CAT Coalition – Infrastructure-Industry Working Group

March 25, 2021 Meeting Summary

Action Items:

- Review and provide feedback on draft of Primer of Terms resource.
- John Corbin will follow up with Tracy and Ed for the next agenda to continue the conversation about digital infrastructure. Please do include my reference to the discussion of digital infrastructure with Tracy and Ed. It is appropriate and will be valuable for the broader audience to be reminded of the digital infrastructure topic, as well as my intent to maintain coordination with the Working Group on this topic through its co-chairs.
- Jeremy will send meeting invites for upcoming meetings.

Notes:

Opening

- Tracy and Ed introduced themselves as co-chairs of this working group. Tracy introduced her new position at ITS America.
- The role of this group is to: 1) support pre-competitive industry research that will advance infrastructure development and maintenance; 2) Connect IOOs with industry; 3) Support the natural evolution of infrastructure to accelerate CAVs; and 4) Clarify terms, definitions and target audiences.
- Ed provided a brief recap of the previous working group meeting, which featured presentations from EasyMile by Lauren Isaac and Honda by Sue Bai on their perspectives on AV deployment.

I-I WG Work Plan Activity: Primer of Terms

Ed provided background on this resource, noting that he had compiled a list of CAT acronyms over the years that has been used as the starting point for this resource. He acknowledged this resource is intended to help bridge the gap between IOOs and OEMs by creating a common understanding of frequently used terms, which sometimes differ between the two stakeholder communities. The "origin" for terms as used by USDOT, IOOs, OEMs, etc. are designated where possible to provide some background as to what users initiated the term; however this is a challenge in cases where terms have been in use for many years and adopted by all stakeholders. This resource will hopefully fill a need to help decision makers involved in funding to make good decisions and assist in communications.

Jeremy emphasized that the definitions in this resource are not intended as a preferred definition or to be exclusive of variations or interpretations used by other organization, nor as an authoritative source or endorsement, but as an introduction and reference. Moreover, definitions are intended to serve as a starting point for practitioners to have a common understanding of terms. Jeremy described how definitions sourced from formal sources where possible, like USDOT, the CV Pooled Fund Study Glossary of Terms, and SAE.

Jeremy will be distributing this resource to WG members in April for review. The request is that WG members not focus on wordsmithing individual definitions, but address the following questions:

- Are there terms that are missing that should be included?
- Are there terms that should be removed?
- Is there a definitive resource that should be used as a reference?

KPMG's AV Readiness Index

Ted Hamer provided an overview of the AV Readiness Index (AVRI). He noted how crashes are up during the pandemic, even though people driving less, and how the convergence of MaaS, MOD, shared use, electrification, and other things are huge factors in AV deployment. The AVRI includes 30 countries, and four pillars of 28 variables: policy and legislation; technology and innovation; infrastructure; and consumer acceptance. Ted noted that AVRI added 5 countries in 2020 to expand to a total of 30 countries.
Ted spent time focusing on the rankings, including the top-ranked countries and how they perform in various categories. Singapore was ranked at the top of the AVRI, following massive investments in infrastructure and is positioning itself to drive the automation and mobility. The Netherlands has massive adoption of infrastructure and set of laws, with close proximity to technologies. A significant amount of testing is taking place in Norway and quite a few demonstrations are taking place in winter weather conditions. Singapore ranks first in policy & legislation and consumer acceptance categories.

The Netherlands is second overall and ranked first in infrastructure, leading on EV charging stations per capita and second only to Singapore on road quality. This ranking is driven by technology & innovation, infrastructure, and consumer acceptance. The influence of electrification as it relates to AVs helps to indicate a level of preparedness, as the index assumes that AVs will be electric. The US has reached 2.8% of new registrations being EVs in December 2020. Tesla has demonstrated their influence as a proven player in self-driving and electric vehicles in the US.

The US is ranked fourth overall, scoring relatively high in policy & legislation and is practically at the top with Israel in technology & innovation. The US is brought down in rank by infrastructure, as 4G coverage, broadband, and EV charging have a ways to go. The new infrastructure bill may include items that would help lift this score, e.g. EV charging. Consumer acceptance going up based on demos happening all around the country. Finland has the highest online ride-hailing market penetration. Helsinki initiatives drive what is happening in the rest of the country.

There has been a lot of legislation to accommodate AVs. Some of this is happening in the US on a state-by-state basis. A lot of work remains regarding data. KPMG is working to understand where AVs will be most impactful. Additionally, Ted noted that a lot of work is happening on the city level; for example, Detroit has a confluence of CAVNUE and the public sector. This exemplifies how the government and private sector working together is a key strength that drives innovation in US. Ted believes the future of AVs and shared use mobility will continue to converge. Additionally, Ted observed that in 2017 there was significant optimism about AVs coming online "in the next 10 years", and the answer remains the same now in 2021. There are a lot of complexities in this sector. Equity will also be very important in this conversation moving forward.

Tracy asked how the type of government was considered in the AVRI (e.g., Singapore is a city/state/country all in one with a major focus on AVs being used for transit vs. the United States being a lot larger and more variety). Ted said this is a factor and a composite index is used to look at government planning, the rule of law resources, and etc. A follow up question was asked about how these rankings fair when looking at deployment: if infrastructure readiness and ability to advance operations in the ranking is emphasized, how would that affect the ranking? Ted said the AVRI looks at rankings from various forums, and he encouraged everyone to look at the updated AVRI and make suggestions for additional items to include in methodology. Ted noted that each metric is scrutinized every year and feedback is welcomed on new items to include.

Ted explained that "smart road furniture" includes dynamic bus shelters that allow for integration with arrival times of buses being updated in real time.

