Driving Toward Greater Safety and Efficiency

Urban Mobility Data Exchanges

Jane Wiseman, Institute for Excellence in Government, September 2020

The author thanks the IBM Center for the Business of Government for a grant that funded the research for this case study and a forthcoming paper on inter-governmental data sharing, and Michael Schnuerle, Director of Open Source Operations at the Open Mobility Foundation for thoughtful contributions to the paper.

Table of Contents

Driving Toward Greater Safety and Efficiency: Urban Mobility Data Exchanges

Jane Wiseman

September 2020

Summary

When micro-mobility services unleashed shared-service bicycles, and then dockless scooters onto city streets, they disrupted more than just traffic. At that time, there were few if any public servants who knew exactly whose responsibility it was to regulate the safety of these new entrants to urban life. Should responsibility lie with those who regulate streets? Or sidewalks? Or parks? Or sharing economy services such as short term housing rentals and ridesharing?

This disruptive innovation has unleashed a creative response from data-savvy individuals who have created a network for urban data innovators to create common standards and platforms and to share approaches to managing the services for the greatest public good. The Mobility Data Specification (MDS), rolled out in 2018, came about because of a need for data standards around dockless scooters, but the need for standards is wide-ranging in the mobility policy area. MDS demonstrates the value of building on existing efforts as it leveraged an existing standard for bike share data.

More than 80 cities are now using MDS to manage their micro-mobility vendors and to gather the data for local mobility policy decision-making. The Open Mobility Foundation (OMF) a non-profit organization created to advance innovation in urban mobility, support cities in adopting MDS and provides a forum for exchange of ideas. OMF hosts open source code and APIs to facilitate rapid transfer of success cases from one jurisdiction to another. This case study demonstrates the power of disruptive innovation to inspire creative government solutions, and the value of networks in sharing success cases.

COVID-19 note: Note that the research for this case study was largely completed before the COVID-19 lockdown dramatically changed city life, and urban mobility along with it. While some of the data in this case study may not reflect current trends, the policy issues and the value of a network for sharing urban challenges and solutions are increasingly salient as city government attempts to navigate the new issues brought about by the pandemic and the economic and civic changes it has wrought.

Introduction

Few public policy areas could be more fundamentally inter-governmental than safe and efficient travel on the roads. Interstate highways were established and largely funded by the federal government, along with the safety requirements of the vehicles that traverse them. Yet the day to day oversight of safe operation of vehicles traveling on those roads are the province of state government whose responsibility for enforcement of speed and other laws protects us on the highway. Once off the highway, the responsibility falls to local law enforcement and regulations set by cities and towns in addition to federal and state law.

The challenge of making transportation safer for vehicles, pedestrians and cyclists, not to mention scooters and the like requires a complex web of intergovernmental collaboration. As technology provides more means of moving from place to place, and for creating data about that movement, some localities are designating mobility managers with responsibility for sorting through the data and policy issues posed by the complex web of existing and new modes of transit.

Even within cities, there can be as many as six or seven different agencies responsible for parts of this emerging area – from the Public Works department responsible for repairing sidewalks to the Highway Department responsible for establishing speed limits and posting signage, the Parking Enforcement division that monitors compliance, the Parking Clerk who grants residents the right to park in designated areas, the Environmental Division which can regulate emissions and establish air quality goals, and a Taxi and Limousine or Hackney division that regulates traditional taxis.

