1. The dot graph below shows how many respondents felt that a particular mode was affordable, comfortable, convenient, fast, reliable, or safe.

- Of the 368 respondents who answered what they liked about using a personal car as a form of transportation in the Dallas-Fort Worth area, 40% said it was affordable, and 32% said it was comfortable.
- About 37% of the 256 respondents said that taxi/rideshare was convenient.
- In addition to personal car, the options of carpool (34%), bus (36%), walk (56%), train (43%) were thought to be affordable by at least one-third of the respondents.

Q2. What do you like about the forms of transportation in the Dallas-Fort Worth area?



Another option, which is not shown on the dot graph, is "don't know." Below is a list of modes and the number of "Don't know" responses associated with the mode. Many respondents chose "Don't know" for modes that they did not use.

- Personal car - 2
- Carpool - 129
- Taxi/rideshare - 96
- Bus - 131
- Train - 101
- Walk - 66
- Personal bike or scooter - 125
- Shared bike or scooter - 178
- Other - 111

Question 3: What do you dislike about the forms of transportation in the Dallas-Fort Worth area?

This question asked respondents what they dislike about the forms of transportation from Question 1. Similar to Question 2, the dot graph below shows how many respondents felt that a particular mode costs too much, is not comfortable, is not convenient, takes too long, is not reliable, or is not safe. From the dot graph, we see that the majority of the answers about what respondents disliked were that they cost too much, are not convenient, and are not comfortable.

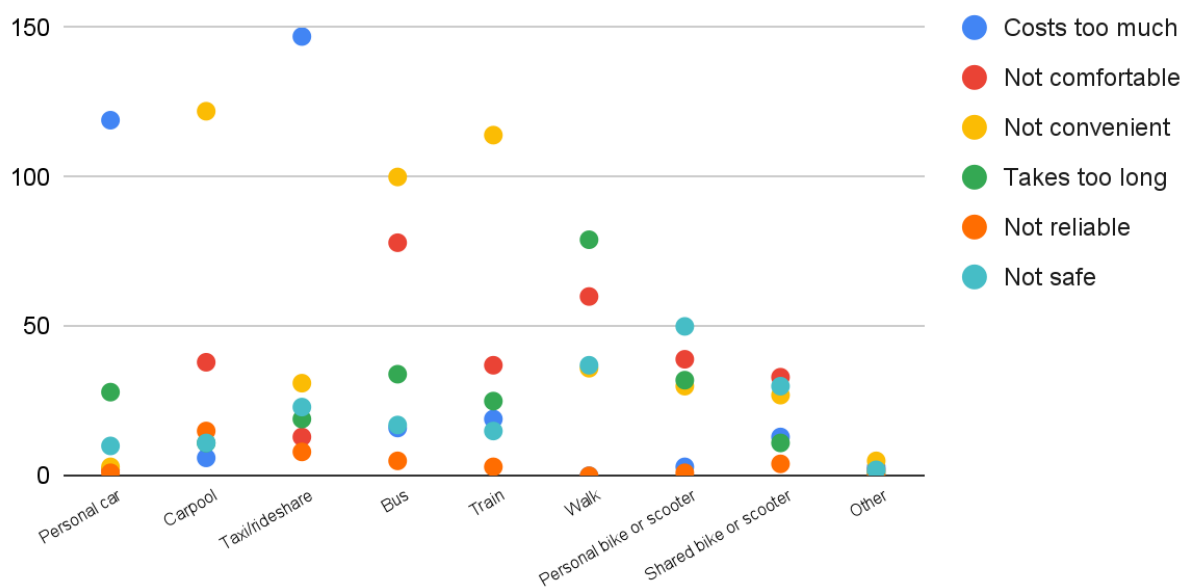
- Of the 213 respondents who answered what they disliked about using a personal car in the Dallas-Fort Worth area, 56% responded that it cost too much. Interestingly, some

respondents who said that personal cars cost too much in Question 3 also shared, in Question 2, that personal cars were affordable. This suggests that respondents may be considering multiple aspects of safety or may have varying opinions on safety depending on the specific technologies. A little over a third of respondents (36%) felt that the technologies would be more expensive.

- 288 respondents answered what they disliked about carpooling, and most said that it was either uncomfortable (42%) or not convenient (30%). Of the 288 respondents that answered what they disliked about taxi/rideshare, about half of them (51%) said that it costs too much.
- Of the 305 respondents who answered what they did not like about the Dallas-Fort Worth area bus, they mainly responded that it was either not convenient (33%) or not comfortable (26%).
- 279 respondents answered what they disliked about trains, and many (41%) of them responded that it was not convenient.

29% of respondents said that walking took too long, 20% of respondents said that personal bikes or scooters were not safe. Many respondents indicated (not shown in the dot graph) that they “Do not know” what they dislike about some of the modes, especially personal or shared bike or scooter. This is in line with biking having a low mode split in the region, as well as the low acceptance or high controversy of shared bikes throughout the region.

Q3. What do you dislike about the forms of transportation in the Dallas-Fort Worth area?



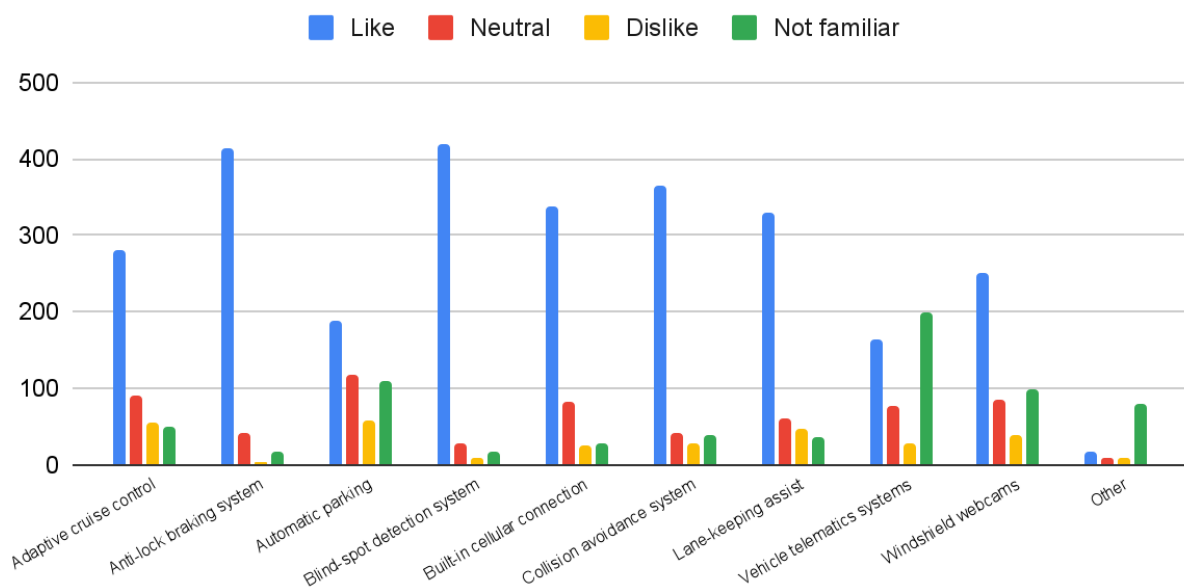
Question 4: How do you feel about advanced driver-assistance systems (ADAS) and related technologies?

This question asked respondents how they felt about advanced driver-assistance systems (ADAS) and related technologies, including:

- Adaptive cruise control
- Anti-lock braking system
- Automatic parking
- Blind-spot detection system
- Built-in cellular connection
- Collision avoidance system
- Lane-keeping assist
- Vehicle telematics system
- Windshield webcams
- Other

As illustrated in the bar graph, most of the technologies were viewed favorably by respondents. More specifically, adaptive cruise control (59%), anti-lock braking system (86%), blind spot detection system (87%), built-in cellular connection (71%), collision avoidance system (76%), lane-keeping assist (69%), and windshield webcams (52%) were all liked by the majority of those who responded to the specific technology.

Q4. How do you feel about advanced driver-assistance systems (ADAS) and related technologies?



Other notable findings that came out of this question include:

- Very few respondents skipped technologies. While most survey respondents did not respond to "Other," at least 468 respondents provided an answer for each of the specific technologies presented.
- For most of the technologies, "Neutral" was the second popular answer after "Like."
- There was a relatively high level (43%) of unfamiliarity with "vehicle telematics systems."

Question 5: How often do you use the following transportation-related apps?

Respondents were asked which of the following apps they currently use:

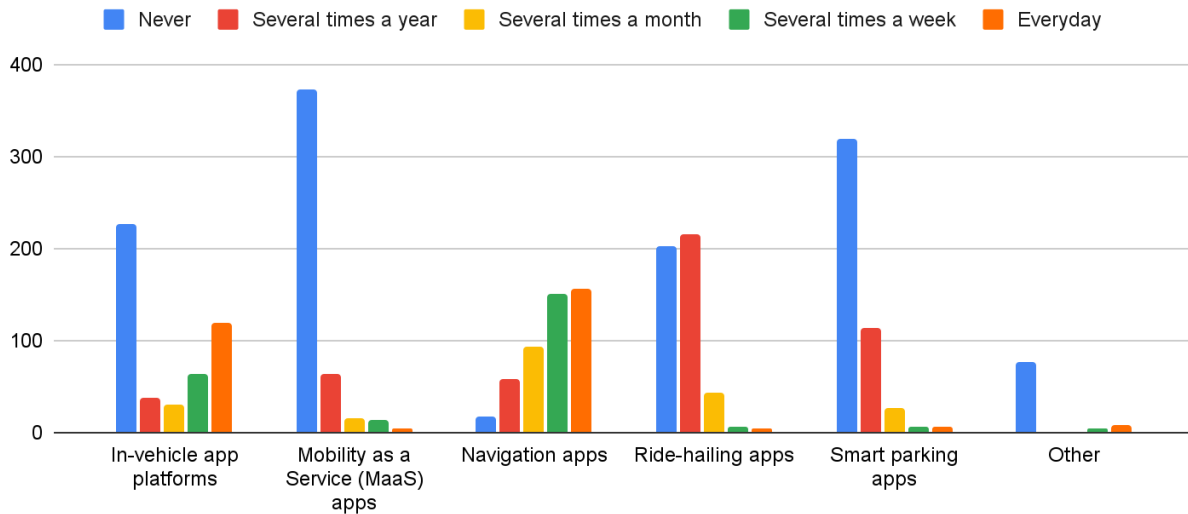
- In-app vehicle platforms
- Mobility as a Service (MaaS) apps
- Navigation apps
- Ride-hailing apps
- Smart parking apps
- Other

Most noticeably, a significant number of respondents indicated that they never use in-app vehicle platforms, mobility-as-a-service apps, or smart parking apps.

- More specifically, 47% of respondents reported that they never use in-app vehicle platforms; 26% said they use these platforms every day. Further insight into this question would help us understand how much knowledge respondents have regarding these apps (for example, are they using in-vehicle app platforms but just do not realize it?).
- Over three-quarters (76%) of the respondents said that they never used mobility as a service apps.
- Of those who responded to how often they use smart parking apps, most (67%) said they never used it.

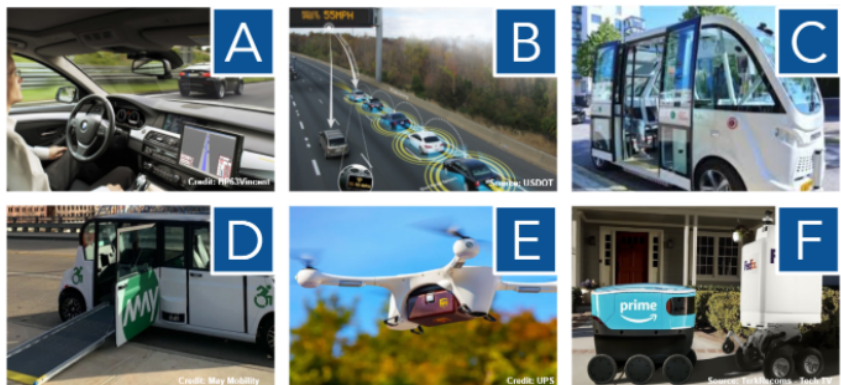
The most frequently used apps were navigation apps. 64% of respondents indicated that they use navigation apps either everyday or several times a week. Of the respondents who answered how often they use ride-hailing apps, 42% said they never use it, while 43% said they use it several times a year.

Q5. How often do you use the following transportation-related apps?



Question 6: Would you and your household consider using the following technologies to support your travel needs around the Dallas-Fort Worth area?

Survey respondents were presented with six technologies (A - automated cars, B - connected cars, C - automated shuttles, D - automated paratransit services, E - drone delivery, F - robot delivery) which were shown in images and explained in text. They were to respond to the question by indicating "Yes," "No," or "Not Sure" for each technology. With the exception of automated paratransit services, between 43% and 54% of respondents answered "Yes" to considering using the technologies. Only 30% of respondents answered "Yes" to using automated paratransit services; this lower percentage could be due to many respondents not having a need for such services.

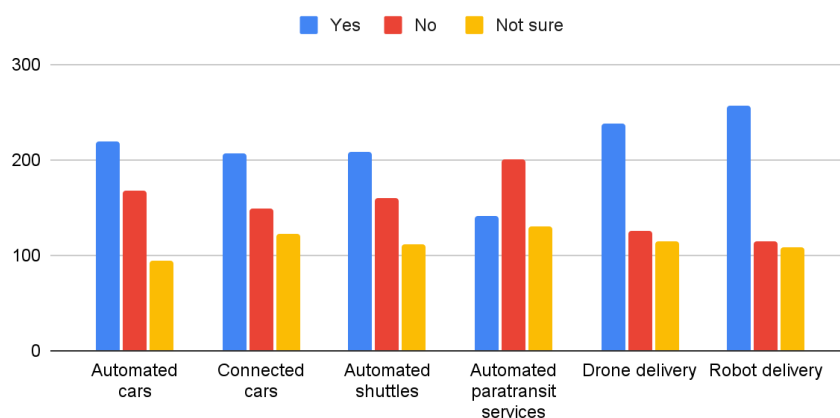


Conversely, between 46% and 56% of respondents said "No" or "Not sure" to their household considering using the technologies (70% for paratransit). This implies that a significant portion

of the region's population is uninformed about the technologies, has reservations or concerns, or has clear opposition to the technologies.

There did not appear to be a strong indicator of overall technology acceptance from any particular respondent. For example, those who said "Yes" to one technology were not necessarily more likely to say "Yes" to all the technologies. Only 71 respondents (15% of all respondents) said yes to all the technologies. There were, however, 128 respondents (26.5% of all respondents) who answered "No" or "Not Sure" to all the technologies.

Q6. Would you and your household consider using the following technologies to support your travel needs around the Dallas-Fort



Question 7: Would you and your household consider using the following technologies to travel between the Dallas-Fort Worth area and other Texas cities?

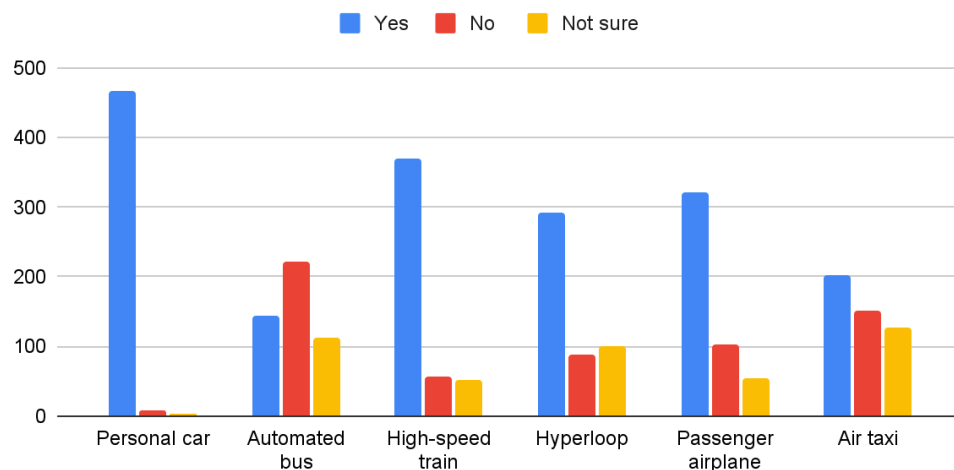
Similar to Question 6, Question 7 asked respondents whether their households would consider using various technologies to travel. Instead of using the technologies to travel in the Dallas-Fort Worth area, Question 7 asked about using the technologies to travel between the Dallas-Fort Worth area and other Texas cities. The forms of technology include: (A - Personal car, B - Automated bus, C - High-speed train, D - Hyperloop, E - Passenger airplane, and F - Air taxi).

The personal car (no technology specified) was by far the most accepted option (97% of respondents said "Yes"). Specifying technologies associated with the personal car would have likely had a significant impact on the responses (e.g., if the personal car was automated or connected, fewer respondents would have selected "Yes"). Following personal cars, the

technologies that respondents said “Yes” to the most were high-speed train (77%), passenger airplane (67%), and the Hyperloop (61%).

The only technology for which there were more no’s than yes’s was the automated bus. Despite a willingness to consider high-speed train (a form of public transportation), many of the same respondents did not want to use an automated bus; more insight would be helpful to understand whether it is because of the automated nature of the bus (although high-speed trains are often automated), a dislike of traveling by bus in general, or a combination thereof.

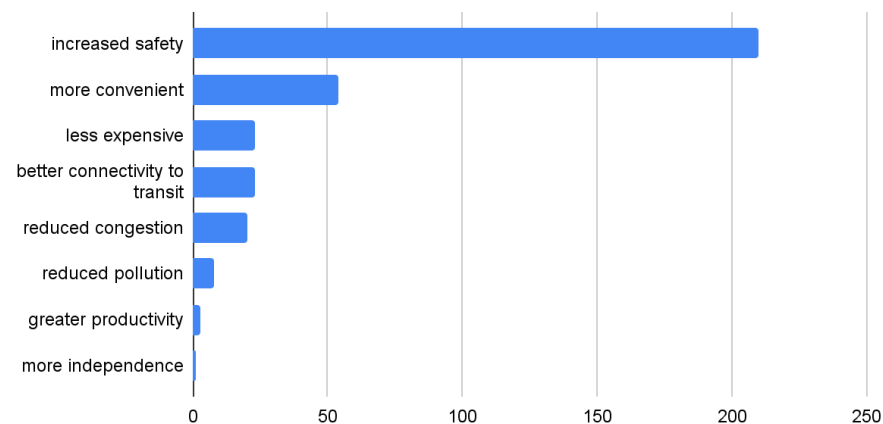
Q7. Would you and your household consider using the following technologies to travel between the Dallas-Fort Worth area and



Question 8: Which of the following benefits do you believe will come with emerging transportation technologies?

Question 8 asked respondents which of the following benefits they believed would come with emerging transportation technologies. The categories of benefits are shown in the horizontal bar graph. The majority of respondents thought that emerging technologies would increase safety (61%). About 16% of respondents felt the technologies would offer more convenience.

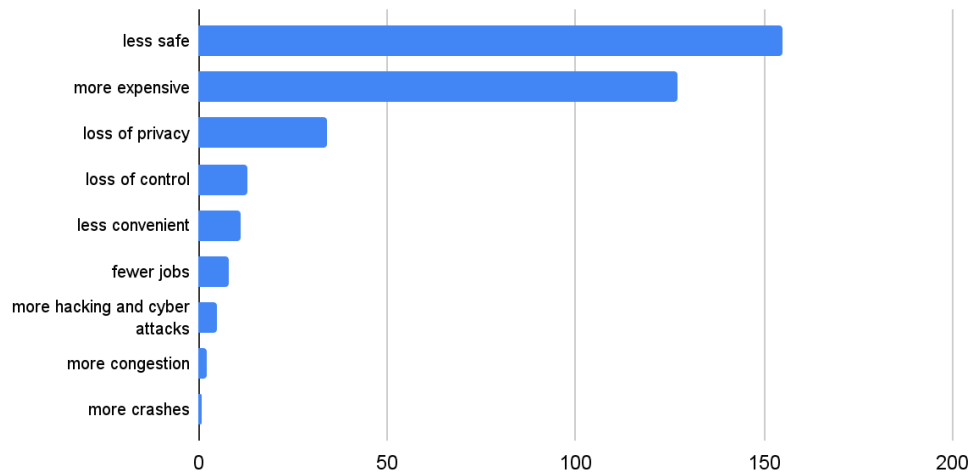
Q8. Which of the following benefits do you believe will come with emerging transportation technologies?



