



Top Five Technology Trends in U.S. Transportation

Exploring Possible Impacts of the COVID-19 Pandemic on Industry Innovations

By Ben Pierce, PMP, Transportation Technology Program Leader

Whether electric vehicles, automated vehicles, personal mobility or more, the way we move from point A to B continues to evolve. The global disruption caused by the COVID-19 pandemic has only accelerated that change. Understanding how to adapt to it with limited resources is key for transportation agencies, planners, leaders and other stakeholders. With a front-row seat to technology's ongoing impact on transportation, expert Ben Pierce shares one view of what we might see in the coming months.

The pandemic's immediate impacts on airline, transit and roadway travel are clear as millions have sheltered in place. Travel changes and patterns on highways and roads have transformed during the pandemic, with truck traffic dominating the highways and interstates and personal modes such as walking, skating, "scootering" and bicycling more heavily used for travel or exercise. Airlines and transit agencies have seen a sharp decline in usage and have received federal funding to offset the decrease in revenue. Another outcome is that e-scooter use has decreased, but bike-share programs have remained somewhat steady in regions where weather allows.

Clearly, communities will continue to be key stakeholders in making decisions to determine the role of these travel options for personal mobility. What is less clear are the long term

impacts of COVID-19 on U.S. travel. It will be critical for the transportation industry to be vigilant and nimble to address potential changes.

An Opportunity to Move Transportation Forward

What does this mean for transportation technology and the adoption of this technology into our transportation system? The current crisis may be looked back upon as a blip, with technological progress continuing on the steady trajectory where it left off after the virus is contained. Or, it may lead to stagnation and abandoned plans as bruised governments and private industry try to avoid risk and focus on essentials rather than exploration and innovation. But there is a more optimistic third possibility: We can seize this unprecedented opportunity to make progress by leaps and bounds and, perhaps, even discover new ideas that will change the world for the better.



A Surge of Electric Vehicles

What will happen this year?

As with their internal combustion counterparts, electric vehicle sales in 2020 are expected to decline as a result of the COVID-19 pandemic. However, despite low petroleum prices, the trend towards electric vehicles will continue in 2020 and beyond.

The Background

Battery technology has come a long way in recent years, and in 2019 there were several new breakthroughs. One such technology was the ability to use lithium-sulfur instead of lithium-ion as the main chemistry. If this breakthrough can be commercialized, this will result in batteries that perform five to 10 times better than their predecessors while becoming less expensive and having less impact on the environment.

On top of such technology breakthroughs, there has continued to be a societal trend and recognition that climate change is happening and that internal combustion engines are a significant contributor. The dramatic reduction in travel caused by the COVID-19 pandemic has already led to cleaner skies in areas previously covered in daily smog. This has created a chance for many to personally observe the connection between vehicle travel and emissions. With the promise of cleaner air proven by the lack of transportation emissions during this crisis, we might just see electric vehicle adoption skyrocket.

Some states, such as New York and California and others, have also issued more stringent policies to push for zero-emission vehicles. Automotive manufacturers and technology companies are pressing onward, with 25-30 new electric vehicle models planned for release in 2020. Even companies

that are not traditional auto manufacturers are designing electric vehicles, such as the Sony vehicle that debuted at the 2020 Consumer Electronics Show.

What does this mean for the transportation industry?

- 1. Plan for or Implement Fleet Conversion/Facility Upgrades.** New electric vehicles are emerging regularly. Those who plan to upgrade fleets or facilities should consider electrifying at least part of the fleet. Today, buses, heavy-duty service vehicles, pickup trucks and passenger vehicles are all available in electric versions.
- 2. Pilot Charging Projects.** Despite the expected growth in EVs, not all agencies or owners are ready to take the plunge and convert to 100% electric operation. Consider a pilot project with a limited number of vehicles as a way to gain experience and test out the technology.
- 3. Inductive Technology May be the Answer.** Inductive, or wireless, charging is on a slower path than wired charging, but the potential is significant. With a longer lead time, there's time now to explore this technology and its integration into our operations and infrastructure.
- 4. Pursue Funding Opportunities Related to EVs.** There are a number of funding opportunities for those interested in EVs, including applying for funds from the Volkswagen settlement, receiving a Department of Energy grant or applying for an Advanced Technologies for Congestion Mitigation and Technology Deployment (ATCMTD) grant from USDOT. Agencies or owners not interested in grants should consider having key corridors named as one of FHWA's "Alternative Fuel Corridors," as this will open opportunities for funding further down the line.