Add to this mix the new entrants such as ride hailing, bike sharing and dockless scooters and the web becomes more challenging. Some mobility policy decisions are made by cities themselves, others by transportation agencies which may be regional and quasi-governmental. The city of Boston has appointed a Chief of Streets who oversees all of city government related to uses of the roadways. Some cities are designating a mobility manager, as Atlanta did in early 2020 but in most places, the responsibilities remain dispersed among a variety of actors. As noted by Stephen Goldsmith, Derek Bok Professor at the Harvard Kennedy School, “the basic problem still remains in most places, with the exception of a few cities that are creating mobility offices, is that those cities often don't have enough authority.[1]”

Goldsmith further notes that data may offer the best opportunity for government to develop smart policy:

> Today, new opportunities exist as the same technology breakthroughs that prove so disruptive to the urban transportation market also provide to public officials the tools

1 Daniel Harsha. *From Liability to Asset: Stephen Goldsmith on How Ridesharing has Transformed the Humble Sidewalk into a Valuable Piece of Urban Real Estate,* DataSmart City Solutions. February 27, 2020

necessary for proper enforcement. Data is the new regulatory currency involving such things as ride share, e-scooters, and dockless bikes. The data produced allows government to evaluate utilization, access, equity, proper parking locations, and more in real time and without human intervention. As city residents increase their dependence on these services, cities must leverage the data to develop new regulatory frameworks that encourage usage, while also steering connected mobility providers to develop business models invested in generating better public outcomes[2].

Some cities have already found that using data can help them not only stay abreast of the technological change in mobility, it can also advance other agendas such as equity and sustainability. For example Kansas City, MO has used data to designate "opportunity zones" characterized by low income and concentrations of minority residents. As vendors seek permits in the city to try out mobility innovations, the city uses these designated zones as required locations for a minimum threshold of services by those companies.

In another example, New York City has mandated that for the city's carshare program, companies agree to put 20 percent of on-street spaces and vehicles in areas with low income residents[3]. Using city income and equity data the NYC DOT can identify gaps in the new mobility networks and seek to address them. NYC also requires that bikeshare companies provide the city with bike and dock availability data in real time. The information is published on the city's open data portal and available to the public. For ride-hailing companies like Uber and Lyft, the city mandates that the companies share with the city data such as ride origin and destination, and whether the driver's app was on or off. With this data, the city can monitor how long a driver has been on the road and can prevent overly-fatigued drivers from causing crashes.

This case study describes three key components of mobility data sharing: a city-initiated data sharing standard, a third-party organization seeking to advance data use in this area, and the federal government's efforts to support and amplify this and other mobility data standards projects.

The Mobility Data Specification (MDS)

The Mobility Data Specification (MDS) came about because of a need for data standards around dockless scooters, but the need for standards in policy and practice as well as data is wide-ranging for mobility. Los Angeles Department of Transportation (LADOT) general manager Seleta Reynolds notes, "As a baseline, the city needs to have the same ability and authority in the digital realm as it has in the physical realm. You can't put up a traffic light that turns purple

[2] Goldsmith, Stephen, and Leger, Matthew. *Mobility and the Connected City: Effectively Managing Connected Mobility Marketplaces*, DataSmart City Solutions. February 20, 2020.

[3] Betsy Gardner. *How NYC is Using Transit Data for Equity Goals*, DataSmart City Solutions. February 18, 2020.

and that means stop. I'm the one who puts in the traffic light, and red means stop — and it means stop whether you're in Singapore or Bogota or Los Angeles. In the digital realm, if we're talking about traffic control devices, no app ought to be able to override the way that those traffic control devices work.[4]"

Origins of the Mobility Data Specification (MDS)

Reynolds came to her job in Los Angeles in 2014 from San Francisco. Tired of watching the new tech-enabled ride-sharing companies shut the city out of their rich data feeds, and eager to harness data to make policy decisions about how to route buses and how to serve disadvantaged neighborhoods, she decided to engage proactively with tech-enabled transportation providers. The emergence of dockless scooters in nearby Santa Monica in 2017 provided just the inventive her team needed to move from theory to action.

Her team had been working for months on an open source standard format for getting location, volume and status data from mobility providers. In 2018, they rolled out the Mobility Data Specification (MDS), and required new micro-mobility providers to abide by it as a condition of operating their dockless scooter companies in Los Angeles. With this regulation in place, the city now gets large volumes of data about where scooters start and end their trips and where broken, illegally parked, and low battery charge scooters are. The city wants this data so that it can advance goals like equity and sustainability across its diverse geography. The data received via MDS can inform city transportation safety, policy enforcement, incident investigation, fee assessment, and planning decisions, like where to put a bus-only or protected bike lane, and how to ensure that low-income neighborhoods have access to dockless vehicles.