Question 9: Which of the following concerns do you have with emerging transportation technologies?

This question was a complement to Question 8. In addition to learning about expected benefits, question 9 sought to gain perspectives on concerns around the technologies. Despite 61% of respondents believing that emerging transportation technologies would increase safety (Question 8), 44% said that emerging transportation technologies would be less safe. Accordingly, some of the respondents indicated that the technologies would both increase safety and be less safe. This suggests that respondents may be considering multiple aspects of safety or may have varying opinions on safety depending on the specific technologies. A little over a third of respondents (36%) felt that the technologies would be more expensive.

Q9. Which of the following concerns do you have with emerging transportation technologies?



Question 10: Select the option that best applies for each transportation statement.

This question asked respondents to indicate their preferences and willingness as it pertains to transportation options.

The first three statements were:

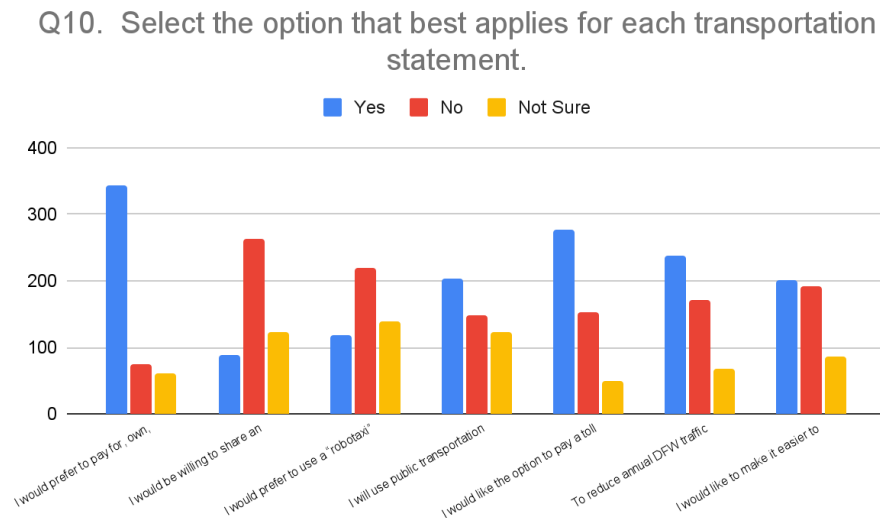
- I would prefer to pay for, own, and maintain my personal automated car.
- I would be willing to share an automated car with other people (e.g., Zipcar, Turo, Get Around).
- I would prefer to use a “robotaxi” service (i.e., automated ride-hailing like Uber/Lyft).

The survey responses showed that most respondents (72%) would prefer to “pay for, own, and maintain” an automated car. In line with that finding, less than 20% of respondents indicated that they were willing to share an automated car with other people and about 25% of respondents indicated that they would prefer to use a “robotaxi” service.

The last four statements that respondents were presented with are:

- I will use public transportation more in the future as automated and connected bus and train technologies emerge.
- I would like the option to pay a toll in order to avoid highway travel delay.
- To reduce annual DFW traffic deaths by half—from 700 to 350—I would be willing to see reduced speed limits and increased traffic law enforcement.
- I would like to make it easier to travel by walking and biking, even if it means fewer lanes for cars in some areas.

Respondents replied to the last four statements in a similar manner. For all four statements, the most widely selected answer was “Yes” (between 42% and 58%), followed by “No” (between 31% and 40%), and then “Not sure” (between 10% and 18%). Of the four statements, “I would like the option to pay a toll in order to avoid highway travel delay,” had the most support. This could be reflective of many survey respondents having a household income over the state’s median household income of \$61,874 ([U.S. Census](#), 2019).

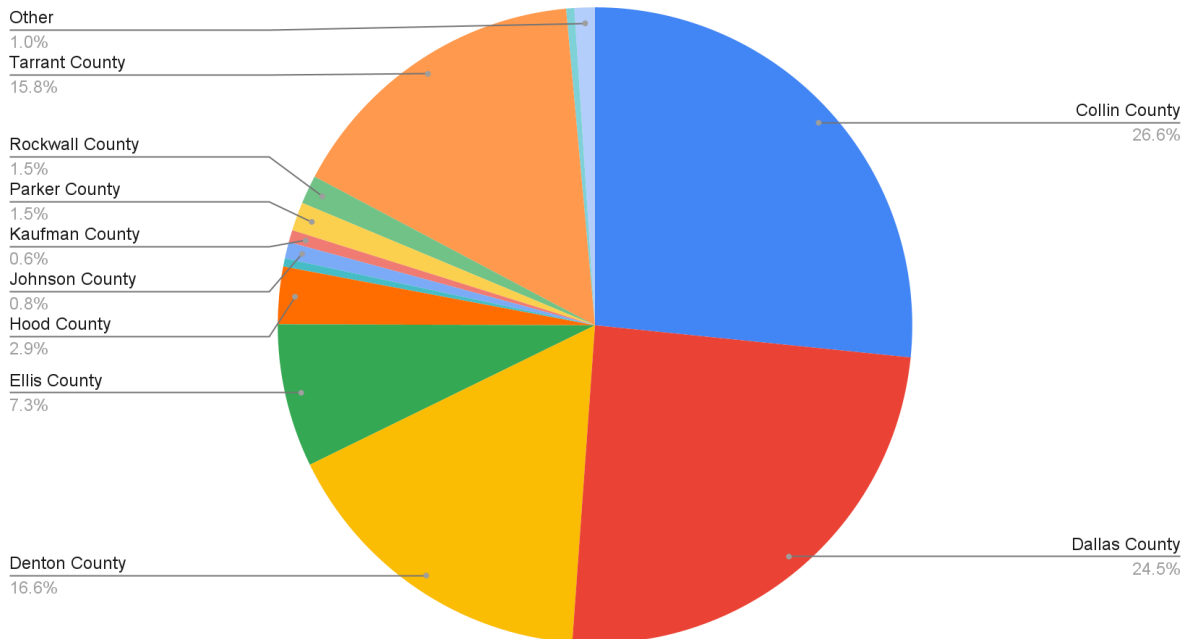


Question 11: What county do you live in?

There was representation from each county in the 12-county region as well as other Texas counties. The responses by county were representative of the region’s population in the sense that the counties with the largest number of respondents are the counties with the largest populations.

- Of the 481 respondents who answered this question:
 - 27% were residents of Collin County
 - 25% were Dallas County,
 - 17% were Denton County, and
 - 16% were from Tarrant County
- Ellis County and Hood County made up about 7% and 3% of respondents, respectively.
- Hunt, Johnson, Kaufman, Parker, Rockwall, and Wise counties each had representation from between two and seven respondents (0.4% to 1.5%).
- The five survey takers who indicated “Other” were from the following counties: Palo Pinto, Harris, Grayson, Erath, and Henderson.

Q11. Percent of Respondents by County



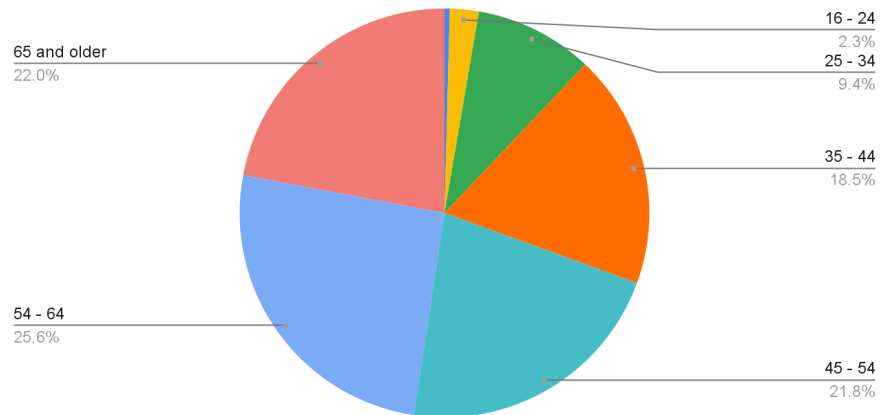
Question 12: What is your age range?

Of the 481 respondents that answered the age range question, 70% were 45 and older. As shown in the pie chart below, 45 and older encompasses three age groups (45-54, 54-64, and 65 and older); the distribution of responses from each of these age groups ranges from 22% to 26%.

A little over 18% of respondents were aged 35 through 44 and a little over 9% of respondents were aged 25 through 34. There were only two responses from those under 16 years of age.

This distribution of ages reveals a need for targeted outreach to get more input from younger residents. The importance of age in understanding the diversity of perspectives of the technology is highlighted later in this report (see Demographic-Stratified Analysis).

Q12. Number of Respondents by Age*

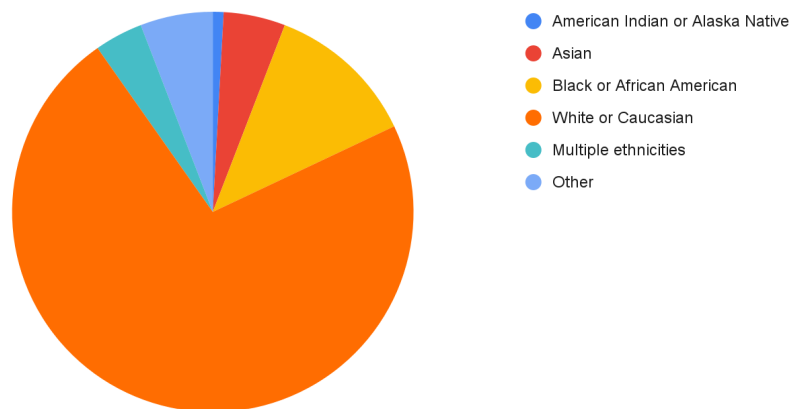


*54 was inadvertently included in two age range groups. This may have slightly impacted the distribution of ages in the two ranges

Question 13: How would you best describe your race/ethnicity?

Of the 462 respondents that answered this question, 72% reported being White or Caucasian, 12% reported being Black or African American, 5% reported being Asian, about 1% reported being American Indian or Alaska Native, and the remaining 10% responded being Multiple races or Other. The distribution of these races is similar to what is reported in the U.S. Census Data for the 12-county Dallas-Fort Worth area. When averaging the percentages by race across the counties, 83% of the population is White alone, 9.5% is Black or African American alone, 4% is Asian alone, and 1% is American Indian or Alaska Native.

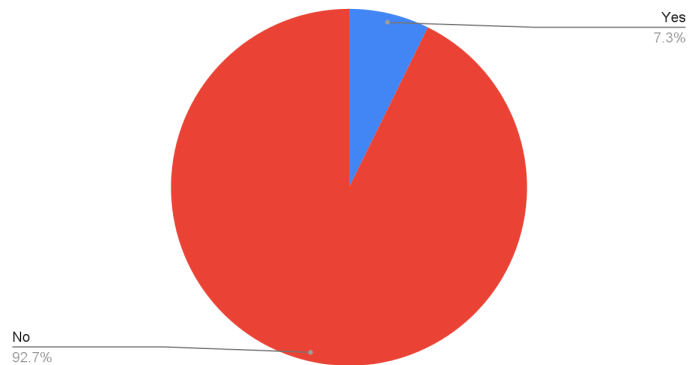
Q13. Number of Respondents by Race



Question 14: Are you of Hispanic or Latinx origin?

452 respondents answered the question, "Are you of Hispanic or Latinx origin?" Of these respondents, 7.3% responded yes. This differs from the U.S. Census data, which reports that 28% of the population in the 12-county Dallas-Fort Worth area is "Hispanic or Latino."

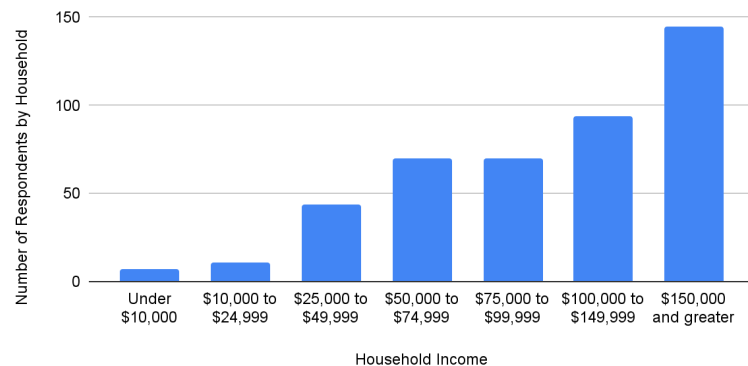
Q14. Are you of Hispanic or Latinx origin?



Question 15: Which of these describes your household income during a typical year?

441 respondents answered the question on household income. As shown in the graph, the number of responses generally increases with household income. This may be indicative of a need to target more low-income households in the region to get their input on the technologies.

Q15. Which of these describes your household income during a typical year?



Over 70% of respondents indicated a household income over \$75,000 a year. The largest percentage of respondents (31%) specified a household income of \$150,000 or more.

Demographic-Stratified Analysis

In order to assess the potential impact of demographics on how respondents felt about the emerging transportation technologies, a stratified analysis was run on question 6, "Would you and your household consider using the following technologies to support your travel needs around the Dallas-Fort Worth area?". A demographic-stratified analysis considered county of residence, age, race, and household income.

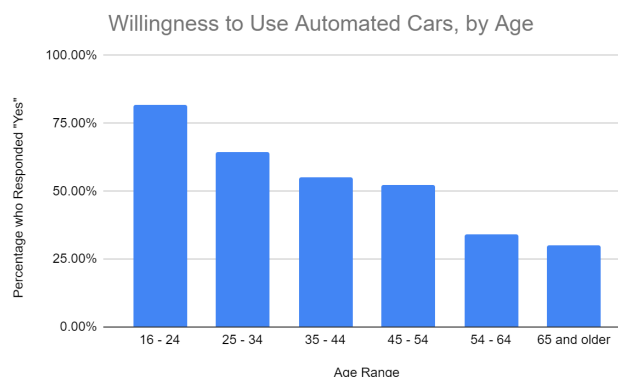
County

The majority of respondents who answered Question 6 were from Collin County, Dallas County, Ellis County, Denton County, and Tarrant County. For that reason, the analysis focused on those counties.

- Between 41% and 54% of respondents Collin County, Dallas County, Denton County, Tarrant County, responded "Yes" to supporting automated cars. In contrast, only 29% of Ellis County respondents said "Yes" to considering automated cars. This same trend was also seen in responses to connected cars, automated shuttles, and drone delivery.
- For automated paratransit services, Collin County and Ellis County residents answered "No" at a higher rate (49% and 60%, respectively) than residents from Tarrant, and Dallas counties.
- In response to robot delivery, 56% of Collin County respondents, 53% of Dallas County respondents, and 66% of Denton County respondents said that they would support the technology, while close to 40% of Ellis County and Tarrant County respondents said they would.

Age

Age was a significant factor in the responses. The bar graph below shows an inverse relationship between age and willingness to use automated cars. For the most part (not considering those "Under 16" - the age group for which there were only two responses), this trend was generally consistent for all of the technologies.



Race/Ethnicity

Most of the survey respondents were White or Caucasian (334), followed by Black or African American (56), and then Asian (23). Together, respondents of those three groups made up to 90% of all respondents. The table below shows the percentage of respondents, by race, who answered "Yes" to considering using the various technologies.

Percent "Yes" to Emerging Transportation Technologies, by Race

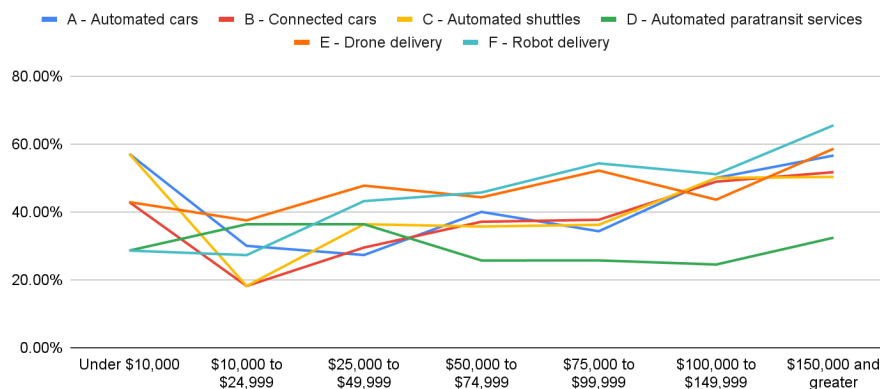
	White or Caucasian	Black or African American	Asian
A - Automated cars	46.7%	34.5%	70.8%
B - Connected cars	44.0%	31.0%	62.5%
C - Automated shuttles	45.8%	25.9%	66.7%
D - Automated paratransit services	26.3%	27.6%	54.2%
E - Drone delivery	49.4%	50.0%	70.8%
F - Robot delivery	54.8%	43.1%	70.8%

Asian respondents were more receptive to considering the technologies than White and Black respondents. With the exception of automated paratransit services, close to half of White respondents answered “Yes” to considering the technologies. For automated cars, connected cars, automated shuttles, and robot delivery, Black respondents were the least likely of the three groups to consider using the technologies.

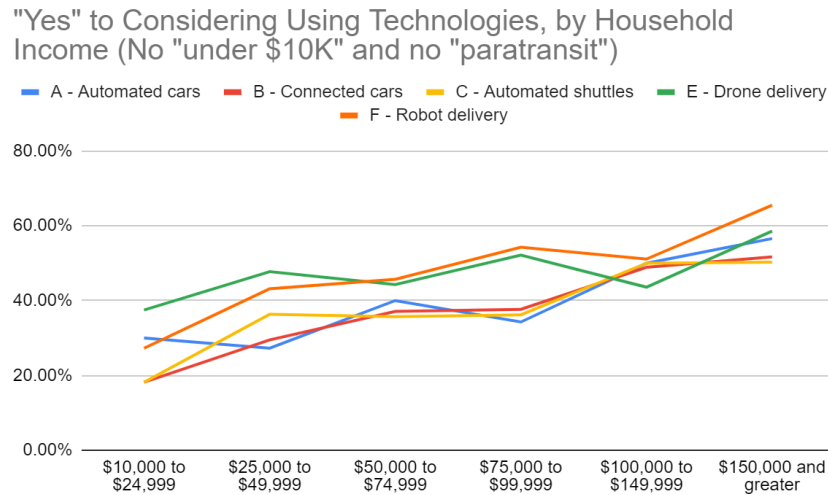
Household Income

In regard to the impact that household income, the relationship between responses and income is not initially clear. The graph below shows the percent

“Yes” to Considering Using Technologies, by Household Income



When responses from those with a household income of \$10,000 and under and automated paratransit services are removed from the data, a trend (increase in willingness to use technology with an increase in household income) is more clearly evident. There were only seven responses from individuals with household incomes under \$10,000 (ages ranging from under 16 to 65 and older). More responses from this income range would be needed to gain a better understanding of how this group’s perspectives about the technologies.



3.0 Concluding Remarks

This survey was a significant component of the public input process for "Connecting North Texas Communities with Emerging Transportation Technologies." Over the two months of conducting outreach and encouraging residents to complete the survey, we were able to get 483 responses. At least 400 responses were needed for the survey to be statistically significant.

Overall, the survey responses showed a wide range of transportation preferences and various levels of willingness to use emerging transportation technologies. The demographic-stratified analysis did shed some light on the factors that may influence people's current transportation modes and technologies, as well as their perspectives on future technologies. Nevertheless, we must consider that, given the number of respondents from any particular demographic group, the answers are not necessarily representative of how a particular demographic group would respond. As this project progresses, we will continue to hear from respondents through focus groups, public meetings, and other mediums, to understand the wants and needs of the region. This will, in turn, provide local governments with more insight as they continue to plan for emerging transportation technologies.

4.0 Appendix (Tables)

Question 1: What forms of transportation do you currently use to travel in the Dallas-Fort Worth area?

Question 2: What do you like about the forms of transportation in the Dallas-Fort Worth area?

Question 3: What do you dislike about the forms of transportation in the Dallas-Fort Worth area?