The Struggle Between Dedicated Short Range Communications and Cellular for Connected Vehicle Applications Will Continue and Escalate

What will happen this year?

The use of Dedicated Short Range Communications (DSRC) has been the standard for connected vehicle applications since the assignment of 75MHz in the 5.9 GHz spectrum in 1998. DSRC will continue to be pushed by USDOT and others even as many in the automotive industry pivot to Cellular Vehicle-to-Everything (C-V2X).

The Background

Dedicated Short Range Communications has been the de facto standard for vehicle-to-vehicle (V2V) and vehicle-to-Infrastructure (V2I) communications since 1998. Over the past two decades, the USDOT and others such as AASHTO have been promoting connected vehicle applications and deployments using this technology. In 2018, the FCC began to question the allocation of that spectrum to DSRC, citing the lack of deployments as an argument for the release of the spectrum. Some automotive manufacturers such as GM, Toyota and Volkswagen supported DSRC while others such as Ford have backed the cellular approach. In December 2019 the debate escalated when the FCC voted to proceed with a Notice of Proposed Rulemaking to free 45 MHz of the dedicated spectrum for commercial use and designate 20 MHz of the original DSRC spectrum for cellular V2X usage. USDOT, AASHTO and others immediately began to push back but no automotive manufacturers have yet to come forward to commit to deploying DSRC in vehicles in the U.S. Toyota has announced that they are retracting their earlier statements indicating DSRC deployment in U.S. vehicles by 2021-2022. Meanwhile, trials of C-V2X have heated up in China and in the U.S., fueling the ongoing debate.

The COVID-19 pandemic has accelerated the change. The pandemic forced many Americans to rely on internet access to communicate with family, friends, conduct classes and perform other traditional “in-person” activities through video conferencing. To address broadband access, the FCC granted 33 wireless internet service providers in less populated areas special temporary authority to use 45 MHz of the 5.9 GHz spectrum “to serve all of those customers who are now working and distance-learning from home.” This effectively will result in a trial run of the FCC’s proposed rulemaking for releasing this spectrum permanently.

What does this mean for the transportation industry?

- 1. Consider Dual-Chipped C-V2X/DSRC Instead of DSRC Equipment.** Those considering or in the process of releasing projects that include connected vehicle applications should look into installing roadside units that have the capability to operate as either DSRC or as C-V2X equipment.
- 2. Study a Pause on Deployment.** The simple truth is that C-V2X is nowhere near as sophisticated in development as DSRC. The applications that go on the equipment have not been developed or converted from a DSRC platform, nor have standards and message sets for C-V2X been developed. This will likely happen quickly as the existing standards for DSRC do provide a roadmap, but for those on the fence regarding when to deploy, it might be a good time for a short pause to let the equipment and standards catch up.
- 3. Pay Attention to Placements of Cellular Microcells.** Many cellular companies want to place microcells within infrastructure owners’ rights-of-way. It is important to know that this is effectively the same type of equipment that will be needed for C-V2X. That is, 5G equipment is also C-V2X equipment. Unfortunately, this will cause friction as cellular companies will want to place this equipment where there is a large segment of the population that can benefit (e.g., inside of a stadium), whereas transportation agencies would want this equipment placed where it can provide a safety benefit to motorists and pedestrians using the roadways. One potential compromise would be for owners to negotiate for placement of 5G microcells at key safety locations in return for ROW access.
- 4. Line-of-Sight Still Is Needed for Safety Applications.** You might think that because your smartphone can get 5G inside of buildings and around corners that line-of-sight is no longer important for low-latency safety applications. This is not true! Line-of-sight will be required because the protocol for low-latency communication, while it is 5G, is different than the protocol for data or voice exchange. In this respect C-V2X is expected to have the same relative effective range as DSRC, 300-800 meters for low-latency safety applications.

Automated Vehicles Will Hit the Trough

What will happen this year?