The MDS development process: open and collaborative by design

The MDS development process was intentionally open and collaborative. The LADOT team provided regular progress updates on its GitHub page[5], and actively sought feedback on its work. The goal was both to create something useful in LA and also to create something extensible to other cities. The two-way feed of data from companies to the city and from the city to companies initially consisted of two application programming interfaces (APIs):

- The Provider API, which specifies the format for how a mobility company sends its data to the city. This API allows the company to send the city the start, end, and route of each dockless vehicle trip in a standard format. This API also enables the company to send the city data about vehicles that are broken, out of power, or in the process of being "rebalanced" (moved from low demand spots to high demand spots).

[4] Betsy Gardner. *Moving Beyond Mobility as a Service: Interview with Seleta Reynolds.* DataSmart City Solutions. December 18, 2019.

[5] https://github.com/openmobilityfoundation/mobility-data-specification

- The Agency API, which lets the city send information back to the companies. For example, the city can let micro-mobility companies know about street closures for construction or public events, so that scooters can anticipate and work around these closures. This API could also enable cities to fine companies for illegally parked scooters.

While some dockless vehicle companies applauded the development of standards as they had previously had to develop different processes for each city that had a data sharing requirement, others have resisted.

MDS demonstrates the value of building on existing efforts as it leveraged an existing standard for bike share data. The North American Bikeshare Association (NABSA) developed the General Bikeshare Feed Specification (GBFS) for bikeshare programs. This effort was not focused specifically on cities and policy-making but on users and on providing information about bike availability. It was developed through a partnership between city bikeshare planners and bikeshare companies[6]. More than 80 cities are now using MDS to manage their micro-mobility vendors and to gather the data for local mobility policy decision-making.

Spotlight on Louisville, early adopter of MDS

One early adopter city, Louisville has found the standard useful. James Graham, Mobility Coordinator manages the e-scooter dockless mobility program. The role ranges across a wide spectrum of responsibilities and has unique and new challenges that need to be addressed as shown in the table below.

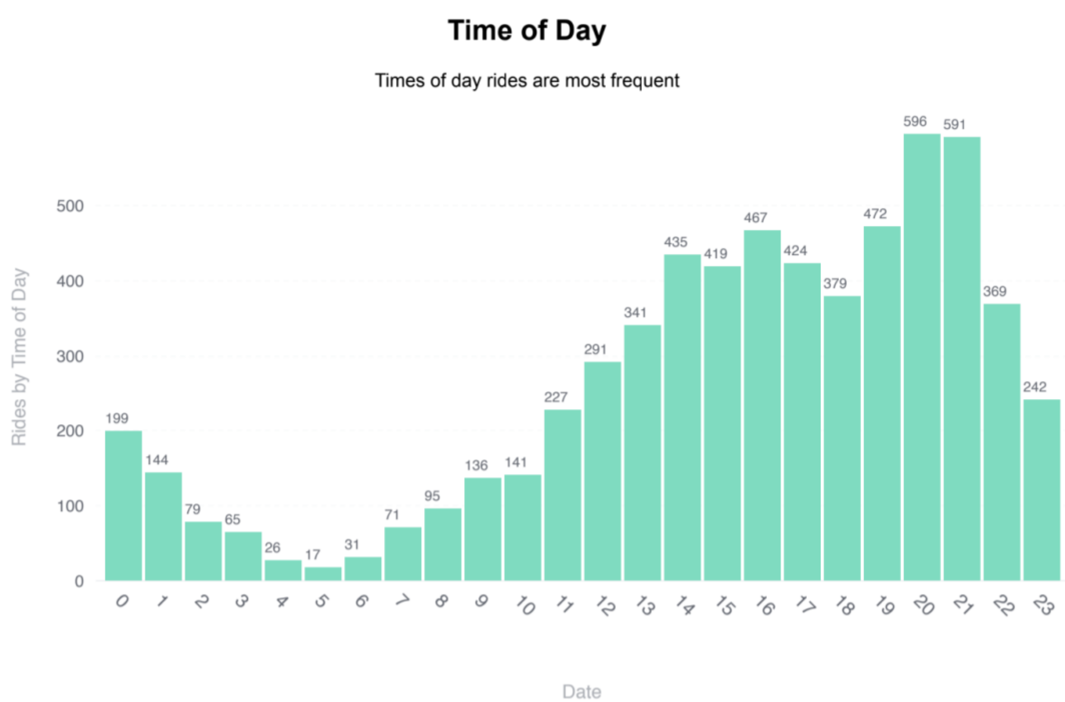
Responsibilities and Challenges **Louisville Mobility Coordinator**	
Mobility Coordinator Responsibility	**Associated Challenge**
• Enforcement of program rules.	• Enforcement needs to be real time, not after the fact
• Assessing permit fees.	• Permit fees are variable and need to be updated dynamically.
• Fielding community feedback and complaints.	• Complaints can come in from a variety of sources and need to be checked against actual scooter activity.