Question 4: How do you feel about advanced driver-assistance systems (ADAS) and related technologies?

Question 5: How often do you use the following transportation-related apps?

Question 6: Would you and your household consider using the following technologies to support your travel needs around the Dallas-Fort Worth area?

Question 7: Would you and your household consider using the following technologies to travel between the Dallas-Fort Worth area and other Texas cities?

Question 8: Which of the following benefits do you believe will come with emerging transportation technologies?

Question 9: Which of the following concerns do you have with emerging transportation technologies?

Question 10: Select the option that best applies for each transportation statement.

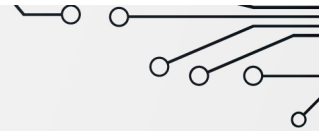
Question 11: What county do you live in?

Question 12: What is your age range?

Question 13: How would you best describe your race/ethnicity?

Question 14: Are you of Hispanic or Latinx origin?

Question 15: Which of these describes your household income during a typical year?



Focus Group Summary

Connecting North Texas Communities with Emerging Transportation Technologies

AV2.1 Focus Groups Report



Connecting **North Texas** Communities
with Emerging Transportation Technologies

December 2021

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I. Overview

The North Central Texas Council of Governments (NCTCOG) launched AV2.1 (“Connecting North Texas Communities with Emerging Transportation Technologies”) to better prepare the region for future transportation technologies. Kittelson and Associates, Inc. appointed Consumer and Market Insights, LLC (CMI), as part of the Engagement Team, to conduct 12 focus groups on the topic of current and future transportation and communication needs within the NCTCOG 16-county region of North Central Texas. This region of North Central Texas, which centers around the two urban centers of Dallas and Fort Worth, includes over 230 member governments including numerous counties, cities, school districts, and special districts.

The purpose of the focus groups was to gain a deeper awareness of the public’s perspective on current, new, and emerging transportation technologies. The study goal was to better understand the public’s:

- 1) Interests, needs, and challenges as it relates to **current technology**
- 2) Preferences, behavior trends, and perceptions as it relates to **emerging and new technologies**

Specific areas of interest include:

Current Technology

- What technologies does the public currently use daily?
- How accessible and reliable are these technologies?
- What other challenges does the public face with these technologies?
- How does the public perceive these challenges?

Emerging and New Technologies:

- What is the public’s perspective on future technologies?
- What future technologies are they familiar with?
- How would these technologies make their lives easier?

This insight will be instrumental in providing directions to assist agency planners and other stakeholder groups as they make plans to meet the needs of the community as it relates to current, new and emerging transportation technologies.

II. Results

In general, focus group participants took a sincere interest in the topics and were very willing to participate. They openly shared their observations and opinions. It was sometimes difficult for some to grasp future concepts, but they asked clarification questions where needed and answered the questions. Participants expressed their appreciation of being asked for their input instead of just being told what they were going to get; this was especially the case with the minority and rural groups.

Commonalities Across Groups

All groups (General Population, Rural, Minorities)

- Use their personal cars daily as primary form of transportation
- Have concerns about the amount of traffic on roadways
- Are frustrated with the slowdowns of constant and many long construction zones
- Use map apps (*except for a few from the minority groups that do not own smart phones*)
- Have concerns about internet connectivity and dead zones when driving
- Expressed common issues about the cost of gas and insurance

Differences Between Groups

General Population vs Rural

Rural groups:

- Feel they have too few transportation options, i.e., no mass transit, limited ridesharing
- Do not have as many internet service provider options
- Experience issues with freight trains blocking major thoroughfares

General Population vs Minorities

Minority groups:

- Are more excited about some future technologies
- Have doubts that future technologies will be fair and equitable to all groups
- Are concerned about the lack of services for the disadvantaged that could benefit the most from future technologies: disadvantaged and senior groups

Primary Groups

General Population

Counties: Collin, Dallas, Denton, and Tarrant

The general population groups were characterized as counties having a population of greater than 600,000. The counties that composed this group included Collin, Dallas, Denton, and Tarrant Counties.

All participants' primary **mode of transportation** is personal cars they use daily. Some try to use the train when possible. They also expressed an interest in walking, carpooling, and ridesharing, if available. The personal car mode of transportation was used most frequently because of convenience, reliability, and availability. They dislike using their personal car because of traffic, construction, and the cost of operating personal cars. Participants stated local travel would be improved by the following: access to light rail, better planning prior to development, less construction, no tolls, and regular review and adjusted timing of traffic lights.

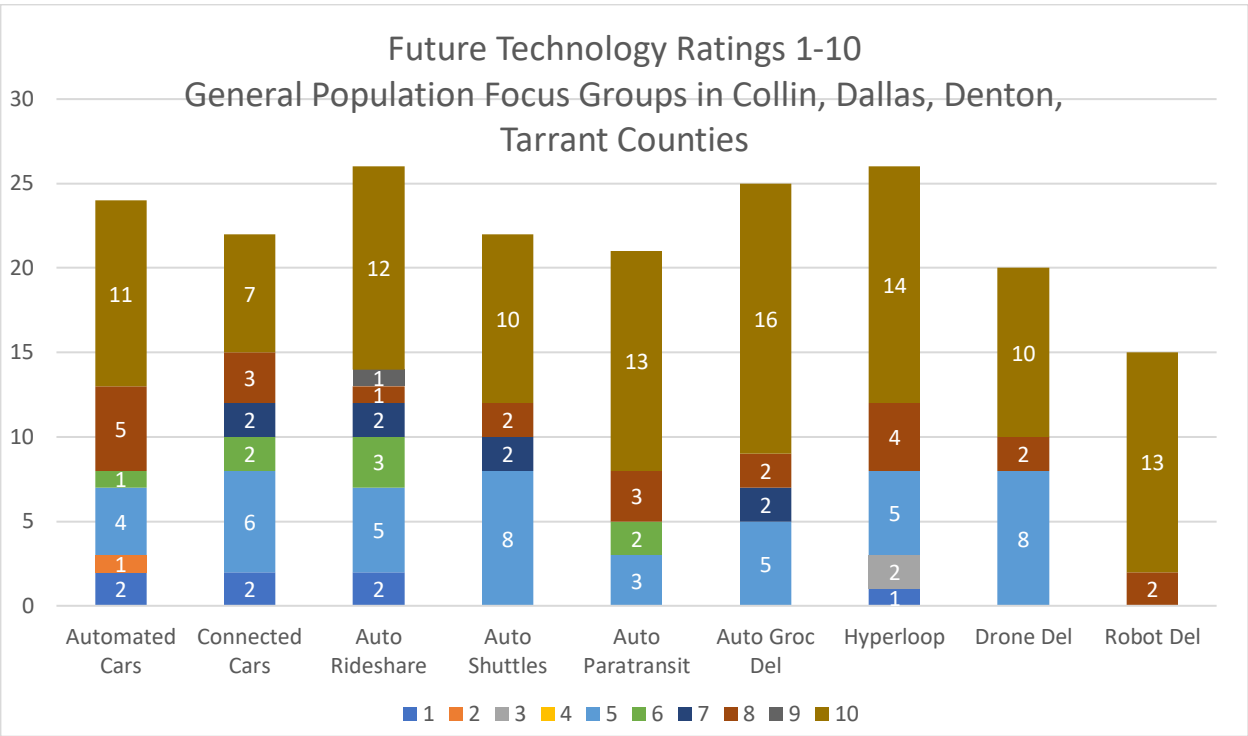
In terms of **communication**, most participants use cell/smartphones and have home and or work internet access. Only a few use public internet because of privacy concerns. They like having information at their disposal and having the ability to work remotely and collaborate. Most communications concerns dealt with poor connections, fewer provider choices, cost of the service, and inaccessibility of internet especially in the underserved communities. Most feel that communication would be better with lower service costs, better and faster internet, and more security. Some participants think that the service should be free or at least government subsidized. There was also the suggestion by some that it be treated as a utility because of it being essential in the current times and future.

These participants used Google Maps and Waze as their predominate **transportation-related cell phone apps**. However, they expressed concerns about accuracy of the mapping apps and poor connectivity when driving. A few participants said they use DART GoPass, Apple Car Play, and rideshare apps, like Lyft and Uber. They said communication and transportation interfaces could be better implemented with infrastructure improvements, app-to-app connectivity, and operational consistency.

Changes that have affected participants because of the **pandemic** include more tele-medicine, working remotely, ordering more online, more virtual meetings and overall, less social interaction.

This group seemed to have the largest number of attendees who might be considered early adopters of **future transportation technologies** in theory. This group rated the future transportation technologies concepts the highest (see Appendix A). There was a high degree of enthusiasm for the more futuristic options, specifically about the Hyperloop, Automated Grocery Store Delivery and Automated (Self-driving) Paratransit Service. Connected Cars were the least regarded and least understood. A common concern of all the technologies was safety and not trusting the technologies would not be hacked. Other concerns include issues with slow and spotty internet services and dead zones. While many see a need for Automated

Paratransit Service, most feel this service would require some human assistance to be safe in this environment.



Note: A rating scale of 1-10 was used (10 being “strongly like” and 1 being “strongly dislike”). See Appendix A for detailed description of future transportation technologies discussed.

Rural

Counties: Hood/Johnson, Ellis/Kaufman, Parker/Wise, Ellis, Hunt/Rockwall

These focus group participants use their personal vehicle as their primary **mode of transportation** because it is the most convenient, given that options are more limited than in metro areas. A few participants listed walking and carpooling as a form of transportation. Uber was mentioned, but there are not as many Uber or other rideshare drivers in these remote areas. One participant takes the train at least once or twice per week, but the downside is it is a long drive to get to the train station. Most participants said the drawback to using a personal vehicle is the amount of traffic, condition of roads and cost of car maintenance. Participants from Hood/Johnson and Ellis/Kaufman focus groups said a big issue is the frequency of being held up by freight trains for long periods of time. These participants believe that travel would be better with more options like buses, trains, and ridesharing. Additionally, participants would like to see less construction, fewer cars on the roads and a train running along I-20 to get to the metro area.

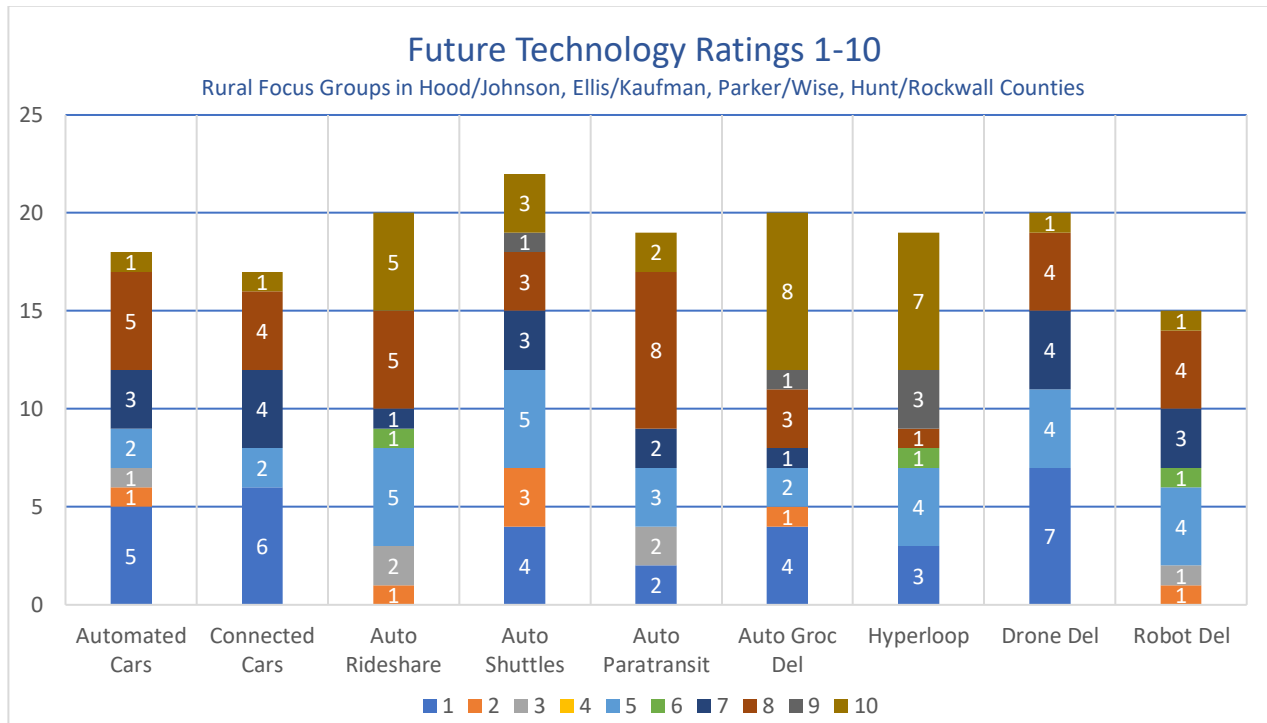
Most participants use their cell/smartphone and internet at home and work daily as their primary form of **communication** because it allows communication with people all over the country and they feel more connected to the world. Additionally, the accessibility, affordability, and availability are a plus. Some dislike

the overall cost of the service, very poor connections that make it difficult to work from home, internet outages that last for days and lack of hot spot reliability. Participants said life in these communities could be better with the following: chain convenience/gas stores like QT or RaceTrac; transportation for people without cars, the elderly and disabled; and better high-speed internet service like fiber-optics.

These participants predominate **transportation related cell phone apps** used are Google Maps and Waze. Participants like no longer needing paper maps, knowing where they are most of the time, the convenience and ease of use of apps and the improved lifestyle. They use rideshare apps Uber and Lyft the least except when on vacation. Many use DART GoPass and TollTag apps when they are in the DFW area. Participants' primary dislikes are having their whereabouts tracked by others, dead zones, having to push buttons while driving, no Uber in the area, and inaccuracy of some apps. The group felt communications apps could be better with improved availability, education on how to use apps, better accuracy and connectivity, dashboard apps integrated into every vehicle to minimize phone distractions, and more frequent updates.

Participants changed how they lived during the **pandemic** in many ways, such as more videoconferencing, working from home, less travel, avoiding crowds, walking more, more online shopping for groceries and food deliveries when possible, and telemedicine doctor appointments. Many of the pandemic changes accentuated the issues with internet service. A couple of the younger participants in these groups mentioned the feeling of isolation and their mental health was affected as relationship dynamics were changing. The ability to connect via Facetime and the internet was helpful.

The participants in these groups were not overly enthusiastic about the **Future Transportation Technologies**. The Automated Grocery Delivery and Hyperloop received the most positive ratings, but even with that, the reception was lukewarm. Other technologies consistently received low to average ratings with the primary concerns being of job loss, lack of control, safety, and security. Some participants were anxious for landowners who have land in Ellis and Kaufman areas if the Hyperloop runs from Dallas to Houston.



Note: A rating scale of 1-10 was used (10 being “strongly like” and 1 being “strongly dislike”). See Appendix A for detailed description of future transportation technologies discussed.

In general, these participants were uneasy about transportation and support services for senior citizens, those on Medicaid and non-English speakers.

Focus group highlights:

- (1) The Parker/Wise group included the oldest participant, a 95-year-old woman who drives a Silverado truck. She is excited about what the future holds. She is very active in her community. She frequently provides rides to medical appointments for the ‘elderly’ and delivers food to them because of a transportation need in Parker County.
- (2) The Ellis/Kaufman focus group had a participant with an advanced driver assistance system on her vehicle. She said that she is not ready to give as much control over to the vehicle as she could, but the function is there.

African American Groups

Counties: Dallas and Tarrant

Most participants use their personal cars as their primary **mode of transportation** and a few use buses and trains most often. Some participants said they use rideshare (3-4 times per year) and walk (1-2 miles per day). Participants use personal cars most often because of comfort, convenience, and reliability. The major dislikes about personal cars included traffic, cost for gas and maintenance, and an increase in road rage. Participants feel it would be better for the community if there was an improved transportation system, enough bus routes being closer, damaged roads, less construction, cheaper gas, ability to walk to trains and more accessibility for the physically challenged.

This group uses home internet and smartphones daily as their primary form of **communication**. Participants like using these communication forms because it keeps them connected to others, allows for greater productivity and working seamlessly; also, it is much easier to find information. The drawback of these services includes lack of connectivity of all devices controlled by one source, outages in the community, slow and spotty coverage in some areas, reduced speed during and since COVID, and it can make one lazy. There is a lot they dislike about the internet and phones, but understand they are necessary. The group feels internet and smartphones could be better with the following: better and cheaper Wi-Fi across the community, increased privacy, simplified use for older residents, training and in general more options for service.

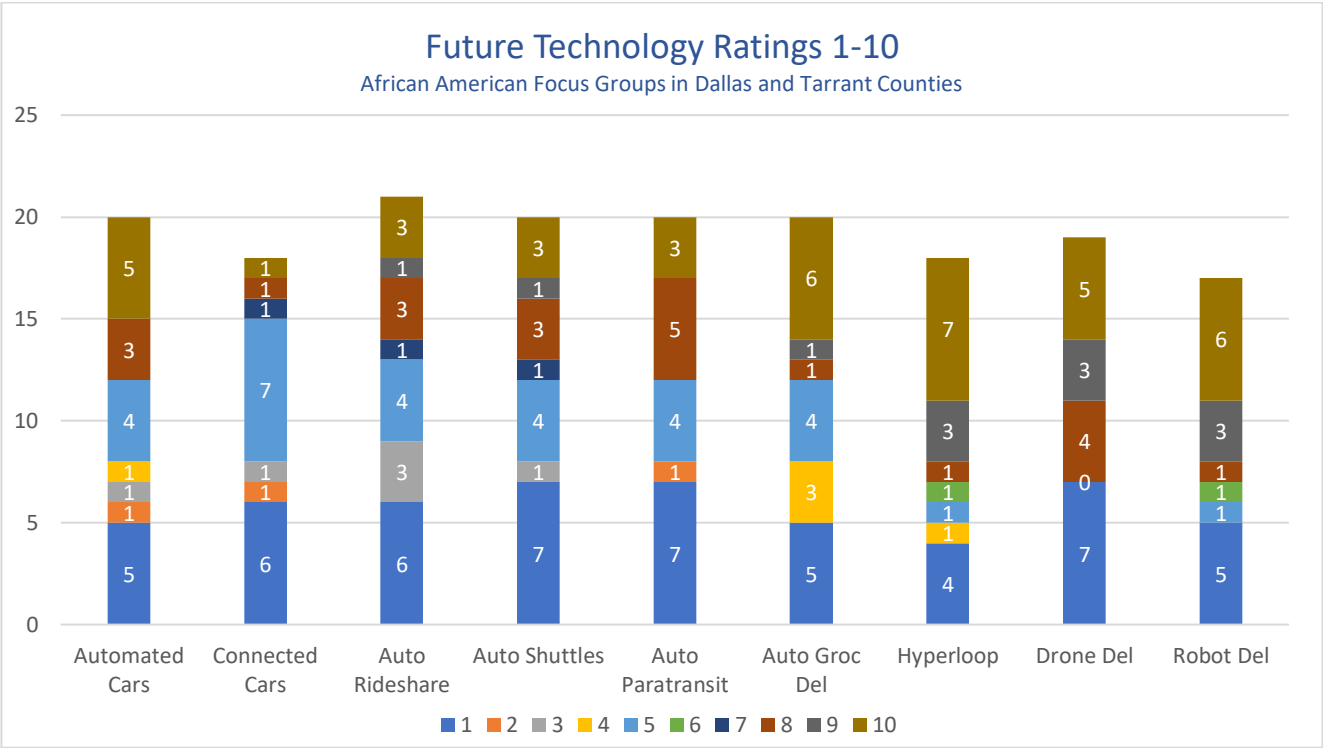
The group uses the following **transportation related cell phone apps** several times a day: Google Maps, Waze, Apple Car Play, Toll Tag, DART GoPass, Uber, Lyft, and mobile parking. Uber and Lyft are used less frequently. The group said the apps are useful for discounts and for checking prices rather than driving from store to store; it saves time and makes one more productive; convenient and allows access to the world. Some don't like phone apps but understand they are necessary; also, don't like remembering so many usernames and passwords. There are issues with service interruptions and downtime. There are also too many apps, and it takes too long to find them. Some mentioned more tutorials for using apps would be useful.