Automated vehicles will enter the trough of disillusionment portion of their lifecycle. There will still be talk and some hype, but expect things to go “quiet” this year with respect to big announcements and deployments.

The Background

Automated vehicles have been touted as the “next big thing” in transportation for the last few years. The hype took hold and recently we have been riding the wave of inflated expectations. At the same time, because of the policies in NHTSA’s Automated Vehicle 3.0 guidelines and the uncertainty in insurance risk, many automotive manufacturers have been reluctant to designate their technology as a Society of Automotive Engineers Level 3 technology and instead they have opted for the lower Level 2 designation, which leaves the burden of driving on the human.

However, many new vehicles are being sold with automated features such as blind-spot detection, lane keeping assist, lane departure warning, adaptive cruise control, automated parking, etc. Similarly, we have now seen the “fly-by-wire” bridge crossed, with vehicle control surfaces such as the pedals and steering wheel no longer directly linked to the wheels, brakes or engine. Right before our eyes, the automotive industry is creating fleets of vehicles that are just a short firmware update or a retrofit kit away from being a highly automated vehicle. In 2020, the automotive industry will buckle down and go to work on updating and enhancing their offerings, having tested the waters on automation and found them to be rich. We likely won’t see many major announcements of breakthroughs in 2020, but look for the excitement to begin to rebuild in 2021 and 2022.

The COVID-19 pandemic, and the resulting potential impact on the financial industry, might cause automated vehicle venture capitalists and investors to shy away from large-scale technology investments. While this traditionally has been true during economic recessions, it may not be true for automated vehicles. One of the things that COVID-19 has taught us is the value of social-distancing for minimizing the spread of this virus. In Florida, for instance, autonomous vehicles are being used to transport medical supplies and tests, minimizing person-to-person contact. Vehicles that can provide the door-to-door experience without drivers might just become the next phase of mass transit. Regardless, the billions invested



in this technology have already created the momentum for moving forward.

What does this mean for the transportation industry?

1. Automation Is on Track – Keep Moving or Fall Behind.

This is not the time to pull back. Having a slow-down in progress after initially high expectations is a natural part of the lifecycle. Automation of vehicles is coming and 2020 will see a brief lull in activities that will allow the industry to either – become complacent and fall behind, or be aggressive and get in front of the change.

2. It’s More Important than Ever to Consider Automated Vehicles in the Design and Reconstruction of Roadways.

The lifespan of infrastructure assets is far beyond that of the expected deployment of automated vehicles. Those planning, updating or constructing infrastructure should stick with the core tenets of future-proofing:

- a. Ensure the fundamentals will be in place (dedicated power, dedicated communications)
- b. Prepare for significant data processing needs
- c. Include provisions for assisting automated vehicles in navigation – wider lane line pavement markings, LiDAR reference markers, other navigational aids.
- d. Consider loads, capacity and fatigue with automated vehicles, using microsimulation and other tools.
- e. Initiate planning for the needed adjustment of policies and procedures to incorporate automated vehicles.



Personal Mobility Gets a Shakeup

What will happen this year?

Personal mobility devices will likely continue to emerge and will spread across the U.S. However, expect companies to be more strategic and targeted in their rollouts. Beyond scooters, other types of personal mobility options will emerge such as “pod vehicles,” electric sitting scooters, electric mopeds, electric skateboards and more.

The Background

2019 was the “Year of the Scooter.” First introduced on the West Coast, their convenience and availability helped them to quickly spread across many cities despite attempts to block them. Following the initial success, several players jumped into the market, flooding cities with scooters. They seemed poised to continue their growth in 2020. But widespread reductions in personal travel have led to large disruptions in their business plans, including the possible need for subsidies. Major players have pulled scooters or cut services in many areas because of lower demand and concerns about sharing scooters that are not cleaned between users. At the same time, ridership saw at least temporary increases in areas where commuters were leery of crowding onto public transit. Long-term, selling or leasing devices to individual users may offer a path forward for companies. We should also look for alternative forms of personal mobility devices to appear, such as the new Segway three-wheeled pod-chair, or hybrid bicycle/scooters with two wheels and a seat but no pedals. These vehicles will take more space on the sidewalk and may encourage users to ride on roadways instead.