[6] Regina Clewlow. *A Practical Guide To Mobility Data Sharing*. Forbes. Aug 28, 2019.

Responsibilities and Challenges Louisville Mobility Coordinator	
Mobility Coordinator Responsibility	**Associated Challenge**
• Evaluating outcomes / e-scooter program performance.	• Outcome evaluation is time- and data-intensive.
• Ensuring safety and equity across the network.	• Permits can include equity and safety provisions, but are they being met?
• Multi-modal transportation planning.	• Better infrastructure is needed, but which projects to prioritize?

Graham has found that MDS streamlines his data tracking, helping him address many of the challenges listed above. He notes that, "I'm one person. I don't have the time to manually check in on all of this data in different formats so a single format helps."

For example, with MDS, Graham can automatically generate a combined view of all scooter traffic by time of day and can look for patterns that would show or example if the nighttime safe riding curfew is being violated as shown in the graphic below.



Source: City of Louisville

In another example, Graham was able to generate heatmaps of where scooters are dropped off as shown in the graphic below. This analysis was helpful in when the city created designated parking spots for drop-off of dockless scooters in response to concerns about scooter “clutter” on sidewalks in busy pedestrian areas.

Source: City of Louisville

Michael Schnuerle, former Chief Data Officer for Louisville, Kentucky, notes that the MDS data standard helped him quickly publish trip data after scooters appeared unexpectedly on local streets. The standard allows the city to require standard data from all e-scooter operators and enables the city to work with an API feed to easily prepare mobility data for internal sharing or aggregation and preparation for publication on the open data portal. In 2018, Louisville became the first city to make aggregated MDS trip data available to the public, along with the methodology for doing so, and now four other cities are doing so as well. After publishing the data, “It was immediately among our four most popular data sets,” Schnuerle noted.

Open Mobility Foundation (OMF)

The Open Mobility Foundation (OMF) is a non-profit organization that emerged on the heels of the movement by cities to adopt standards such as MDS. OMF was created in 2019 to make more and better open source mobility management tools available to cities for data-driven policy-making. The ultimate goal is better and more affordable and accessible urban transportation outcomes by providing open access to cutting-edge digital tools and fostering sharing across many partners to scale successes.

OMF is a virtual organization comprising just two full time staff and overseen by a large board of directors that includes public sector representatives. The board is supported by working committees that include both public sector and non-public sector participants. This unique public-private model allows for open and transparent exchange of ideas and information in this complex intergovernmental policy area.