Many participants expressed there is a huge digital divide (disparity) between some communities. Cell phones could be better with more availability and easier usability for seniors and more widespread availability in general.

Participants said the **pandemic** has changed things for so many people including having to wear masks, more online medical appointments, having items delivered, less dining out, and a slower lifestyle. Some said they must use technology more and have become more dependent on the internet with virtual meetings and online school.

The Automated Grocery Delivery and Hyperloop are the **Future Transportation Technology** concepts that rated the highest with this group. While these technologies were rated the highest, there are still things the group dislikes, such as the impact on jobs with both technologies. There are concerns with the Hyperloop, such as costs associated with the project, disruption to the landscape, and safety concerns. The group did not necessarily like the other technologies and went so far as to state that they don't trust

Automated Cars and Connected Cars. This group also had a concern that those who could benefit the most from the future technologies will have the least access.



Note: A rating scale of 1-10 was used (10 being “strongly like” and 1 being “strongly dislike”). See Appendix A for detailed description of future transportation technologies discussed.

Hispanic/Latino Focus Groups

Counties: Dallas and Tarrant

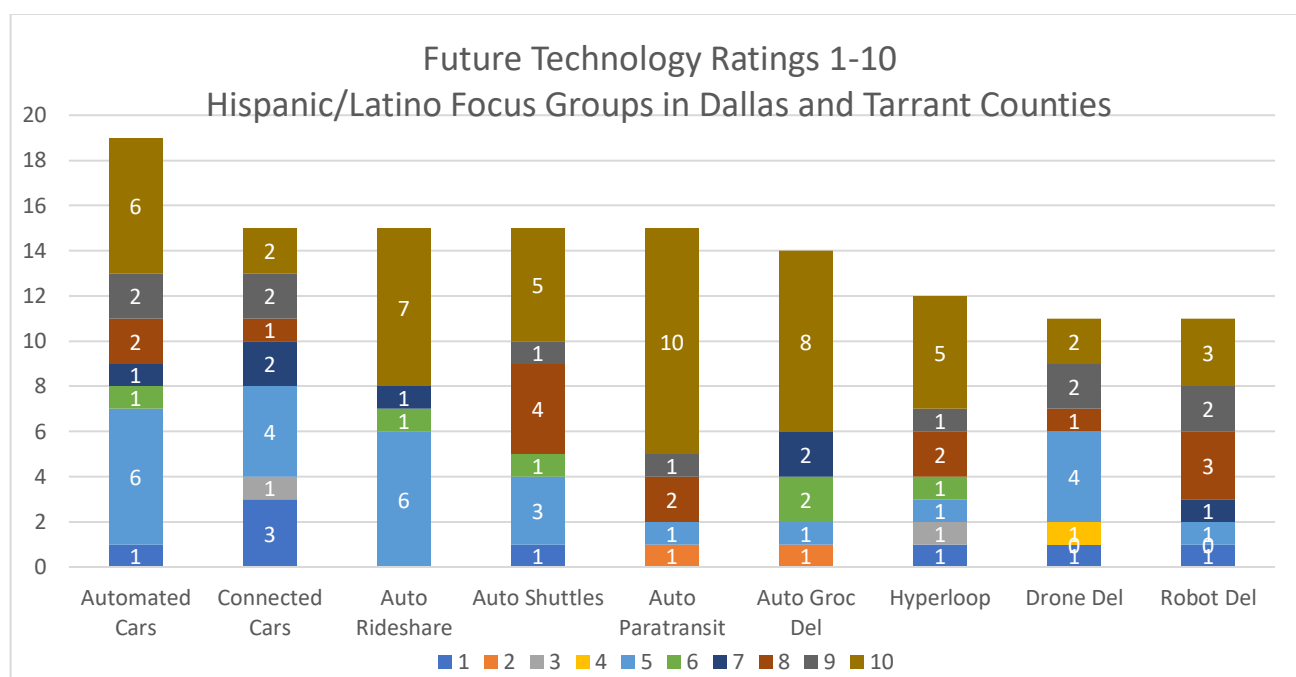
These participants use their personal cars more than any other **mode of transportation**, along with taxis, bikes, and some walking. The participants like using their personal cars daily because of convenience, reliability, the freedom to travel, and it allows independence. The things they do not like about using their personal cars are traffic, maintenance costs, gas prices, construction, and the unsafe way that others drive. Things that would make transportation better include better roads and routes, traffic light systems working more efficiently, solving infrastructure problems, more efficient mass transit and smaller buses, re-evaluate DART service/coverage, and less traffic.

These participants use the standard forms of **communications** like phone/smartphone, home, and work internet daily. They like these forms of communications because they are convenient, can connect with family, get tasks done fast and easily. Primary dislikes of these communications are sporadic disconnections, coverage is not enough, unwanted advertisements, spam calls and texts, technologies not easy to use, and expensive phone bills. Additional tower routes for good traffic patterns, improved security and privacy would make the whole process better.

The typical **transportation related phone apps** that are used most often are Google Maps, Waze, Apple Car Play, Uber, Lyft, Toll Tag, Mobile Parking, and OnStar. Some apps are used daily but others, like Uber, are only used when traveling. The things they like the most are easy, convenient to use in the car, reliability, allows connections to others, and cuts down on wait time while driving. Primary app dislikes are maps are not hands-free, inaccurate Google voice instruction, privacy, ads, people looking at phones while driving, loss of signal, and cost of services. The apps could be better by improving privacy, more map accuracy, reduced costs, more reliable apps, communication between apps, improved connections, more apps with voice commands, and app education.

The **pandemic** changed the way the group lives and travels many ways including more virtual events, no air travel, more online shopping, telemedicine, and working remotely. Some mentioned that they learned new applications with their children having online school, had no in-person church, fewer family gatherings, and saved more money.

The group's ratings for the **Future Transportation Technologies** did not indicate any overwhelming interest in any of the technologies. The Automated (self-driving) Paratransit Services and Automated Grocery Delivery received the highest ratings. They liked the fact that people with disabilities could have a way to get around but disliked the lack of human intervention. Many found the Hyperloop interesting and would consider that technology in the future to reduce travel time.



Note: A rating scale of 1-10 was used (10 being “strongly like” and 1 being “strongly dislike”). See Appendix A for detailed description of future transportation technologies discussed.

These participants expressed concern for those who might not be able to afford the services and the ability of apps being accurately translated into different languages. They also see the need for better public transportation accessibility, better bus safety and wait time in cities, and better public transportation in rural communities. Participants stated while technology is accepted, it is important not to get rid of jobs and human connections.

III. Plan

This plan included the NCTOG 12-County Dallas-Fort Worth Metropolitan Planning Area (MPA) that consists of Collin, Dallas, Denton, Ellis, Hood, Hunt, Johnson, Kaufman, Parker, Rockwall, Tarrant, and Wise Counties to ensure a representation of the DFW Region. This approach incorporated unique differences of the counties including transportation system operations and jurisdictions, and traditional characteristics (age, ethnicity, gender, etc.).

Methodology

CMI developed a comprehensive plan to capture the thoughts and opinions of the 83 participants from the Dallas Fort Worth MPA. This plan required the focus group team to identify locations in the community to hold the focus groups. CMI partnered with Chambers of Commerce, community organizations, and other stakeholder groups to coordinate community outreach efforts. Venues used for the focus groups included community rooms in Recreation Centers, an Art Gallery, a church fellowship hall, an office suite conference room, private school conference room, and City Council Chambers.

Twelve focus groups were held over a three-week period in October and November 2021. The focus groups were segmented by General Population, Rural, African American, and Hispanic/Latino.

Groups	Counties
General Population	Collin County Dallas County Denton County Tarrant County
Rural	Hood and Johnson Counties Ellis and Kaufman Counties Parker and Wise Counties Hunt and Rockwall Counties
Minority	Dallas County African American Group Dallas County Hispanic/Latino Group Tarrant County African American Group Tarrant County Hispanic/Latino Group

Locations

Focus group locations are detailed below.

Dates	Target Counties	Groups	Locations
<i>October 2021</i>	Collin	General	Caddo Office Reimagined Plano, TX
	Dallas	African American	St. Phillips Community School Dallas, TX
	Hood & Johnson	Rural	Cresson City Hall Meeting Chamber Cresson, TX
	Tarrant	African American	Fort Worth Central Station Fort Worth, TX
	Tarrant	General	Fort Worth Central Station Fort Worth, TX
<i>November 2021</i>	Dallas	General	Farmers Branch Recreation Center Farmers Branch, TX
	Dallas	Hispanic/Latino	Anita Martinez Recreation Center Dallas, TX
	Denton	General	Green Valley Baptist Church Aubrey, TX
	Ellis & Kaufman	Rural	Ennis Welcome Center Ennis, TX
	Parker & Wise	Rural	Springtown Courthouse Annex Springtown, TX
	Rockwall & Hunt	Rural	Rockwall Recreation Center Rockwall, TX
	Tarrant	Hispanic/Latino	Artes de la Rosa Fort Worth, TX

Counties

The focus group team extended invitations to residents from each county to participate in the focus groups using multiple communication and outreach methods that included social media, email blasts from Chambers of Commerce, Lions Clubs, college campus email blasts, shopping mall face-to-face invites and word of mouth. Residents from the following counties participated in the focus groups:

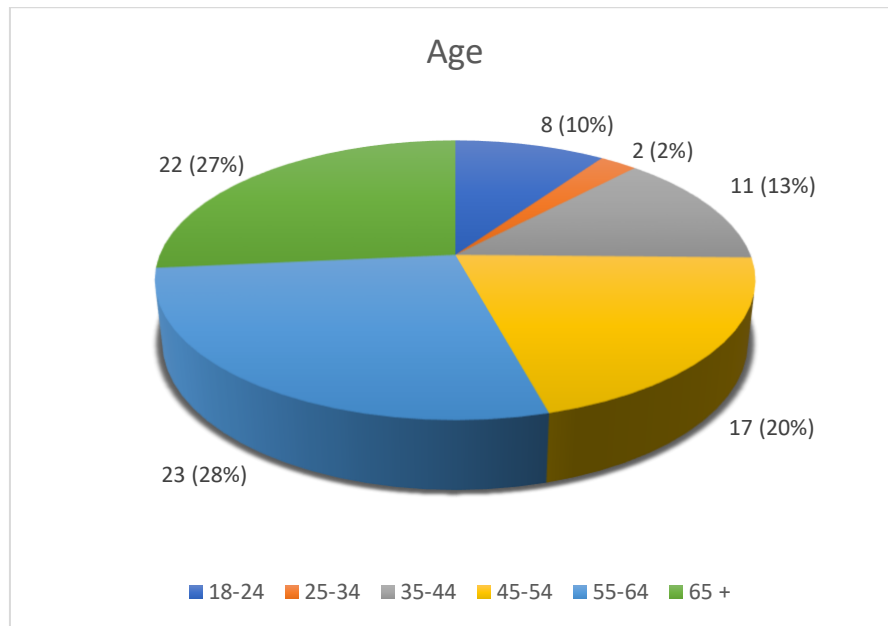
Collin	Hood
Dallas	Parker
Denton	Rockwall
Ellis	Tarrant

No residents from Hunt, Kaufman, Johnson, and Wise Counties participated despite the same communication and outreach methods used for the other counties. We recommend future focus groups be held in each rural county since the counties are large and widespread.

Demographics

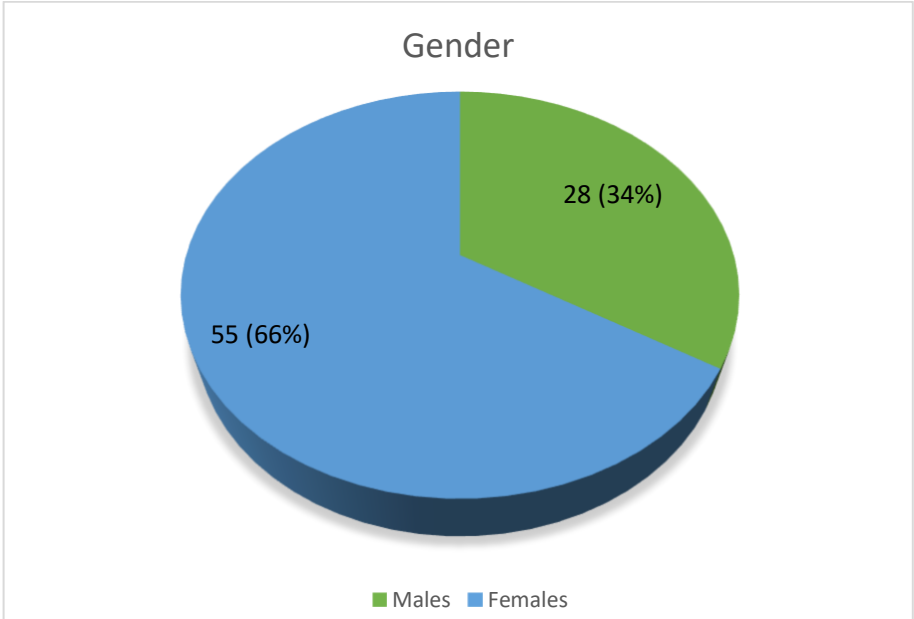
Age

Participants' ages ranged from 18 - 95 years. Five generations were represented in the focus groups: Gen Z (18 – 24 years), Millennials (25-40 years), Generation X (41-56 years), Baby Boomers II (57-66 years), Baby Boomers I (67 – 75 years), Silent (76 – 95 years).



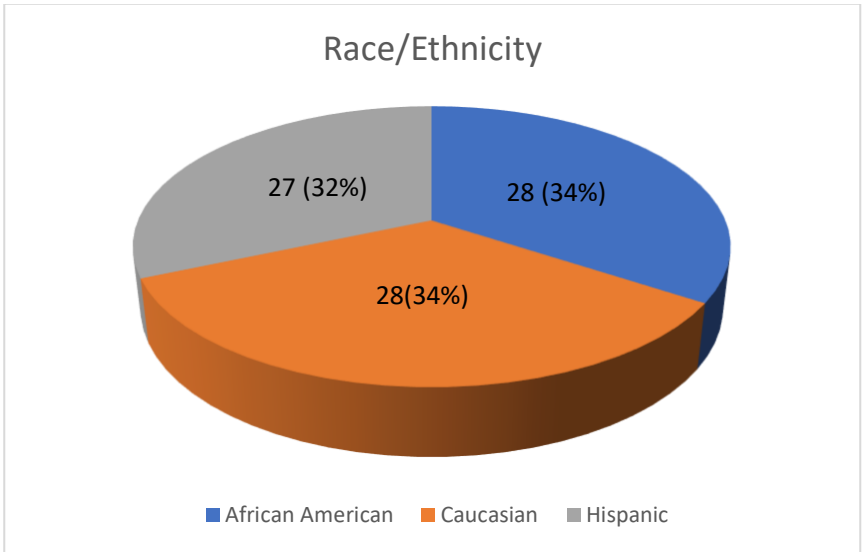
Gender

There were more women than men who elected to participate in the focus groups.



Race/Ethnicity

There was representation from all three target groups: Caucasians, African Americans, and Hispanics.



Questions

Transportation Technology- Now and in the Future

- What comes to mind when you hear the word **Transportation**?
- What comes to mind when you hear the words **Transportation in the Future**?
- What is one word or phrase that describes your **Automated Vehicles**?

Your Current Transportation Experiences and Needs

- What FORMS of TRANSPORTATION do you currently use to travel?
- What FORMS of COMMUNICATION do you currently use?
- What TYPE of TRANSPORTATION RELATED CELL PHONE APPLICATIONS (Apps) do you use?
- How has the pandemic changed the way you live and travel?

Future Transportation Technologies

- How would you rate future technologies?
- As technology continues to advance, which of these technologies would you and your household consider using in the future?
- If you could pick one thing to make your life easier with automated transportation, what would it be?
 - Automated Cars (partially or fully self-driving cars)
 - Connected Cars (cars that use the Internet to communicate with other cars and infrastructure)
 - Automated Ridesharing Services (e.g., UConner, Lyft, Uber) or Car
 - Sharing Services (e.g., Zipcar, Turo, Get Around)
 - Automated Self-Driving Shuttles
 - Automated Self-Driving Paratransit Services (e.g., for people with disabilities)
 - Automated Grocery Store Delivery
 - Hyperloop (high-speed train that travels through tubes)
 - Drone Delivery
 - Robot Delivery

IV. Conclusions/Recommendations

- These focus group results provide a deeper dive from a research/insight perspective on current, new, and emerging transportation technologies as it relates to three key stakeholder groups: General Population, Rural, Minority (African American and Hispanic).
- Information from these three segment groups, comparing similarities and differences between the groups is important to better understand the perspective of North Central Texas Region public communities is important for:
 - Recognizing regional opportunities for improving the quality of life in North Central Texas as it relates to transportation technologies and communication, especially in rural counties and underserved communities.
 - Designing more robust plans and programs to better meet the needs of public stakeholders in designated service areas.
- Focus group attendees said the time they spent time and knowledge/insight they gained from the focus groups was very helpful. The groups asked to receive some level of feedback on the focus group results.
- Look for ways to implement small changes to show the public that improvements are happening, and forthcoming.

V. Appendix A: Future Transportation Technologies Images

Focus group participants rated the following Future Transportation Technologies Images on how likely they would use or see the technologies as realistic in their lives.



A- Automated Cars (partly or fully self-driving cars)

B- Connected Cars (cars that use the Internet to communicate with other cars and infrastructure)

C- Automated Ridesharing Services (e.g., UConner, Lyft, Uber) or car-sharing services (e.g., Zipcar, Turo, Get Around)

D- Automated (Self-driving) Shuttles

E- Automated (Self-driving) Paratransit Services (e.g., for people with disabilities)

F- Automated Grocery Store Delivery

G- Hyperloop (high-speed train that travels through tubes)

H- Drone Delivery

I- Robot Delivery

VI. Appendix B: Focus Groups Supporting Comments

Focus group participants were divided into three primary groups: General Population, Rural, Minority. All participants were asked the same questions and their responses are reported by group.

General Population Focus Groups - Collin County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	• Vehicles • Cars, trucks, and trains • Buses and trains • Getting from one place to another
What comes to mind when you hear the words "Transportation in the Future"?	• Electric cars (2) • More accommodation • Future vehicles
What comes to mind when you hear the words "Automated Vehicles"?	• Non-gasoline cars (2) • Vehicles that operate themselves (2) • Scary

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? • Personal car (4) • Carpool • Ride share • Walk How often? • Multiple times throughout the day (2) • Every day (2) What do you LIKE about the forms of transportation you use? • Convenient (2) • Faster (2) • Available (2) • Reliable
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	• Comfortable • Can go where I need when I need What do you DISLIKE about the forms of transportation you use? • Cost (2) • Traffic • Toll fees What would make it better for you and others? • More access to public transportation (2) • Less traffic (2) • Less construction • Cheaper tolls
What FORMS of COMMUNICATION do you currently use?	What Forms of COMMUNICATION do you currently use to travel? • Smart phone (4) • Smart phone apps (3) • Blue Tooth (3) • Home Internet (3) • Work Internet How often? • Several times a day (3) • Every day What do you LIKE about the forms of communication you use? • Fast source of information (3) • GPS (2) • Staying connected with friends and family What do you DISLIKE about the forms of communication you use? • Poor connections, dead zones (3) • Lack of Privacy (2) • Spam What would make it better for you and others? • Faster internet

	• Better security • Better regulation of material on internet • More cell sites throughout city • People having patience with drivers who are not familiar with the area
What FORMS of TRANSPORTATION - RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? • Navigation apps (4) • Mobility as a Service apps (2) • Ride-hailing apps (2) • Vehicle applications platforms (2) • Smart Parking How often? • Every day (2) • Once a week (2) What do you LIKE about the apps you use? • They make getting around easier (2) • Accuracy • Convenience What do you DISLIKE about the apps you use? • Sometimes map directions are confusing (3) • Slow speed What would make it better for you and others? • Consistency among apps • Better speed on apps • Push notifications
How has the pandemic changed the way you live and travel?	• On-line doctor appointments (3) • Video conferencing (2) • Shopping on-line (2) • Working from home • Ordering groceries on-line • Using food delivery • Allowed us to become entrepreneurs

Community Opinions on Future Transportation Technologies

**Future
Technologies
Image Ratings**

*(Refer to
Appendix A to see
rating scale
images)*

Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE)

Rating = 10

- Automated cars (3)
- Automated paratransit services (3)
- Automated grocery store delivery (3)
- Hyperloop (3)
- Connected cars (2)
- Automated ridesharing services (2)
- Automated (self-driving) shuttles (2)
- Drone delivery (2)
- Robot delivery

Rating = 9

- Drone delivery (1)

Rating = 8

- No responses

Rating = 7

- No responses

Rating = 6

- No responses

Rating = 5

- Automated ridesharing services (1)
- Automated (self-driving) shuttles (1)
- Hyperloop (1)
- Robot delivery (1)

Rating = 4

- Robot delivery (1)

Rating = 3

- Automated cars (1)
- Connected cars (1)
- Automated paratransit services (1)
- Automated grocery store delivery (1)
- Hyperloop (1)

Rating = 2

- Automated cars (1)

Rating = 1

- Automated cars (1)
- Connected cars (1)

- Automated ridesharing services (1)

What do you LIKE about the future technology image?