What does this mean for the transportation industry?

- 1. Complete Streets Could Become a Reality.** These types of personal mobility devices are not going away. They will compete with bicycles and automobiles for space on the roadway, and urban design will need to accommodate these new modes of travel. Expecting them to share a bicycle lane or sidewalk would likely continue the cycle of conflicts and injury. Designers today who are not a proponent of “complete streets” will need to account for the mixed-use roadways that will be needed in urban environments in the next decade.
- 2. Multi-Modal Just Got a New Dimension.** Personal mobility devices will continue to have an impact on transit, which can be either positive or negative. The relatively inexpensive trips may pull some riders away from transit, but it may also encourage other users as it provides a solution for the first-mile/last-mile decision. Transit agencies and planners should embrace this new form of transportation and develop partnerships with providers, including parking and/or racks at transit stops.
- 3. There Is a Strong Need for Promoting Safety Measures.** Riding scooters is fun. It can also be dangerous. There has been an increase in head injuries due to scooters since they were first deployed. Regulations are needed to make scooters safer, such as requiring helmets, enforcement of safe operating laws, marking or warning riders of potential hazards, etc. Set an example. If you choose to ride a scooter — wear a helmet. The same goes for bicycles. The cleanliness of shared personal mobility devices will also be a key safety concern and will likely require new policies and practices to implement.

Tolling Continues to Transform

What will happen this year?

Tolling will continue its modern evolution. As a New York City central business district tolling launch looms in early 2021, other cities will set the groundwork for their own cordon-based tolling programs. In 2020, discussions will also return to road user charging and there will be more opportunities and announcements of new projects.

The Background

The tolling industry has evolved during the past several decades with consolidation of technologies, roadside equipment vendors and back-office processing. Movement to all-electronic tolling (AET) or open road tolling has been a trend for the past decade following early successes in Texas and in other locations. The COVID-19 pandemic only accelerated movement in this trend with agencies seeking to reduce exposure risk of their employees and the public.

The use of AET in an urban environment for congestion relief as well as for revenue generation was first successfully deployed in London and in Asia. The New York City Central Business District deployment will be the first of its kind in the U.S. If successful, it is hard to believe that other major cities will not follow suit. Tolling technology continues to advance, moving from paper tickets and manned booths to AET with radio-frequency identification technologies. At the same time, new technologies based upon GPS and/or triangulated positions available through a smartphone are beginning to emerge.

The coronavirus pandemic, with its drastically reduced travel, will have a significant impact on funding for toll agencies and for state DOTs whose funding for transportation systems is largely from fuel taxes. Fuel tax revenue had already been falling as a result of increased electric and hybrid vehicle adoption. That long-term move away from conventional fuels may encourage policy leaders and transport experts to



explore alternative revenue solutions such as tolling options or the adoption of road user fees, where a traveler pays by mile for use of the roadway as a replacement or supplement to traditional tolling mechanism to boost revenues.

What does this mean for the Transportation industry?

- 1. Cordon Based Pricing May be Forthcoming.** If the NYC Central Business District Tolling project is successful, we can expect other cities in the U.S. to follow suit. The NYC project is proposed to be launched in 2021. There are potential lessons and insights that could benefit other cities considering cordon congestion tolls.
- 2. Road User Charging Is on the Horizon.** Anybody involved in tolling should become familiar with the concept of road user fees. These methods range from “low-tech” options such as a yearly registration fee to a “high-tech” in-vehicle device that wirelessly captures mileage and assesses a fee. A national evaluation of road user charging methods and pilots is underway.
- 3. Tolling at a Premium.** New trends in tolling are emerging as High Occupancy Vehicle lanes continue to be converted to High Occupancy Toll lanes. In 2020, we will see the industry begin to explore other types of managed lanes such as the use of a “express lane” within an existing tolled system.

About the Author

Transportation technology expert Ben Pierce has spent more than 29 years researching, evaluating and following the evolution of transportation. He is a nationally recognized speaker and thought leader who believes modern transportation can be a solution when addressing today's challenges. As the transportation technology program leader at HDR, he helps clients plan for and integrate technology enhancements as a means to solving societal problems — from infant mortality and access to healthcare, to educational opportunities and connecting people to employment and beyond.