The AVRI report can be accessed at: https://home.kpmg/xx/en/home/insights/2020/06/autonomous-vehicles-readiness-index.html.

Update on Physical Infrastructure Enhancements to Support AV Deployment
Paul Carlson described the approach to the AV Infrastructure project. He recommended anyone who wants more details to listen to recordings of the three webinars conducted in October 2020, which can be accessed at:

AV Impacts Webinar 1: Traffic Control Devices (October 9, 2020)
AV Impacts Webinar 2: Physical Infrastructure and Operations (October 16, 2020)
AV Impacts Webinar 3: Agency Readiness (October 23, 2020)

Paul said the research team discovered through interviews that there are two paths to the Level 4 and 5 automation: the path taken by traditional OEMs with their Level 2+ vehicles (evolutionary), and the other developers like Waymo and Lyft who are working to get to Level 4 and 5 very quickly to disrupt the vehicle space (revolutionary). Both of these paths were covered in this effort. The needs from the infrastructure perspective are quite different, depending on which path is the focus.

Paul showed that despite the extensive growth of Level 3+ vehicles in the next 10 years, the majority of vehicles in the US will be ADAS-equipped Level 2-capable vehicles. He noted that by the end of 2022, 99% of light vehicles sold in the US will have camera and/or radar-based systems, i.e. "Level 2 capable. Paul reviewed findings of traffic control devices, specifically pavement markings and signage, and the work to understand more specific needs of "better markings" that have been heard from industry. Regarding pavements, bridges, and operations, he noted that some believe early AV deployment may lead to increased congestion, requiring increased role of TSMO. There are challenges with AVs understanding digital signage based on the type of in-vehicle camera that is used. Finally, there were findings on agency readiness based on concerns heard from state DOTs, such as the need for more guidance and standards, more funding, and better understanding on what is needed, when, and how to maximize the return on investment.

Despite the unknowns, agencies are already doing a lot to prepare for AVs. Specific examples included upgrading pavement markings, initiating internal task forces, supporting legislation, and engaging OEMs. A number of agencies acknowledged that they were observing the trends and what others were doing, but not yet prepared to allocate resources to change their practices until there was more certainty.

Paul also described the changes in the proposed 11th edition of the Manual of Uniform Traffic Control Devices (MUTCD). The last major update was in 2009, and this new edition intends to incorporate preparedness for AVs. There are a significant number of changes, including a new chapter on AVs with all new material. FHWA describes this chapter as a reference for agencies to start to consider about preparing their roadways for AVs via infrastructure enhancements. This chapter includes section on the purpose, an overview of connected and automated vehicles, definitions and terms that reference SAE J3016 to define the levels of automation, and the final section includes general design and use considerations that is largely repetitive from other parts of the manual. Part 5B include items "agencies should consider" regarding signs, markings, highway traffic signals, temporary traffic control, railroad crossings, and bicycle facilities. Paul included example considerations for each of these categories. Paul

noted that the comment period on this is open until May 14 for anyone interested in providing feedback.

Paul expanded on the role of TSMO, noting the digital piece is outside of the AV Infrastructure project, but many in industry encouraged increased data sharing and standardization to facilitate data sharing. There is progress being made in this area, such as the USDOT Work Zone Data Exchange (WZDx), but many in the industry are looking for more information, such as a dynamic map with specific instructions on lane use.

Q&A

- Tracy asked if data protocols in other countries are more established, and whether industry has articulated specific requests for type of data they would like to receive. Paul noted that data and digital infrastructure was outside the scope of the project. Ted noted other countries being more proactive on data standardization – type, format, and platform for available data. There is a lot of unknowns about what OEMs seem to request. AVs in an urban environment may be more challenging, and data exchanges can make this a less challenging task. Some are taking a "build it and they will come" approach, but there are many unknowns. The UK is very focused on data standardization, as one example.
- Another question asked if AVs are giving information back to infrastructure? Paul noted that one view of data exchange is one-way sharing of data, e.g. the WZDx or other information from IOOs. Paul does not see a lot of two-way communications, but things are changing really quickly and at least one effort at FHWA being led by John Corbin is underway to explore this topic: what information from AVs would the DOT find useful? Could it be used in planning? Could it reduce costs by being a surrogate for other data that would otherwise be collected? How do we make two-way data exchange a win-win situation. Ted noted that work zone data is of interest for AVs, or any time the road condition is changing: weather conditions, work zones.
- A question was asked to clarify about stop signs at the freeway nose – there are 13 locations on the interstate system where a stop sign appears to be on the nose of the freeway ramp, this is an example where the human would be able to discern the intent of the stop sign, but the AV requires special programming to understand that is a special situation.
- Ted Bailey noted the emphasis in Washington State to keep AV testing on levels 4/5 since this is where the driver is not in control.
- Daniella asked about insights about motivating the private sector to engage in data sharing models or monetizing infrastructure data. Ted Hamer noted the layers of agreements within the private sector that makes it challenging for an OEM to share the data in an exchange. This is very situational with unknown variables. There are some leads in this sector that can lead to innovation. Ted would not encourage agencies to dictate the terms for data sharing, but consider what would make it easier for AVs to share the data and lower their costs. Ultimately, this is an open-ended question in the field. John Corbin will follow up with Tracy and Ed for the next agenda to continue the conversation about digital infrastructure.

Next WG meetings and Adjourn

The next meetings for this working group are tentatively scheduled for:

- Thursday, May 27, 1:30-3:00 pm ET
- Thursday, July 29, 1:30-3:00 pm ET

- Thursday, September 30, 1:30-3:00 pm ET
- Thursday, November 18, 1:30-3:00 pm ET

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