A - Automated cars

- Transportation for those who don't drive (2)
- Makes multitasking easier

B - Connected cars

- Better communication (2)
- Safer

C - Automated ridesharing services

- Cheaper, faster, easier
- Provides transport for non-drivers

D - Automated (self-driving) Shuttles

- Can focus on other things while traveling
- On-time

E - Automated paratransit services

- Great help for disabled (3)

F - Automated grocery store delivery

- Good for elderly and those who can't get out of house (2)
- Skip the lines at the store

G - Hyperloop

- Faster, quick travel (4)

H - Drone delivery

- Faster (3)

I - Robot delivery

- Faster (3)

What do you DISLIKE about the future technology image?

A - Automated cars (partly or fully self-driving cars)

- Distrust of technology (2)
- Car can be controlled remotely

B - Connected cars

- Safety
- Unnecessary

C - Automated ridesharing services

- Maintenance issues
- Someone else in car might be sick

D - Automated (self-driving) shuttles

- No one there to control things in difficult situations (2)
- Loss of jobs
- Security

E - Automated paratransit services

- Mental health issues
- Security

F - Automated grocery store delivery

- May get wrong items (2)
- Quality of food

G - Hyperloop

- Safety (3)
- Fewer stops

H - Drone delivery

- Order may not be accurate
- May deliver to wrong house

I - Robot delivery

- Accuracy,
- Safety
- Technology errors

As technology continues to advance, which of these images would you and your household consider in the future?

- A - Automated Cars (2)
- B – Connected Cars (1)
- E - Automated Paratransit Services (1)
- G - Hyperloop (3)
- H - Drone Delivery (1)

If you could pick one thing to make your life easier with automated transportation, what would it be?

- A - Automated Cars – read or work while you travel
- G – Hyperloop

General Population Focus Groups - Dallas County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	● Getting to a location (3) ● Travel (3) ● Vehicle mobility (2) ● Car (2) ● Bus (2) ● Train ● Movement
What comes to mind when you hear the words "Transportation in the Future"?	● Electric cars (4) ● More readily accessible transportation (3) ● Self-driving cars (2) ● More technology ● Elevated train ● Bullet train ● Eco-friendly travel ● Flying Cars
What comes to mind when you hear the words "Automated Vehicles"?	● Self-driving cars (5) ● SUV (2) ● Increased safety ● Less personal public transportation ● Tesla ● Necessity

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? ● Personal Car (14) ● Train (3) ● Taxi/Ride-share (3) ● Walk (2) ● Carpool ● Bike How often?
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- Multiple times throughout day (6)
- Daily (4)
- Personal Car – Once a week , Several times a week (3)
- Taxi/Ride-share – Several times a year (3)
- Several times a year (2)
- Walk – Daily (2)
- Carpool – Several times a week (2)
- Train – Once a week
- Bike – Once a week

What do you LIKE about the forms of transportation you use?

- Go where I want when I want (6)
- Personal car – reliable (5)
- Convenient (4)
- Comfortable (3)
- Safe (2)
- Quick (2)
- Personal
- Train – reliable
- Safe
- Walk – quick
- Carpool – cost effective
- Companionship in car

What do you DISLIKE about the forms of transportation you use?

- Personal car – Cost (9)
- Traffic (5)
- Unsafe drivers (2)
- Carpool – schedule dependent upon other people (2)
- Unsafe roads
- Emission
- Construction
- Can't get directly to my destination

What would make it better for you and others?

- Personal car – being able to carpool (3)
- Better built vehicles
- Safer road
- Minimum speed limits enforced on highways
- Less construction
- Trains – metro system
- More accessibility

**What FORMS of
COMMUNICATION**

What Forms of COMMUNICATION do you currently use to travel?

do you currently use?

- Home Internet (12)
- Smart Phone (12)
- Smart Phone Apps (8)
- Blue tooth (7)
- Work Internet (4)
- Public Internet (4)
- Cell Phone without internet (3)

How often?

- Home Internet – Multiple times throughout day (7), Daily (5)
- Smart Phone – Daily (6), Multiple times throughout day (6)
- Smart Phone Apps – Daily (4), Multiple times throughout day (4)
- Blue Tooth – Daily (5)
- Multiple times throughout day (2)
- Multiple times throughout day (2)
- Several times a week (2)
- Public Internet – Daily
- Cell Phone without internet – Daily
- Work Internet – Daily

What do you LIKE about the forms of communication you use?

- Home Internet – Convenient (5)
- Smart Phone Apps – Convenient (4)
- Reasonable cost (3)
- Smart Phone – Convenient (3)
- Good connection (2)
- Blue Tooth – Convenient (2)
- Work Internet – Convenient (2)
- Public Internet – Convenient (2)
- Cell Phone without internet – Reasonable cost (2)
- Privacy, easy access, able to conduct a business from home
- Good connection
- Privacy
- Reasonable cost
- Easy to use
- Answers at fingertips
- Easy to use
- Good connection
- Easy access
- Consistent, convenient, able to connect with people

What do you DISLIKE about the forms of communication you use?

- Smart Phone – Lack of privacy and security (5)

	• Poor connections (4) • Home Internet – cost (4) • Poor connections (4) • Security and hacking concerns (3) • Lack of personal connection to others, advertisements • Cost (3) • Addiction to phone (3) • Work can reach me 24/7 What would make it better for you and others? • Smart Phone – more cell phone towers for better connectivity (5) • More cost efficient (4) • More security (4) • Improved security (4) • Home Internet – lower cost (2) • More accessible to more people • Smart Phone Apps – more user-friendly apps, no pop up adds • Cell Phone – people not using while driving
What FORMS of TRANSPORTATION-RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? • Navigation apps (14) • Ride-hailing apps (6) • Mobility as a Service Apps (5) • Vehicle application platforms (5) • Smart Parking Apps (5) • Door Dash (2) How often? • Navigation apps – daily , once a week , 1-3 times a month , multiple times throughout day (3), several times a week (6) • Mobility as a Service apps – multiple times throughout day (2), once a week , several times a week • Ride-hailing apps – several times a week (2), 1-3 times a month • Vehicle application platforms – daily (3), multiple times throughout day • Smart Parking apps –several times a week (2), once a week, several times a year • Door Dash – several times a week (2) What do you LIKE about the apps you use? • Navigation apps – knowing where I am going (5) • Easy to use (3)

	• Can check on traffic (2) • Knowing how long it will take (2) • Ride-hailing apps – easy to use (2) • Convenient • Mobility as a Service apps – convenient, easy to pay • Vehicle application platform - convenient, makes driving more entertaining, automatic connection to apple play • Smart Parking apps – ability to find a parking spot in crowded venues, convenient • Door Dash – having food delivered, convenient What do you DISLIKE about the apps you use? • Navigation apps – Inconsistent or incorrect information (3) • Not always user friendly (2) • Vehicle application platforms – not working consistently (2) • Security and virus concerns, poor connections, ads, doesn't allow for how long traffic will take • Mobility as a Service apps – not always easy to use • Ride-hailing apps – poor connections, security, and virus concerns • Pushing buttons while driving • Smart Parking apps – not always easy to use What would make it better for you and others? • Navigation apps – updated maps (3) • More user friendly (2) • Smart Parking apps – easier to use (2) • Work consistently, less ads, more precise communication and timing • Ride-hailing apps – better security • Vehicle application platforms – easier access, voice commands • Information on what apps is available and how to use them
How has the pandemic changed the way you live and travel?	• On-line doctor appointments (7) • Video conferencing (7) • Shopping on-line (6) • Less people interaction, visiting (4) • Work from home (3) • Attending school from home (3) • Walking (2) • Ordering groceries on-line (2) • Using food delivery (2) • Driving rather than using public transit (2) • Less travel • Less job opportunities and more restrictions

Community Opinions on Future Transportation Technologies

Future Technologies Image Ratings

(Refer to Appendix A to see rating scale images)

Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE)

Rating = 10

- Automated Cars (6)
- Automated paratransit (6)
- Automated grocery delivery (6)
- Robot delivery (5)
- Automated (self-driving) shuttles (4)
- Connected Cars (3)
- Ride sharing (3)
- Hyperloop (3)
- Drone delivery (3)

Rating = 9

- Automated Cars (1)
- Automated Ride sharing (1)
- Automated grocery delivery (1)

Rating = 8

- Hyperloop (3)
- Automated Cars (2)
- Connected Cars (2)
- Automated grocery delivery (2)
- Automated (self-driving) shuttles (1)
- Drone Delivery (1)

Rating = 7

- Automated grocery delivery (2)
- Drone delivery (2)
- Connected Cars (1)
- Automated ride sharing (1)
- Automated (self-driving) shuttles (1)
- Automated paratransit (1)
- Hyperloop (1)
- Robot delivery (1)

Rating = 6

- Robot delivery (4)
- Connected cars (2)
- Automated Cars (1)
- Automated ride sharing (1)
- Automated paratransit (1)

Rating = 5

- Automated ride sharing (5)
- Drone delivery (5)
- Connected cars (4)
- Automated (self-driving) shuttles (4)

- Automated Cars (3)
- Automated paratransit (2)
- Robot delivery (1)

Rating = 4

- Automated (self-driving) shuttles (1)
- Automated paratransit (1)

Rating = 3

- Connected cars (1)
- Automated ride sharing (1)
- Hyperloop (1)
- Drone delivery (1)

Rating = 2

- Automated Cars (1)
- Connected cars (1)
- Robot delivery (1)

Rating = 1

- Hyperloop (2)
- Automated ride sharing (1)
- Automated (self-driving) shuttles (1)
- Automated grocery delivery (1)
- Robot delivery (1)
- Drone delivery (1)

What do you LIKE about the future technology image?

A - Automated cars

- Convenient (3)
- Makes travel easier (2)
- Benefits timid drivers (2)
- Safer automated. Not having to worry about other drivers
- Can get rest before getting to destination

B - Connected cars

- Safer (5)
- Easier travel (2)
- Less traffic (2)
- Faster, better traffic flow
- May keep you from making mistakes that cause an accident

C - Automated ridesharing

- Convenient (3)
- Less expense for car maintenance
- Reliable, provides other options
- Safer
- Easier to get places,

- Not having to drive, drop off and pick up at curb

D - Automated (self-driving) shuttles

- Provides other options (2)
- Convenient (2)
- Safer
- Better for the environment
- Less expense

E - Automated paratransit services

- Provides opportunity for mobility for people who might not otherwise be able to get around (9)
- Convenient
- Less pollution

F - Automated grocery delivery

- Convenient (6)
- Easy (3)
- No people contact
- No waiting

G - Hyperloop

- Faster (9)
- Convenient (2)
- Cost effective (2)
- Reliable
- Eco-friendly
- Travel long distance in short time
- Won't increase traffic

H - Drone delivery

- Fast (5)
- Convenient (4)
- Easier to get items
- No people contact

I - Robot delivery

- Fast (3)
- Convenient (3)
- Easier to get items (2)
- Safer for packages
- No people contact

What do you DISLIKE about the future technology image?

A – Automated Cars

- Possible technology failure (6)
- Human error (2)
- Takes the fun out of driving
- Still requires human supervision

- Safety concerns
- Expensive
- Reliability

B – Connected Cars

- Possible technology failure (3)
- Safety concerns
- Lack of control
- May cause accidents
- Scary
- Relying on car and being distracted
- Security

C – Automated Ridesharing

- Cost (2)
- Service not being available when needed (2)
- Privacy and safety from other passengers (2)
- Not very convenient

D – Automated (self-driving) Shuttles

- Reliability (2)
- Lack of control
- Not available where I need to go
- Possible hacking
- Dependent on other people

E – Automated Paratransit Services

- Could leave someone stranded due to technical failure (5)
- Safety of impaired passengers (2)
- Cost of equipment

F – Automated Grocery Delivery

- Technical failures (3)
- Like to do my own shopping (3)
- Might take too long for delivery
- Loss of jobs

G – Hyperloop

- Cost (2)
- No drivers
- Not enough stops
- Risky
- Crowded
- May take up farm land

- Politics surrounding creation

H – Drone Delivery

- Technical failure (4)
- Noise from drone (2)
- Package could get lost
- Easy to steal package
- Lack of security

I – Robot Delivery

- Technical failure (3)
- Possible damage to package (2)
- Package could get lost
- Loss of jobs
- Expensive
- Less human interaction
- Loss of jobs

As technology continues to advance, which of these technologies would you and your household consider in the future?

- A – Automated Cars are easier (7)
- B – Connected Cars (3)
- C – Automated Ridesharing services (4)
- D – Automated (self-driving) shuttles (3)
- E – Automated Paratransit Services are a great opportunity for disabled (5)
- F – Automated Grocery Delivery (6)
- G – Hyperloop (8)
- H – Drone Delivery (7)
- I – Robot Delivery (5)

If you could pick one thing to make your life easier with automated transportation, what would it be?

- A – Automated Cars (6)
- B – Connected Cars
- E – Automated Paratransit
- G – Hyperloop (4)

General Population Focus Groups - Denton County

General Transportation Perspective

What comes to mind when you

- Bus
- Car
- Movement

hear the word “Transportation”?	
What comes to mind when you hear the words “Transportation in the Future”?	• Trains (3)
What comes to mind when you hear the words “Automated Vehicles”?	• Electric cars • Less fuel • Self-sustaining – very little human interaction

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? • Personal car (3) • Taxi • Train How often? • Car – several times a week What do you LIKE about the forms of transportation you use? • Cost effective (2) • Reliable (2) • Reasonable wait times (2) • Gets me to my destination • Convenient • Comfortable • No stress What do you DISLIKE about the forms of transportation you use? • Traffic (2) • Construction • Tolls What would make it better for you and others? • Realistic pricing (2) • Improved navigation through congestion
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	Expanded train routes
What FORMS of COMMUNICATION do you currently use?	What Forms of COMMUNICATION do you currently use to travel? - Home internet (2) - Smart phone (2) - Work internet - Cell phone - Blue tooth How often? - Home internet – multiple times throughout the day - Smart phone – multiple times throughout the day; several times a week - Work internet – multiple times throughout the day - Cell phone – multiple times throughout the day - Blue tooth – multiple times throughout the day What do you LIKE about the forms of communication you use? - Consistent (2) - Good privacy and security (2) - Reasonable cost - Useful for checking email, weather, and calendar What do you DISLIKE about the forms of communication you use? - Slow service - Limited-service choices - Poor customer service or poor training - Monitoring my time What would make it better for you and others? - Having a more simple phone (2) - Having different apps - More options for service - Reliability of service
What FORMS of TRANSPORTATION-RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? - Navigation apps (2) - Ride-hailing apps (2) - Vehicle application platforms - Mobility as a Service How often? If you don't use? - Limit use due to lack of storage space

	• Mobility as a Service – whenever I’m in the car • Ride-hailing apps – when traveling • Navigation apps – several times a month What do you LIKE about the apps you use? • Convenience (2) • Being able to get around when not familiar with an area • Variety of information and resources available • Auto pay ability What do you DISLIKE about the apps you use? • Dead zones • Technical malfunctions • Takes up a lot of cloud space What would make it better for you and others? • Shopping on-line (2) • Better reliability
How has the pandemic changed the way you live and travel?	• Order groceries on-line • On-line doctor appointments • Working from home • Church on-line • Limit the places I go

Future Technologies Image Ratings	Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE)
<i>(Refer to Appendix A to see rating scale images)</i>	Rating = 10 - Automated paratransit services (2) - Automated grocery delivery (2) - Connected cars (1) - Automated ridesharing services (1) - Automated (self-driving) shuttles (1) - Robot delivery (1)
	Rating = 9 No responses
	Rating = 8 - Automated ridesharing services (1) - Automated paratransit services (1) - Robot delivery (1)
	Rating = 7 Automated ridesharing services (1)
	Rating = 6 No responses
	Rating = 5 - Automated cars (2) - Hyperloop (2) - Automated (self-driving) shuttles (1) - Drone delivery (1)
	Rating = 4 No responses
	Rating = 3 No responses
	Rating = 2 No responses
	Rating = 1 - Automated cars (1) - Automated (self-driving) shuttles (1) - Automated grocery delivery (1)
	What do you LIKE about the future technology image?

A – Automated Cars

- Easier to see what is behind you when backing up
- Better for disabled or handicapped persons

B – Connected Cars

- Safety

C - Automated Ridesharing services

- Availability, ease,
- Cost

D - Automated (self-driving) shuttles

- No responses

E – Automated Paratransit Services

- Makes life simpler for special needs people

F – Automated grocery delivery

- Comfort, ease

G – Hyperloop
Speed

H – Drone Delivery

- Convenience

I – Robot Delivery

- Convenience (2)

What do you DISLIKE about the future technology image?

A – Automated Cars

- Distrust the technology
- Malfunctions (2)

B – Connected Cars

- Not comfortable with this, could be misused

C - Automated Ridesharing Services

- No responses

D - Automated (self-driving) Shuttles

- Not comfortable with safety

E – Automated Paratransit Services

- Would still need someone to assist the handicapped if needed

F – Automated grocery deliver

- Prefer to select own food (2)

G – Hyperloop

- Unproven technology

H – Drone Delivery

- Not sure of effectiveness, safety
- Technology problems
- Loss of jobs

I – Robot Delivery

- Technology failures
- Loss of jobs
- No human interaction

As technology continues to advance, which of these images would you and your household consider in the future?

- A - Automated Cars
- B – Connected Cars
- C – Automated Ridesharing services
- E – Automated Paratransit Services
- H – Drone Delivery
- I – Robot Deliver – (2)

If you could pick one thing to make your life easier with automated transportation, what would it be?

- A - Automated Cars (2)
- G - Hyperloop/Trains

General Population Focus Groups - Tarrant County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	• Travel or moving from one place to another (3) • Rail • Mass transit
What comes to mind when you hear the words "Transportation in the Future"?	• More technology (2) • Mass Transit • Rail • Less vehicles on the road • The Jetsons
What comes to mind when you hear the words "Automated Vehicles"?	• Transportation requiring no driver or little to no human interaction (2) • Mass transit • Rail • Electric cars

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? • Personal Car (6) How often? • Multiple times a day (3) • Every day (2) • Several times a week What do you LIKE about the forms of transportation you use? • Get to my destination (2) • I can personalize my travel and destination • Reliable • Comfortable • Get me to my destination without waiting on someone else
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	What do you DISLIKE about the forms of transportation you use? • Traffic (6) • Cost (3) • Other driver's actions What would make it better for you and others? • More people using mass transit or rideshare (5) • Lower cost • Better synchronization of traffic signals
What FORMS of COMMUNICATION do you currently use?	What Forms of COMMUNICATION do you currently use to travel? • Home Internet (5) • Smart phone (5) • Bluetooth (3) • Cell phone without internet (2) • Work internet • Public internet How often? • Multiple times a day (3) • Daily (2) • Several times a week What do you LIKE about the forms of communication you use? • Consistent (3) • Good connection • Virtual appointments so I don't physically have to be present • Reasonable cost • Privacy and security • Instant information What do you DISLIKE about the forms of communication you use? • Poor connectivity (3) • Lack of human interaction (2) • Cost • Slow speed • Drivers texting and driving What would make it better for you and others? • Improved privacy and security (2) • People using safely while driving (2) • People putting their phones away and interacting • Better transmission

What FORMS of TRANSPORTATION-RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? • Navigation apps (6) • Ride-hailing apps (5) • Mobility as a Service apps (4) • Smart Parking apps (3) • Vehicle application platforms (2) • Food delivery How often? If you don't use? • Daily (4) • Multiple times per day • Several times a week What do you LIKE about the apps you use? • Convenience (2) • Ease of access (2) • Safety, less physical contact (2) • Time saving • Better informed • Fun to be able to see around the world in an instant What do you DISLIKE about the apps you use? • Lack of connectivity in some areas (2) • Poor technology on some apps (2) • Some apps do not allow automated update What would make it better for you and others? • Education or information on how to use (2) • Continuous updates • Ways to block cyber bullying or accessibility (2)
How has the pandemic changed the way you live and travel?	• Working from home (4) • Shopping online (4) • Online doctor appointments (2) • Video conferencing (2) • Ordering groceries online (2) • Food delivery • Driving rather than taking public transit • More aware of surroundings and people around me (2)

**Future
Technologies
Image Ratings**

*(Refer to
Appendix A to see
rating scale
images)*

Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE)

Rating = 10

- Hyperloop (5)
- Robot delivery (4)
- Automated ride sharing (3)
- Automated grocery delivery (3)
- Drone delivery (3)
- Automated Cars (2)
- Automated shuttle (2)
- Connected cars (1)
- Automated paratransit (1)

Rating = 9

- Automated paratransit (1)

Rating = 8

- Automated Cars (2)
- Automated shuttle (2)
- Connected cars (1)
- Drone delivery (1)
- Robot delivery (1)

Rating = 7

- Automated ride sharing (1)
- Automated grocery delivery (1)

Rating = 6

- Automated Cars (1)
- Automated ride sharing (1)
- Automated shuttle (1)

Rating = 5

- Connected cars (2)
- Automated paratransit (2)
- Automated grocery delivery (2)
- Automated Cars (1)
- Automated ride sharing (1)
- Automated shuttle (1)
- Hyperloop (1)

Rating = 4

- No responses

Rating = 3

- No responses

Rating = 2

- No responses

Rating = 1

- Connected cars (2)
- Automated paratransit (1)
- Drone delivery (1)

What do you LIKE about the future technology image?

A – Automated Cars

- Less traffic
- Ability to multi-task
- Safer, smarter driving

B – Connected Cars

- Smarter decisions

C – Automated Ridesharing Services

- Convenience (3)
- Cost efficient
- Availability

D – Automated Shuttle

- Safer (2)
- Convenience
- More access (3)
- Ability to control

E – Automated Paratransit Services

- Provides accessibility and independence for a population group (3)
- Need more services like this

F – Automated Grocery Delivery

- Convenience (2)
- Less traffic (2)
- No crowds in store
- Trackable
- Saves on gas
- Safer

G – Hyperloop

- Speed (4)
- Efficient
- Modern
- Safe

H – Drone Delivery

- Safer (2)

- Smarter,
- New jobs
- Faster

I – Robot Delivery

- Safer (2)
- Less people handling
- Reliable

What do you DISLIKE about the future technology image?

A – Automated Cars

- Subject to human error (2)
- Mechanical failure

B – Connected Cars

- Safety hazards due to connectivity (2)
- Strain on internet
- Human error possibility
- Data tracking

C – Automated Ridesharing Services

- Drivers are not always good drivers
- Cost
- Possibility of breakdown or no-show

D – Automated Shuttle

- Potential mechanical failure (2)
- Puts humans out of work

E – Automated Paratransit Services

- No physical assistance for those who might need some (3)
- Possible emergency event
- May not be dependable

F – Automated Grocery Delivery

- Scheduling not always accurate
- Items not always as ordered

G – Hyperloop

- Derailing (2)
- Cost and accounting of funds
- Scar
- Lack of access

H – Drone Delivery

- Transmission difficulties
- Would not like my groceries flying in the air

- Not enough use

I – Robot Delivery

- Technical difficulties
- Not largely available
- Cost
- Possibility of hacking

As technology continues to advance, which of these images would you and your household consider in the future?

- A – Automated Cars (2)
- B – Connected Cars
- C – Automated Ridesharing services (2)
- D – Automated (self-driving) shuttles (4)
- E – Automated Paratransit Services (2)
- F – Automated Grocery Delivery (2)
- G – Hyperloop (3)
- H – Drone Delivery (4)
- I – Robot Delivery (4)
- Convenience, safety, reliability, lack of human error

If you could pick one thing to make your life easier with automated transportation, what would it be?

- A - Automated Cars
- G - Hyperloop (2)

Minority Focus Groups (African American) - Dallas County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	● Movement (2) ● Buses (2) ● Trains ● Cars ● How to get around in vehicles
What comes to mind when you hear the words "Transportation in the Future"?	● Faster, high speed movement (2) ● Space travel ● What transportation vehicles will look like in the future
What comes to mind when you hear the words "Automated Vehicles"?	● Vehicles without drivers (2) ● High technology vehicles ● Something out of this world, flying class ● Destruction because of lack of person to control

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? ● Personal car (3) ● Bus (2) ● Train (2) ● Walk ● Carpool
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	How often? • Personal Car – Multiple times throughout day (2) • Bus – Several times a week • Train – Several times a week • Walk – Daily • Carpool – Several times a week What do you LIKE about the forms of transportation you use? • Comfortable (4) • Reliable (3) • Safe (3) • Get me to my destination (2) • Cost Effective What do you DISLIKE about the forms of transportation you use? • Not enough bus availability close by (3) • Traffic • Cost of gas, upkeep, and insurance What would make it better for you and others? • More options for mass transit (3) • Closer bus routes (2) • Cheaper gas • Less traffic
What FORMS of COMMUNICATION do you currently use?	What Forms of COMMUNICATION do you currently use to travel? • Cell phone w/o internet (4) • Home Internet (3) • Smart Phone apps (2) • Blue Tooth (2) • Work Internet • Smart Phone How often? • Multiple times throughout day (3) • Multiple times throughout day (2) • Blue Tooth – Multiple times throughout day (2) • Smart Phone – Multiple times throughout day • Smart Phone apps – Multiple times throughout day • Work Internet- Multiple times throughout day • Home Internet – Daily • Cell phone w/o internet - Daily

	What do you LIKE about the forms of communication you use? • Ability to be connected to work and friends/family (2) • Ability to work from home • Privacy and security What do you DISLIKE about the forms of communication you use? • Inconsistent connection (2) • Cost (2) • People having immediate access to you What would make it better for you and others? • Greater availability to more people (2) • Lower cost • Better privacy and security
What FORMS of TRANSPORTATION-RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? • Navigation apps (2) • Smart Parking apps (2) • Never use any (2) • Vehicle application platforms • Mobility as a Service apps • Ride-hailing apps • Food Delivery apps How often? • Navigation apps – Several times a week • Multiple times throughout the day • Smart Parking apps - Several times a week • Multiple times throughout the day • Vehicle application platforms - Several times a week • Mobility as a Service apps – Several times a week • Ride-hailing apps – Several times a week • Food delivery apps – Several times a week What do you LIKE about the apps you use? • Easy (2) • Saves time, productivity • Automatic application

	What do you DISLIKE about the apps you use? • Lack of security • Time it takes to download • Rerouting What would make it better for you and others? • Lower costs • 100% accuracy
How has the pandemic changed the way you live and travel?	• Video conferencing (2) • More frequent use of technology (2) • Working from home (2) • On-line doctor appointments (2) • Not able to see friends • Don't go out to eat, use pick-up instead • On-line shopping • Driving rather than using public transit • Increased productivity

Community Opinions on Future Transportation Technologies

Future Technologies Image Ratings <i>(Refer to Appendix A to see rating scale images)</i>	Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE) Rating = 10 • Hyperloop (2) • Robot delivery (2) • Automated grocery delivery (1) • Drone delivery (1) Rating = 9 • No responses Rating = 8 • Automated ridesharing services (1) • Automated grocery delivery (1) • Drone delivery (1)
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Rating = 7

- No Responses

Rating = 6

- Robot delivery (1)

Rating = 5

- Connected cars (1)
- Automated ridesharing services (1)
- Automated paratransit services (1)
- Automated grocery delivery (1)
- Hyperloop (1)

Rating = 4

- Automated cars (1)

Rating = 3

- Automated cars (1)
- Connected cars (1)

Rating = 2

- Automated paratransit services (1)

Rating = 1

- Automated shuttle (3)
- Automated cars (2)
- Connected cars (2)
- Automated ridesharing services (2)
- Automated paratransit services(2)
- Drone delivery (2)
- Automated grocery delivery (1)
- Hyperloop (1)
- Robot delivery (1)

What do you LIKE about the future technology image?

A – Automated Cars

- Letting someone else do the driving (2)
- Safety

B – Connected Cars

- Availability to connect with others

C – Automated Ridesharing Services

- Safer
- Convenient

D – Automated (self-driving) Shuttles

- Would be good in as long as it doesn't hit anyone

E – Automated Paratransit Services

- Helpful to impaired or elderly

F – Automated Grocery Store Delivery

- Don't have to shop for yourself
- Helpful to the disabled

G – Hyperloop

- Faster
- Good for long trips
- More time to travel

H – Drone Delivery

- Faster deliveries
- Ability to stay home

I – Robot Delivery

- Faster deliveries
- Ability to stay home

What do you DISLIKE about the future technology image?

A – Automated Cars

- Safety (2)
- Possible technology malfunction

B – Connected Cars

- Internet inconsistency (2)
- Many cars may be involved if there is an accident

C – Automated Ridesharing Services

- Safety
- Need for disinfecting, having to trust unknown drivers

D – Automated (self-driving) Shuttles

- System malfunctions (2)
- Safety

E – Automated Paratransit Services

- Safety in case of a malfunction or problem (3)
- Loss of jobs

F – Automated Grocery Store Delivery

- Possibility of people harming your food

G – Hyperloop

- Safety

H – Drone Delivery

- Accuracy of order
- Loss of jobs

I – Robot Delivery

- Loss of jobs

As technology continues to advance, which of these images would you and your household consider in the future?

- C – Automated Ridesharing services
- F – Automated Grocery Store Delivery (2)
- G – Hyperloop, ability to travel more
- H – Drone Delivery
- I – Robot Delivery

If you could pick one thing to make your life easier with automated transportation, what would it be?

- E – Automated Paratransit Services
- H – Drone Delivery
- I – Robot Delivery

Minority Focus Groups (African American) - Tarrant County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	• Moving people from one location to another (4) • Public transportation (buses, trains, taxis) (2) • Ways to get around (2) • Planes (2) • Cars • Trains • Travel • Gas money and bus passes
What comes to mind when you hear the words "Transportation in the Future"?	• Fast, high-speed transport (7) • High speed trains (4) • Electric transport • Subways • Light Rail • Computer driven • Space travel
What comes to mind when you hear the words "Automated Vehicles"?	• Driverless vehicles (12) • Trains • Comfort • Reliability • Crazy • Electric cars

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? • Personal Car (14) • Taxi/Ride-share (2) • Walk (3) • Plane
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How often?

- Personal Car – Daily , Several times a week (2), multiple times throughout the day (11)
- Taxi/Ride-share – Several times a week , Several times a year
- Walk – 1 to 3 times a month (2), Daily
- Plane – Several times a year

What do you like about the forms of transportation you use?

- Comfortable (8)
- Reliable (7)
- Safe (4)
- Convenient (4)
- Can customize my route (2)
- Cost effective (2)
- Gets me to my destination (2)
- No wait time (2)
- Private
- Ability to contact someone for help if in an accident
- ADA friendly
- Independence
- Only means available
- Nice opportunity for “self-time”

What do you DISLIKE about the forms of transportation you use?

- Cost (11)
- Fear of safety/road rage (4)
- Traffic (4)
- Liability (2)
- Stress of driving
- Not always being able to park close to entry

What technology would make it better for you and others?

- Less expensive gas and maintenance (3)
- Not having to drive or having personal driver (2)
- Better neighborhood bus stop design
- Nearby pick up/drop off for public transport (2)
- Transport during high traffic times that is comfortable, safe, has reasonable cost and Wi-Fi
- Vehicles that were made to last longer
- Designated parking everywhere I go
- Less construction and better roads

What FORMS of
COMMUNICATION
do you currently
use?

What Forms of COMMUNICATION do you currently use to travel?

- Home Internet (12)
- Smart Phone (12)
- Smart Phone Apps (7)
- Public Internet (6)
- Work Internet (4)
- Blue Tooth (4)
- Cell Phone without internet (3)

How often?

- Multiple times throughout day (24)
- Smart Phone Apps – Daily (2)
- Public Internet – Daily (2)
- Multiple times throughout day (2)
- Work Internet – Several times a week
- Several times a week
- Cell Phone without internet – Daily
- Smart Phone –Several times a week
- Multiple times throughout day
- Blue Tooth – Daily
- Home Internet – Daily

What do you LIKE about the forms of communication you use?

- Easy to find and research information (3)
- Convenience (3)
- Privacy and security (3)
- Consistent (3)
- Fast (2)
- Good connection (2)
- Able to connect to family and friends (2)
- Ability to control my appliances
- Reasonable cost
- Ability to be productive and work seamlessly
- Can pay bills and move money around

	What do you DISLIKE about the forms of communication you use? • Poor connection (5) • Ease for hackers to attack (2) • Cost (2) • Makes you lazy • Need for updates • Not as personal • Addictive • It can take you places you don't want to go • Inconsistent • Lack of privacy What would make it better for you and others? • More accessibility across community with higher speed (7) • Lower cost (6) • More consistency (2) • Privacy (2) • Security (2)
What FORMS of TRANSPORTATION-RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? • Navigation apps (14) • Vehicle application platforms (9) • Mobility as a Service apps (7) • Ride-hailing apps (4) • Smart Parking apps (4) • Food Delivery apps How often? • Navigation apps – Once a week , daily (2), 1-3 times a month (2), Several times a week (2), Multiple times throughout day (5) • Vehicle application platforms - Daily (2), Several times a week , 1-3 times a month , Multiple times throughout day (5) • Mobility as a Service apps – Several times a week , 1-3 times a month , Multiple times throughout day (4) • Ride-hailing apps – Several times a week , 1-3 times a month , Multiple times throughout day • Smart Parking apps – Several times a week (2), Daily • Food Delivery apps – Several times a week

	What do you LIKE about the apps you use? • Convenient (5) • Fast, accurate information (3) • Increased access to world (2) • Coupons and discounts (2) • Time saving (2) • Productivity • Reliable • Dependable • Don't worry about getting lost What do you DISLIKE about the apps you use? • Being tracked or hacked, security (3) • Can be difficult to navigate (2) • Inaccurate information (2) • People stopped learning to read maps • They can crash or freeze • Having to remember passwords • Service interruptions • On-line purchasing failures • Storage requires upgraded phone equipment What would make it better for you and others? • Easier to use (3) • Being more accessible to more people/bridge digital divide (2) • More accessible tutorials • Being able to reserve ride-share for a specific time in order to do multiple errands • Voice directed apps • Having only 3-4 apps that can do everything • 100 % accuracy • Lower cost
How has the pandemic changed the way you live and travel?	• Limited travel (5) • On-line doctor appointments (4) • Video conferencing (4) • Shopping on-line (3) • More Walking (2) • Food Delivery (2) • Work from home (2) • Driving rather than using public transport • Too many new rules • Everything takes longer – getting passport, birth certificate, etc. • Can't visit friends in their homes • More dependent on internet

Community Opinions on Future Transportation Technologies

Future
Technologies
Image Ratings

*(Refer to
Appendix A to see
rating scale
images)*

Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE)

Rating = 10

- Hyperloop (5)
- Automated cars (4)
- Automated grocery delivery (4)
- Automated ridesharing services (3)
- Drone delivery (3)
- Connected cars (2)
- Automated (self-driving) shuttles (2)
- Robot delivery (2)
- Automated paratransit services (1)

Rating = 9

- Hyperloop (2)
- Drone delivery (2)
- Robot delivery (2)
- Automated ridesharing services (1)
- Automated shuttle (1)
- Automated grocery delivery (1)

Rating = 8

- Automated paratransit services (4)
- Automated cars (3)
- Automated shuttle (3)
- Automated ridesharing services (2)
- Drone delivery (2)
- Connected cars (1)
- Hyperloop (1)
- Robot delivery (1)

Rating = 7

- Drone delivery (2)
- Connected cars (1)
- Automated ridesharing services (1)
- Automated shuttle (1)

Rating = 6

- Hyperloop (1)

Rating = 5

- Connected cars (5)

- Automated cars (3)
- Automated paratransit services (3)
- Automated grocery delivery (3)
- Automated ridesharing services (2)
- Automated shuttle (2)
- Robot delivery (2)

Rating = 4

- Automated shuttle (1)
- Hyperloop (1)

Rating = 3

- Automated ridesharing services (3)
- Automated grocery delivery (2)
- Automated cars (1)
- Connected cars (1)
- Automated shuttle (1)

Rating = 2

- Automated cars (1)
- Connected cars (1)
- Automated paratransit services (1)
- Automated grocery delivery (1)
- Hyperloop (1)

Rating = 1

- Automated paratransit services(5)
- Connected cars (4)
- Drone delivery (4)
- Robot delivery (4)
- Automated ridesharing services (3)
- Automated shuttle (3)
- Automated grocery delivery (3)
- Automated cars (2)
- Hyperloop (2)

What do you LIKE about the future technology image?

A – Automated Cars

- Safer (2)

- Increased flexibility
- Convenient
- Less stress
- Ability to multi-task
- Could reduce likelihood of drunk driver

B – Connected Cars

- Safety (2)
- Ability to communicate between vehicles (2)
- Improved traffic flow (2)
- Convenient

C – Automated Ridesharing Services

- Cost effective (2)
- No worries about driving or parking, safer
- Convenient
- No dependence on human availability

D – Automated (self-driving) Shuttles

- No worries about driver error or ability (2)
- Less traffic, increases accessibility (2)
- Environment efficiency

E – Automated Paratransit Services

- Expanded access for disabled (3)
- Decreases human error
- Don't need a driver

F – Automated Grocery Store Delivery

- Helpful for elderly or disabled (4)
- Convenient (3)
- Not having to leave home or go to the store (3)
- Efficient
- Predictable delivery schedule
- No need to hire a driver

G – Hyperloop

- Get me there faster (4)
- More travel options (2)
- Less traffic (2),
- Less stress

- Less pollution

H- Drone Delivery

- Convenient (2)
- Safe (2)
- Fast (2)
- Effective
- Futuristic
- Like having an assistant, improved accuracy

I – Robot Delivery

- Safe (2)
- Fast (3)
- No worries about delivery person
- Convenient
- Wouldn't have to go anywhere

What do you DISLIKE about the future technology image?

A – Automated Cars

- Safety concerns (4)
- Possible malfunctions (3)
- Lack of control (2)
- Drivers won't fully engage car's capability,
- Inability to react to things not programmed

B – Connected Cars

- Technical errors or malfunction (5)
- Possibility for hacking or malice (2)
- Safety issues

C – Automated Ridesharing Services

- Lack of control (3)
- Safety issues (3)
- Technical malfunction
- Reduces spontaneity
- Inconvenience

D – Automated (self-driving) Shuttles

- Technical malfunction (5)
- Safety (2)

- Lack of control

E – Automated Paratransit

- Possible need for human assistance (8)
- Safety concerns (4)

F – Automated Grocery Store Delivery

- Don't trust others to pick same quality (3)
- Loss of jobs (3)
- Accuracy (2)
- Security

G – Hyperloop

- Increased possibility of accidents at high speed (2)
- Safety (2)
- Expensive
- Disruptive to landscape and environment
- impact on jobs

H- Drone Delivery

- Crowded skies (4)
- Job impact (2)
- Accuracy of orders
- Inability to transport items over certain weight

I – Robot Delivery

- Impact on traffic (3)
- Tampering or hacking (3),
- Impact on jobs (2)
- Accuracy of orders

As technology continues to advance, which of these images would you and your household consider in the future?

- A – Automated Cars - safety, and less stress (5)
- B – Connected Cars
- C – Automated Ridesharing services (2)
- D – Automated (self-driving) shuttles (2)
- E – Automated Paratransit Services
- F – Automated Grocery Store Delivery (5)
- G – Hyperloop - faster travel options (11)
- H- Drone Delivery – increased speed of delivery (4)
- I – Robot Delivery - fast, not needing to go to the store (11)
- Fear that those who could benefit the most from these options will have the least access

If you could pick one thing to make your life easier with automated transportation, what would it be?

- A – Automated Cars (2)
- D – Automated (self-driving) shuttles (2)
- E – Automated Paratransit Services
- F – Automated Grocery Store Delivery (2)
- G – Hyperloop
- I – Robot Delivery

Minority Focus Groups (Hispanic/Latino) - Dallas County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	● Getting from one place to another (4) ● Public Transportation (2) ● Infrastructure
What comes to mind when you hear the words "Transportation in the Future"?	● Electric vehicles (3) ● Mass transit ● More Carpooling, less buses ● Fast train ● Toll roads ● Planning and development for population needs
What comes to mind when you hear the words "Automated Vehicles"?	● Less human interaction in driving (2) ● Electric vehicles (2) ● Transportation as a service ● Environmentally friendly

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? ● Personal car (7) ● Walk ● Bike How often? ● Personal car – Multiple times a day (3), Several times a week , Daily
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	What do you LIKE about the forms of transportation you use? • Reliable (3) • Comfortable (3) • Convenient (3) • Freedom to go on my schedule (3) • Gets me to my destination (2) • Fast What do you DISLIKE about the forms of transportation you use? • Cost of gas, insurance, and maintenance (4) • Traffic (4) What would make it better for you and others? • Less traffic (3) • Mass transportation (2) • Lower cost (2) • Better roads • Public transportation stops closer to home
What FORMS of COMMUNICATION do you currently use?	What Forms of COMMUNICATION do you currently use to travel? • Home Internet (5) • Smart Phone (3) • Work Internet (2) • Cell phone without internet (2) • Smart phone apps (2) • Blue Tooth (2) How often? • Home internet – Multiple times throughout day (5) • Smart Phone – Multiple times throughout day (3) • Work Internet – Multiple times throughout day (2) • Cell phone without internet – Multiple times throughout day (2) • Smart phone apps – Multiple times throughout day (2) • Blue Tooth – Multiple times throughout day (2)

	What do you LIKE about the forms of communication you use? • Able to stay informed (2) • Staying connected (2) • Ease of use • Good privacy and security • Makes life convenient • Can listen to music • Can have it with you all the time What do you DISLIKE about the forms of communication you use? • Cost (4) • Lack of privacy and security (3) • Poor connections (3) • Unwanted advertising What would make it better for you and others? • Better security/privacy (4) • Improved coverage and connections • Lower cost
What FORMS of TRANSPORTATION-RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? • Navigation apps (5) • Vehicle application platforms (4) • Mobility as a service app (3) • Ride-hailing apps (2) • Food delivery (2) • Smart Parking apps How often? • Vehicle application platforms – Multiple times throughout the day (3) • Mobility as a service apps - Multiple times throughout the day (2) • Navigation apps – Multiple times throughout the day (2) • Several times a week • 1-3 times a month • Ride-hailing apps – Multiple times throughout the day • Food delivery - Several times a week • Smart Parking apps – Multiple times throughout the day

	What do you LIKE about the apps you use? • Cuts down on wait time • Ability to be in contact with others • Fast • Easy to use • Makes travel easier • Hands free What do you DISLIKE about the apps you use? • Unreliable information at times (2) • Poor or slow connectivity (2) • Slow updates • Poor security • Advertising What would make it better for you and others? • Low cost or free internet (2) • Educate community as to what is available • More user friendly • Better connectivity • Continual updates
How has the pandemic changed the way you live and travel?	• Shopping on-line (4) • Doctor appointments on-line (3) • Video conferencing (3) • Work from home • Less travel • People more stressed out • More walking for exercise • Did not make a big difference in my travel or lifestyle

Future Technologies Image Ratings	Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE)
<i>(Refer to Appendix A to see rating scale images)</i>	Rating = 10 - Automated Cars (2) - Automated ridesharing services (2) - Automated shuttle (2) - Automated paratransit services (2) - Automated grocery delivery (2) - Drone delivery (1) - Robot delivery (1)
	Rating = 9 Connected cars (1)
	Rating = 8 - Automated Cars (1) - Connected cars (1) - Automated paratransit services (1) - Hyperloop (1) - Drone delivery (1) - Robot delivery (1)
	Rating = 7 - Connected cars (1) - Automated grocery delivery (1) - Robot delivery (1)
	Rating = 6 - Automated shuttle (1) - Automated grocery delivery (1) - Hyperloop (1)

Rating = 5

- Automated ridesharing services (4)
- Automated cars (3)
- Automated shuttle (2)
- Automated paratransit (2)
- Drone delivery (2)
- Connected cars (1)
- Automated grocery delivery (1)
- Hyperloop (1)
- Robot delivery (1)

Rating = 4

- No responses

Rating = 3

- No responses

Rating = 2

- Automated paratransit services (1)

Rating = 1

- Connected cars (2)
- Automated cars (1)
- Automated shuttle (1)
- Automated paratransit services (1)
- Automated grocery delivery (1)
- Hyperloop (1)
- Drone delivery (1)
- Robot delivery (1)

What do you LIKE about the future technology image?

A – Automated Car

- Safer (5)
- Convenient
- Don't have to focus on driving

B – Connected Cars

- Safer, better security
- Warns of what is up ahead

C – Automated Ridesharing services

- Less traffic (3)
- Less construction
- Cost effective accessible
- Environmentally friendly

D – Automated (self-driving) Shuttles –

- Good in confined areas (airports) but not on public streets,
- Less traffic
- Get from point to point without many stops
- Environmentally friendly

E – Automated Paratransit

- Good option for people who have difficulty getting to appointments (3)
- Ensures transport available to essential places

F – Automated Grocery Delivery

- More time at home
- Convenience
- Saves time

G – Hyperloop

- Good for long distance travel
- Cuts down travel time, fantasy

H – Drone Delivery

- Less traffic
- Good for hard-to-reach areas

I – Robot Delivery

- Less traffic,
- Contactless (safer in Covid)
- Good for environment

What do you DISLIKE about the future technology image?

A – Automated Cars

- Unsafe (5)
- Expensive (2)
- Lack of control
- Distrust of technology

B – Connected Cars

- Concerns about lack of privacy/security (3)
- Lack of safety (2)
- Distracted drivers
- Technology seems far off

C – Automated Ridesharing Services

- Lack of control
- Not knowing who else will be in car
- Lack of service and delays at peak times ,
- Having to be on someone else' schedule

D – Automated (self-driving) Shuttles

- Would not feel safe (2)
- Loss of jobs (2)
- Not as common as it should be

E – Automated Paratransit Services

- Lack of human interaction if needed (4)
- Don't trust self-operated vehicles

F – Automated Grocery Delivery

- Not all products are available
- Cost
- Delivery times not reliable and frozen foods melt

G – Hyperloop

- Technology still in development
- Inefficient
- Will not carry enough people

H – Drone Delivery

- Too futuristic
- Would not want drones flying around my home
- Loss of jobs
- Not realistic

I – Robot Delivery

- Loss of jobs
- Not realistic

As technology continues to advance, which of these images would you and your household consider in the future?

- A – Automated Cars - makes life easier (3)
- C – Automated Ridesharing services - cuts down on traffic (2)
- G – Hyperloop - cuts down on travel time, may be able to travel more (5)
- I – Robot Delivery - would deliver items to my door

If you could pick one thing to make your life easier with automated transportation, what would it be?

- A – Automated Cars
- B – Connected Cars
- C – Automated Ridesharing services
- F – Automated Grocery Delivery

Minority Focus Groups (Hispanic/Latino) - Tarrant County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	• Going from one place to another (3) • Vehicles (cars, buses) (3) • Movement of goods or people (2) • Going forward • Driving
What comes to mind when you hear the words "Transportation in the Future"?	• Fast moving trains (3) • Air (2) • Technology • No gas • Futuristic • Speed & efficiency • Renewable energy
What comes to mind when you hear the words "Automated Vehicles"?	• Safe (2) • Fast • No fuel • Money • Slowing down vehicles if over a certain speed • Trusting a machine and losing control • Cars that drive themselves • Being in control

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? • Personal car (9) • Taxi/Ride Share (2) • Walk • Bike How often?
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- Personal car – Several times a week , daily (3), Multiple times throughout day (5)
- Taxi/Ride share – Several times a year (2)
- Walk - Daily
- Bike – Occasionally

What do you LIKE about the forms of transportation you use?

- Personal car – I am able to travel when I need or want to (7), reliable (3), comfortable (3), convenient , gets me to my destination , cheap (10)
- Walk – Getting from point to point in a short amount of time

What do you DISLIKE about the forms of transportation you use?

- Personal car – Increasing gas prices (4)
- Cost of maintenance (3)
- Traffic (3)
- Other drivers are not courteous
- Construction , expense , safety on highways
- Taxi/Ride share – increasing prices , not always safe

What would make it better for you and others?

- More police on highway, better enforcement (2)
- Cheaper fuel (2)
- More driver education
- Bigger highways
- Flying rather than driving Home
- Better built cars, made to last
- European town set up
- High speed trains

What FORMS of
COMMUNICATION
do you currently
use?

What Forms of COMMUNICATION do you currently use to travel?

- Home Internet (8)
- Smart phone (7)
- Work Internet (2)
- Cell phone without internet (2)
- Smart phone apps (2)
- Blue tooth
- Public Internet

How often?

- Home Internet - Daily, Multiple times throughout day (7)
- Work Internet – Multiple times throughout day (2)
- Public Internet – Several times a week
- Cell phone without internet – Multiple times throughout day (2)
- Smart phone – Daily, Multiple times throughout day (7)
- Smart phone apps – Daily, Several times a week
- Blue tooth – Daily

What do you LIKE about the forms of communication you use?

- Keeping in touch with others, work, and the world (3)
- Affordable (3)
- Speed of being able to complete tasks quickly or get information quickly (3)
- Convenient (2)
- Easy (2)
- Being able to work from home
- Immediate gratification
- Mobility
- Good connection
- Consistency

What do you DISLIKE about the forms of communication you use?

- Lack of privacy and security, worry about hackers (5)
- Cost (4)
- Slow speed in some areas (2)
- Poor connection (2)
- Dumbing down of intelligence

What would make it better for you and others?

- More affordable (4)
- More public access sites
- Better security
- More towers for better connections
- More education on how to use

What FORMS of
TRANSPORTATION-
RELATED CELL
PHONE
Applications (Apps)
do you use?

What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use?

- Mobility as a Service (6)
- Ride-hailing apps (3)
- Vehicle application platforms (2)
- Smart Parking apps (2)
- Food Delivery apps

How often?

- Multiple times throughout day (3)
- Daily (3)
- Vehicle applications platforms – Daily (2)
- Mobility as a Service apps – Several times a week
- Daily (2)
- Navigation apps – Several times a week (2)
- Ride-hailing apps – Daily (2)
- Smart Parking apps – As needed
- Food Delivery apps – Daily
- Don't have time to learn them all
- Don't have many apps on my phone

What do you LIKE about the apps you use?

- Vehicle application platforms – music , makes life more enjoyable
- Mobility as a Service apps – feel safer on toll roads and they are more fuel efficient
- Navigation apps – Information for getting where I need to go (3)
- Ease , time saving , reliable
- More accurate picture of traffic and time it will take to get places , makes life easier
- Ride-hailing apps – easy to use
- Smart Parking apps – easy parking when I fly

What do you DISLIKE about the apps you use?

- Lack of consistent signal (2)
- Confusion/lack of knowledge on how to use (2)
- Cost (2)
- Maps not always accurate
- Poor connection in rural area

What would make it better for you and others?

- Reliable connections (3)
- Better understanding/knowledge of apps (3)
- Communication within apps while maintaining privacy
- Better selection to choose from

How has the pandemic changed the way you live and travel?	• Travel less (4) • On-line shopping (4) • Video conferencing (3) • On-line doctor appointment (3) • Working from home (2) • Learned how to use my apps • Less traffic on roads • Driving rather than taking transit • On-line groceries • Food delivery • Re-evaluated lifestyle and drive for a purpose
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Community Opinions on Future Transportation Technologies

Future Technologies Image Ratings <i>(Refer to Appendix A to see rating scale images)</i>	Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE) Rating = 10 • Automated grocery delivery (5) • Hyperloop (5) • Automated ride sharing (4) • Automated paratransit (4) • Automated Cars (3) • Automated shuttle (2) • Connected cars (1) • Drone delivery (1) • Robot delivery (1) Rating = 9 • Connected cars (2) • Drone delivery (2) • Robot delivery (2) • Automated Cars (1) • Automated shuttle (1) • Automated paratransit (1) • Hyperloop (1)
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Rating = 8

- Automated shuttle (4)
- Robot delivery (2)
- Automated Cars (1)
- Automated paratransit (1)
- Hyperloop (1)

Rating = 7

- Automated Cars (1)
- Connected cars (1)
- Automated ride sharing (1)
- Automated paratransit (1)
- Automated grocery delivery (1)

Rating = 6

- Automated Cars (1)
- Automated ride sharing (1)
- Automated grocery delivery (1)

Rating = 5

- Connected cars (3)
- Automated ride sharing (3)
- Drone delivery (3)
- Automated Cars (2)
- Robot delivery (2)
- Automated shuttle (1)
- Automated grocery delivery (1)

Rating = 4

- Drone delivery (1)

Rating = 3

- Connected cars (2)
- Hyperloop (1)

Rating = 2

- No responses

Rating = 1

- Drone delivery (1)
- Robot delivery (1)

What do you LIKE about the future technology image?

A - Automated Cars

- Safe (2)
- Convenient (2)
- Not having to drive (2)
- Gain personal time
- Less pollution
- Less human error

B - Connected Cars

- Ability to access information about accidents (3)
- Convenient (2)
- Reduces speeding and lane over-exposure
- Stress free

C - Automated Ride Sharing Services

- Ability to travel or get around without a car (2)
- Convenient (2)
- Cost efficient
- Improved commuting
- Saves time

D - Automated (self-driving) Shuttles

- Convenient (2)
- Cost efficient
- Don't have to depend on people (staff shortages)
- Safe
- Reliable

E - Automated Paratransit Services

- Improved mobility for disabled and elderly (6)
- Safe
- Wouldn't have to wait for a driver to take them some place

F - Automated Grocery Store Delivery

- Convenient (3)

- Saves time (2)
- Less people contact during covid/safe (2)

G - Hyperloop

- Fast (5)
- Safe (2)
- May be able to go place you haven't been to before
- Less pollution

H - Drone Delivery

- Fast delivery (5)

I - Robot Delivery

- Fast delivery (2)
- Convenient
- Safe

What do you DISLIKE about the future technology image?

A - Automated Cars

- Distrust of technology (3)
- Lack of control (2)
- Safety (2)
- Expense of maintaining car (2)
- Would not like for long distance driving

B - Connected Car

- Lack of privacy/security (2)
- Safety (2)
- Lack of control

C - Automated Ridesharing Services

- Possibility of fraud
- Wait time
- Riding with a stranger
- Cost increasing

D - Automated (self-driving) Shuttles

- Questions about security (2)

- Safety (2)
- Having to wait for a shuttle

E - Automated Paratransit Services

- That not everyone has access to this (2)
- Safety of passengers (2)
- Wait time for transport causing stress

F - Automated Grocery Store Delivery

- Prefer to choose my own food
- Prefer the physical aspect of shopping
- Not having the items, I like
- Can't choose exactly what you want
- Order could go bad or be stolen

G - Hyperloop

- Safety (2)
- Limited routes
- Not available in rural areas
- Possible elimination of roads leading traffic to smaller businesses
- Don't like to be in enclosed spaces

H - Drone Delivery

- Has limitations to what can be delivered
- Unsafe
- Can be hacked
- Items can be broken, lost, or stolen

I - Robot Delivery

- Order may be stolen (2)
- Job elimination

As technology continues to advance, which of these images would you and your household consider in the future?

- A – Automated Cars – improved safety (3)
- B – Connected Cars (4)
- C – Automated Ridesharing services (2)
- D – Automated (self-driving) shuttles (2)
- E – Automated Paratransit Services (0)
- F – Automated Grocery Store Delivery – limits need to drive, saves fuel and time (4)
- G – Hyperloop – fast traveling, improved traffic flow (5)
- H – Drone Delivery
- I – Robot Delivery (2)

If you could pick one thing to make your life easier with automated transportation, what would it be?

- A – Automated Cars (4)
- E – Automated Paratransit
- G – Hyperloop

Rural Focus Groups - Ellis County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	● Moving from place to place (3) ● Cars (2) ● Trucks ● Transit
What comes to mind when you hear the words "Transportation in the Future"?	● Modernizing technology (2) ● Electric cars ● Self-driving cars ● Trains ● Faster and safer transportation
What comes to mind when you hear the words "Automated Vehicles"?	● Vehicles that operate without manual intervention (4) ● Train service ● Safety, fewer lives lost

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? ● Personal Car (5) ● Plane (2) ● Walking How often? ● Car – Multiple times a day (5) ● Planes - several times a year (2) ● Walking – multiple times a day ● Car – Daily
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	What do you LIKE about the forms of transportation you use? • Convenient (3) • Comfortable (2) • In control, not dependent on anyone (2) • Cost effective (2) • Reliable What do you DISLIKE about the forms of transportation you use? • Traffic (3) • Cost – gas and upkeep (3) • Don't like to drive (2) • Disrespectful drivers What would make it better for you and others? • Public transit options (bus, train, subway) (3) • Less construction (2) • Better highways with more shoulder room to pull off
What FORMS of COMMUNICATION do you currently use?	What Forms of COMMUNICATION do you currently use to travel? • Home Internet (5) • Smart Phone (5) • Smart Phone Apps (4) • Public Internet (2) • Blue Tooth (2) • Work Internet How often? • Multiple times throughout the day (5) • Daily What do you LIKE about the forms of communication you use? • Convenience (5) • Fast and easy • Reliable • Privacy What do you DISLIKE about the forms of communication you use? • Cost (4) • Poor connections (2) • GPS not always accurate • Futuristic • Impersonal

	What would make it better for you and others? • Better connectivity/access (2) • Lower cost (2) • Better high-speed options in rural areas • Internet available and billed as utility in all households
What FORMS of TRANSPORTATION-RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? • Navigation apps (5) • Ride-hailing apps (3) • Vehicle application platforms (2) • Mobility as a Service apps (2) • Smart Parking • Door Dash How often? • Several times a year • 1-3 times a month • Once a week • Several times a week • Daily • Multiple times throughout the day What do you LIKE about the apps you use? • Convenience (4) • Easy to use (3) • Not getting lost in new places What do you DISLIKE about the apps you use? • Not user friendly, difficult to use (3) • Accuracy not always up to date (2) • Using while driving not always easy • Crashing and slow speed What would make it better for you and others? • Frequent updates (3) • More user friendly (3) • Better accuracy (3) • Faster speed • Smart Car option to use while driving

How has the pandemic changed the way you live and travel?	• On-line doctor appointments (4) • Shopping on-line (4) • Groceries on-line (4) • Video conferencing (2) • Food Delivery (2) • Less vacations or travel (2) • Work from home • School from home • Walking • More driving versus public transport • Avoiding hotels and using VRBO and cabins instead
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Community Opinions on Future Transportation Technologies

Future Technologies Image Ratings <i>(Refer to Appendix A to see rating scale images)</i>	Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE) Rating = 10 • Automated ridesharing services (2) • Automated grocery delivery (1) • Hyperloop (1) Rating = 9 • Hyperloop (2) Rating = 8 • Automated ridesharing services (2) • Automated paratransit services (2) • Automated grocery delivery (2) • Automated cars (1) • Connected cars (1) • Automated shuttle (1) • Drone delivery (1) Rating = 7 • Automated cars (2) • Connected cars (2) • Automated shuttle (2) • Automated paratransit services (1) • Automated grocery delivery (1) • Drone delivery (1) • Robot delivery (1) Rating = 6 • Automated ridesharing services (1) Rating = 5
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- Drone delivery (2)
- Automated ridesharing services (1)
- Hyperloop (1)
- Robot delivery (1)

Rating = 4

- No responses

Rating = 3

- Automated cars (1)
- Robot delivery (1)

Rating = 2

- Automated shuttle (1)
- Automated paratransit services (1)

Rating = 1

- Automated cars (2)
- Connected cars (2)
- Automated shuttle (2)
- Automated paratransit services (2)
- Automated grocery delivery (2)
- Hyperloop (2)
- Drone delivery (2)
- Robot delivery (2)

What do you LIKE about the future technology image?

A – Automated Cars

- Able to multi-task (2)
- Reliable
- Less accidents

B – Connected Cars

- More safety
- Ability to get information about hazards or construction

C – Automated Ridesharing Services

- Convenience (3)
- Less wear and tear on car
- Available if you have been drinking
- Won't have to pay for parking

D - Automated (self-driving) Shuttles

- Don't have to worry about the driver's skill
- Convenient
- Saves money on gas and parking

E - Automated Paratransit Services

- Giving disabled people more mobility (2)
- Like the fact that it will exist

F – Automated Grocery Store Delivery

- Availability
- No worry about workers being out late or in bad weather
- Safer
- Convenient
- Don't have to worry about running out of products at home
- Already using this for deliveries to son in college and it works well

G – Hyperloop

- Faster travel
- Safe
- Less traffic

H – Drone Delivery

- Convenient
- Good in inclement weather
- Keeps workers out of bad weather

I – Robot Delivery

- Interesting concept
- Good in inclement weather

What do you DISLIKE about the future technology image?

A – Automated Cars

- Unsure about safety (3)
- Technology crashing concerns (2)
- Makes me too complacent

B – Connected Cars

- Technology problems (3)
- Privacy issues (2)

C – Automated Ridesharing Services

- Long wait times (2)
- Cost (2)
- Safety
- Worry about how the driver drives

D – Automated (self-driving) Shuttles

- Safety (3)
- Lack of control
- Computer error
- Availability when needed

E – Automated Paratransit Services

- Safety
- Safety of disabled patrons
- Computer error

F – Automated Grocery Store Delivery

- Accuracy (2)
- Loss of jobs (2)
- Cost

G – Hyperloop

- Safety (2)
- Scary
- Computer error
- Effect on landowners

H – Drone Delivery

- Limits on what can be delivered
- Feasibility for long distance delivery
- Safety
- Computer error

I – Robot Delivery

- Don't like the idea unless they are controlled (2)
- Computer error
- Safety

As technology continues to advance, which of these images would you and your household consider in the future?

- A – Automated Cars - less gas expense (2)
- B – Connected Cars
- C – Automated Ridesharing services - wouldn't need a designated driver (4)
- D – Automated (self-driving) shuttles
- E – Automated Paratransit Services - having room for walker is a plus
- F – Automated Grocery Store Delivery (3)
- G – Hyperloop (2)
- H – Drone Delivery
- I – Robot Delivery

If you could pick one thing to make your life easier with automated transportation, what would it be?

- B – Connected Cars
- C - Automated Ridesharing services (3)
- F – Automated Grocery Store Delivery (2)

Rural Focus Groups - Hood County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	● Getting around (2) ● Moving people and goods between locations ● Move from one location or another ● Lack of for residents who don't have cars ● Mobility
What comes to mind when you hear the words "Transportation in the Future"?	● Monorails or highspeed rails (2) ● More opportunities and growth ● More mobility ● Public transportation ● Electric powered vehicles
What comes to mind when you hear the words "Automated Vehicles"?	● Autopilot (6) ● More opportunities ● Accessibility, further reach

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? ● Personal car (6) ● Rideshare (2) ● Walk ● Train ● Bicycle How often? ● Personal car – multiple times a day (4), daily (2) ● Train – when travelling out of town ● Rideshare – when travelling out of town ● Bicycle – several times a year ● Walk - daily What do you LIKE about the forms of transportation you use?
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	• Reliable (2) • Comfortable (2) • Reasonable wait times • Self-Reliant What do you DISLIKE about the forms of transportation you use? • Traffic (5) • Expensive (3) • Not safe (2) What would make it better for you and others? • Other options such as train or bus (4) • Better roads (4) • Synchronized traffic signals (2)
What FORMS of COMMUNICATION do you currently use?	What Forms of COMMUNICATION do you currently use to travel? • Smart Phone browsing internet (6) • Smart Phone apps (5) • Blue Tooth (5) • Home Internet (5) • Work Internet (4) • Public Internet (3) • Cell Phone without internet (2) How often? • Multiple times throughout day (5) • Daily What do you LIKE about the forms of communication you use? • Ease of access (4) • Instant availability of information (3) What do you DISLIKE about the forms of communication you use? • Lack of privacy and security (5) • Poor connection (5) • Cost too much (3)

	What would make it better for you and others? • More reasonable cost (4) • More choice in providers (2) • No dead zones (2) • More accessible to low-income families • Transportation to locations if not available in home
What FORMS of TRANSPORTATION-RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? • Navigation apps (6) • Mobility as a Service apps (5) • Vehicle application (4) • Ride-hailing apps (4) • Smart Parking Apps (3) • Others: Venmo, Food Delivery How often? • Multiple times a day (3) • Daily (2) What do you LIKE about the apps you use? • Real time information (4) • Easy to locate information (2) • Ability to multi-task (2) What do you DISLIKE about the apps you use? • Data tracking (4) • Information incorrect at times (4) • Lack of privacy and security (2) • Expense What would make it better for you and others? • Updated information • Communication about apps and how to use (2)
How has the pandemic changed the way you live and travel?	• Shopping online, order groceries on line, food delivery (5) • On-line doctor appointments (4) • Video conferencing (4) • Attending school from home (2) • Working from home • Travel less

Community Opinions on Future Transportation Technologies

Future Technologies Image Ratings <i>(Refer to Appendix A to see rating scale images)</i>	Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE) Rating = 10 - Automated grocery delivery (3) - Hyperloop (3) - Automated paratransit services (2) - Drone delivery (2) - Robot delivery (2) - Automated cars (1) - Connected cars (1) - Automated ridesharing services (1) - Automated shuttle (1) Rating = 9 - No responses Rating = 8 - Automated ridesharing services (2) - Automated shuttle (2) - Automated paratransit services (2) - Automated cars (1) - Connected cars (1) - Hyperloop (1) - Drone delivery (1) - Robot delivery (1) Rating = 7 - Automated cars (1) - Automated shuttle (1) - Automated paratransit services (1) Rating = 6 - No responses Rating = 5 - Connected cars (1) - Hyperloop (1) Rating = 4 - No responses Rating = 3 - Automated grocery delivery (2) - Drone delivery (1) - Robot delivery (1) Rating = 2 - Automated ridesharing services (3)
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- Automated cars (2)
- Automated shuttle (1)
- Automated grocery delivery (1)
- Drone delivery (1)
- Robot delivery (1)

Rating = 1

- Connected cars (2)
- Automated cars (1)
- Automated shuttle (1)
- Automated paratransit services (1)

What do you LIKE about the future technology image?

A- Automated Cars

- Safety/protection (2)
- Time saver (2)

B - Automated Grocery Delivery

- Convenience (3)

C - Automated Paratransit

- Increases mobility of impaired (6)

D - Automated Ridesharing services

- Shared cost/less expense
- Less traffic
- Timesaver

E - Automated (self-driving) shuttles

- Availability (2)
- Less traffic
- Time saver
-

F - Connected Cars

- Ability to get directions and traffic info (2)
- Protection

G - Drone Delivery

- Efficient (3)
- Safe; Good for remote medicine delivery

H - Hyperloop

- Speed (5)
- Reduced pollution (2)

I - Robot Delivery

- Efficient (4)
- Cost savings

What do you DISLIKE about the future technology image?

A - Automated Cars

- Distrust technology (6)

B - Connected Cars

- Privacy/Security

C - Automated Ridesharing Services

- Safety (4)
- Limited options for some areas (2)

D - Automated (self-driving) Shuttles

- Distrust of technology (3)
- Maintenance cost
- Time schedules
- Safety

E - Automated Paratransit Services

- Distrust of technology
- Lack of assistance for boarding/deboarding

F - Automated Grocery Store Delivery

- Errors in delivery (3)
- Products not selected for quality
- Delivery disruption

G - Hyperloop

- Cost (2)
- Comfort
- Location/accessible and not disrupting green spaces

H - Drone Delivery

- Errors in delivery (3)

I - Robot Delivery

- Errors in delivery (3)
-

	As technology continues to advance, which of these images would you and your household consider in the future? A - Automated Cars (2) B - Connected Cars C - Automated Ridesharing Services (4) D - Automated (self-driving) Shuttles (3) E - Automated Paratransit Services (4) F - Automated Grocery Store Delivery (3) G - Hyperloop (4) H - Drone Delivery (3) I - Robot Delivery (4) If you could pick one thing to make your life easier with automated transportation, what would it be? B - Connected Cars C - Automated Ridesharing Services (2) D - Automated (self-driving) Shuttles H - Drone Delivery I - Robot Delivery
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Rural Focus Groups - Parker County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	• Moving people and goods between locations (2) • City and church transportation is available, but it is not enough • Vehicles • Purpose and volume
What comes to mind when you hear the words "Transportation in the Future"?	• More efficient • More cement and asphalt, loss of habitat • Faster • More reliable • Easily available
What comes to mind when you hear the words "Automated Vehicles"?	• Electric vehicles (2) • Hands off driving • Uber (2) • Efficiency

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel? • Personal Car (6) • Train (2) • Walk (2) • Carpool • Rideshare How often? • Personal Car – once a day (3) • Multiple times a day (3) • Once a week • Walk – several times a week What do you LIKE about the forms of transportation you use? • Gets me to my destination (3) • Reliable (2) • Controllable – there when I need it (2) • Comfortable (2) • Cost effective • Reasonable wait time What do you DISLIKE about the forms of transportation you use? • Too much traffic (2) • Cost of gas (2) • Poor drivers What would make it better for you and others? • Closer public transportation (2) • More transportation for elderly and handicapped • Better traffic flow designs
What FORMS of COMMUNICATION do you currently use?	What Forms of COMMUNICATION do you currently use to travel? • Cell phone without Internet (4) • Smart phone apps (2) • Home Internet (2) • Smart phone (2) • Blue Tooth (2) • Work Internet • Public Internet How often? • Multiple times throughout the day (3)

	• Every day • Several times a week What do you LIKE about the forms of communication you use? • Affordable (2) • Connectivity (2) • Accessibility to information What do you DISLIKE about the forms of communication you use? • Lack of Privacy and security (2) • Lack of providers What would make it better for you and others? • Better cost for internet • If other people learned to tap into all the abilities of their technology
What FORMS of TRANSPORTATION-RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? • Mobility as a Service apps (2) • Navigation apps (2) • Ride-hailing apps (2) • Vehicle application platforms • Smart Parking apps • Food apps How often? • Multiple times throughout the day • Every day • 1-3 times a month • Several times a year • I don't understand it • I only talk on my cell phone – don't use it for any text or apps What do you LIKE about the apps you use? • No paper maps • Better informed

	What do you DISLIKE about the apps you use? • Lack of privacy and security • Quality What would make it better for you and others? • Informational sessions for training
How has the pandemic changed the way you live and travel?	• Less travel • More on-line shopping • On-line doctor appointments • Working from home • Video conferencing • I did not go out for a time, but I do not buy anything on-line

Community Opinions on Future Transportation Technologies

Future Technologies Image Ratings <i>(Refer to Appendix A to see rating scale images)</i>	Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE) Rating = 10 • Automated grocery delivery (2) • Automated cars (1) • Connected cars (1) • Automated ride sharing (1) • Automated shuttle (1) • Automated paratransit services (1) • Hyperloop (1) • Drone delivery (1) • Robot delivery (1) Rating = 9 • Automated shuttle (1) Rating = 8 • No responses Rating = 7 • Automated Cars (1)
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- Connected cars (1)

Rating = 6

- No responses

Rating = 5

- Automated ride sharing (2)
- Automated shuttle (1)
- Automated paratransit (1)
- Hyperloop (1)
- Robot delivery (1)

Rating = 4

- No responses

Rating = 3

- No responses

Rating = 2

- No responses

Rating = 1

- Drone delivery (2)
- Automated cars (1)
- Connected cars (1)
- Automated paratransit services (1)
- Automated grocery delivery (1)
- Hyperloop (1)
- Robot delivery (1)

What do you LIKE about the future technology image?

A – Automated Cars

- Safer
- Less stress
- Ability for manual control
- Not having to steer

B – Connected Cars

- More data means smarter
- Informed decisions
- All driving the same speed

C – Automated Ridesharing Services

- Multiple people in a vehicle
- Cost efficiency
- Reliability

D – Automated (self-driving) Shuttles

- Multiple people in a vehicle
- Safer
- More efficient

E – Automated Paratransit Services

- Need more services like this
- People being able to get around

F – Automated Grocery Store Delivery

- Not having to leave home
- Trackable
- Job creations

G – Hyperloop

- High speed
- Efficient
- Safe

H – Drone Delivery

- Smarter
- Safer
- Faster
- New jobs

I – Robot Delivery

- Safer
- Reliable
- New jobs

What do you DISLIKE about the future technology image?

A – Automated Cars

- Distrust of liability
- Lack of privacy and security
- Lack of control

B – Connected Cars

- Lack of privacy and security (2)

C – Automated Ridesharing Services

- More pollution
- Having other people in the car

D – Automated (self-driving) Shuttles

- Maintenance costs
- Space for people

E – Automated Paratransit Services

- Distrust of technology
- Lack of assistance if needed

F – Automated Grocery Store Delivery

- Distrust of technology
- Not picking the items I prefer

G – Hyperloop

- Cost (2)
- Speed

H – Drone Delivery

- Distrust of technology

I – Robot Delivery

- Distrust of technology

As technology continues to advance, which of these images would you and your household consider in the future?

- A – Automated Cars (3)
- B – Connected Cars (2)
- C – Automated Ridesharing services (2)
- D – Automated (self-driving) shuttles (1)
- E – Automated Paratransit Services (1)
- F – Automated grocery store delivery (1)
- G – Hyperloop (2)
- H – Drone Delivery (1)
- I – Robot Delivery (1)
- They are all convenient, safe, reliable and have less human error

If you could pick one thing to make your life easier with automated transportation, what would it be?

- A – Automated Cars – safer (2)
- B – Connected Cars – to help visit family and friends
- E – Automated Paratransit Services - makes life easier
- G – Hyper Loop

Rural Focus Groups - Rockwall County

General Transportation Perspective

What comes to mind when you hear the word "Transportation"?	● Driving (2) ● Travel ● Getting from one place to another
What comes to mind when you hear the words "Transportation in the Future"?	● Improvement, advancement, progress (3) ● Fast trains
What comes to mind when you hear the words "Automated Vehicles"?	● Necessary (2) ● Reliable ● Efficient

Community Current Transportation Experiences and Needs

What FORMS of TRANSPORTATION do you currently use to travel?	What Forms of TRANSPORTATION do you currently use to travel?
	● Personal car (4) ● Carpool ● Taxi/Ride Share How often? ● Personal car – Several times a week, Multiple times throughout day (3) ● Taxi/Ride Share - Several times a year (2) ● Carpool – Several times a week

	What do you LIKE about the forms of transportation you use? • Freedom to set my own schedule, come and go as I please (3) • Safe (3) • Reliable (2) • Companionship in carpool • Curbside pickup and drop off What do you DISLIKE about the forms of transportation you use? • Expense (3) • Tolls • Traffic • Poor road conditions • Construction • Better street maintenance What would make it better for you and others? • No construction/faster construction projects (2) • Less costly vehicle maintenance (2) • Expanded train service (2) • No tolls (2) • Better traffic control • Shorter wait times for public transit
What FORMS of COMMUNICATION do you currently use?	What Forms of COMMUNICATION do you currently use? • Home internet (4) • Smart phone (4) • Blue tooth (3) • Smart phone apps (2) • Public internet

How often?

- Home internet – Several times a week, Multiple times throughout day (3)
- Smart Phone – Several times a week, Multiple times throughout day (3)
- Blue tooth – Several times a week, Multiple times throughout day (2)
- Smart phone apps – Several times a week , Multiple times throughout day (2)
- Public internet - Multiple times throughout the day

What do you LIKE about the forms of communication you use?

- Convenience (2)
- Easy connection with people in other areas of country (2)
- Consistency (2)
- Privacy and security (2)
- Cost efficient
- Good connection

What do you DISLIKE about the forms of communication you use?

- Lack of privacy and security (4)
- Poor connection/slow speed (3)
- Expense

What would make it better for you and others?

- Better security (3)
- More providers
- Faster speed
- Lower cost

What FORMS of TRANSPORTATION-RELATED CELL PHONE Applications (Apps) do you use?	What TYPE OF TRANSPORTATION-RELATED CELL PHONE APPLICATIONS (APPS) do you currently use? • Navigation apps (4) • Vehicle application platforms (2) • Ride-hailing apps (2) • Food delivery/Shopping How often? • Navigation apps - Multiple times throughout the day (2), Several times a week • Vehicle application platforms - Multiple times throughout the day • Ride-hailing apps – Several times a week What do you LIKE about the apps you use? • Convenient (3) • Not getting lost (2) • Getting alternate route information for traffic, accidents, and construction (2) • Reliable • Hands free while driving What do you DISLIKE about the apps you use? • Poor connections (3) • Not always accurate (2) • Has made me lazy/Don't know how to get around without it anymore (2) • Distraction of reading and pushing buttons while driving What would make it better for you and others? • Better connections (2) • More accurate information • More frequent technology updates • Better security
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How has the pandemic changed the way you live and travel?	• Video conference/facetimeing (3) • Shop on-line (2) • Food delivery • Restricted travel • Become too dependent on doing everything on-line
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Community Opinions on Future Transportation Technologies

Future Technologies Image Ratings (Refer to Appendix A to see rating scale images)	Rate on a scale of 1-10 (10 being the strongly LIKE and 1 being strongly DISLIKE)
	Rating = 10 • Automated ridesharing services (2) • Automated grocery delivery (2) • Hyperloop (2) Rating = 9 • Automated grocery delivery (1) Rating = 8 • Automated paratransit services (3) • Automated cars (1) • Drone delivery (1) • Robot delivery (1) Rating = 7 • Automated ridesharing services (1) Rating = 6 • Hyperloop (1) Rating = 5 • Automated shuttle (3) • Automated cars (1) • Connected cars (1) • Automated paratransit services (1) • Automated grocery delivery (1) • Hyperloop (1) • Drone delivery (1) • Robot delivery (1) Rating = 4 • No responses

Rating = 3

- Automated ridesharing services (1)

Rating = 2

- Robot delivery (1)

Rating = 1

- Connected cars (3)
- Automated cars (2)
- Drone delivery (2)
- Automated shuttle (1)
- Robot delivery (1)

What do you LIKE about the future technology image?

A - Automated Cars

- Safer
- Less pollution

B – Connected Cars

- May cut down on mistakes that cause accidents
- Less traffic jams

C – Automated Ridesharing Services

- Less impaired drivers
- Cost effective
- Less traffic

D – Automated (self-driving) shuttles

- Saves time
- Faster
- Dependable

E – Automated Paratransit Services

- More freedom to get around for those with disabilities (3)
- Much needed service

F – Automated Grocery Store Delivery

- Saves time, saves money
- Job creation

G – Hyperloop

- Get to destination faster (3)
- Less traffic

H – Drone Delivery

- Faster

I – Robot Delivery

- Faster and easier

What do you DISLIKE about the future technology image?

A - Automated Cars

- Possible technical malfunction (2)
- Safety

B – Connected Cars

- Loss of connection (2)
- Technical errors

C – Automated Ridesharing Services

- Safety
- Distrust of someone else doing the driving

D – Automated (self-driving) Shuttles

- Safety (2)
- Distrust of technology

E – Automated Paratransit Services

- Distrust of technology
- Safety
- Possible need for assistance for handicapped

F – Automated Grocery Store Delivery

- Quality of products
- Less social interaction
- Inaccuracy of order

G – Hyperloop

- Safety
- Higher possibility of fatalities with accidents

H – Drone Delivery

- Loss of jobs
- Lost packages
- Possible accidents

I – Robot Delivery

- Loss of jobs (2)
- Lost packages
- Increased traffic

As technology continues to advance, which of these images would you and your household consider in the future?

- G – Hyperloop, no traffic, faster travel (4))

If you could pick one thing to make your life easier with automated transportation, what would it be?

- G – Hyperloop (4)