Building on the foundation of the Mobility Data Specification (MDS), OMF takes on the technical issues related to rapidly changing urban mobility technology and hopes to create mobility management tools that help people "move safely, efficiently, and effectively." To help cities implement MDS, OMF now owns and manages the MDS code base and will create and manage a set of model policies covering topics such as privacy, data security, and procurement, and will develop technical implementation guidelines to spread adoption of MDS in cities.

The 15 founding cities are Austin, Chicago, Los Angeles, Louisville, Miami Dade, Minneapolis, New York City DOT, New York City Taxi and Limo Commission, Philadelphia, Portland, San Francisco, San Jose, Santa Monica, Seattle, and Washington DC, and many more have since joined.

As noted by the OMF, "The primary work product of the Foundation is the governance and development open-source software and related policies, to codify the data model, syntax, semantics, and operational usage of a set of interfaces between software subsystems[7]."

The Open Mobility Foundation has an ambitious vision, which according to their web site is to support "the development and broad deployment of a common, open-source software platform that allows cities to fulfill their multiple responsibilities for safety, limiting congestion, promoting commerce, ensuring the protection of individual data, and improving the quality of life in age of digitally-driven transport.[8]"

OMF members can be from cities, mobility service providers, third party tool builders, academia, civic nonprofits, corporate stakeholders, subject matter experts, and the public. OMF projects are designed to be collaborative and cross-cutting, leveraging a diverse range of perspectives and organizations.

OMF has partnered with an established standards-setting non-profit, OASIS, created in 1993 and now a 5000+ member consortium. This member-driven body sets standards for developing code, APIs, or specifications in a wide range of areas such as cybersecurity, privacy, cryptography, cloud computing, content technologies, energy, emergency management, and the Internet of Things (IoT). In addition to the membership fees paid by participating cities and public agencies, the Open Mobility Foundation is funded in part by The Rockefeller Foundation.

US Department of Transportation (DOT)

In 2017, more than 37,000[9] people died in motor vehicle crashes in the United States, and in 2016 more than 3 million people were injured. The US Department of Transportation has taken a leadership role in forging inter-governmental data exchanges to improve safety on roadways

---

[7] Open Mobility Foundation, Overview Document, www.openmobilityfoundation.org
[8] https://www.openmobilityfoundation.org/faq/
[9] US Department of Transportation: https://www.transportation.gov/SafetyDataInitiative

in response to the recent rise in traffic fatalities on the roads. DOT is forging data partnerships both with state and local government and also with academia and the private sector.

DOT collects vast amounts of data from state and local government on the condition of their roads, vehicle crashes, and how many cars are traveling on them annually, transit usage, rail-related injuries and deaths, data on worker fatalities on the railroad, flight safety, and so on. This data is inherently intergovernmental, as it relies on local governments to submit data to their states who then submit it to the federal government, all in a consistent and standardized format. So, for example the national census of fatal crashes relies on a local police officer who responds to the crash and records the results, which are passed on through reporting channels in the department, and through county or state officials before becoming part of the national DOT database.

DOT Chief Data Officer Dan Morgan and his team are at the heart of the department's efforts to use data more effectively in making policy decisions and in enabling others to do so as well. The team has created an open data portal that provides the public and researchers access to large volumes of data and the ability to integrate across data sets. As Morgan points out, the most interesting answers in transportation span the boundaries of organizations and of jurisdictions of government. He wants users to be able to look across and beyond DOT to find answers to transportation challenges.

His vision is to have a truly integrated data set across the department, or as he says, data that can "cross the white space of the org chart." He wants to make it easy for DOT staff, the public, and researchers to share data and to work, "horizontally, vertically and diagonally," and realizes this is a culture change for many in government who are used to operating in their own silos.

"The data we rely on is mostly created at the local level, some of it from municipalities and some from other sources such as Waze. But we also need other sources that transcend transportation. You don't experience transportation one piece of infrastructure at a time. You live in a place, and understanding a place necessarily involves integrating data from different disciplines. I can't understand where to build transportation if I don't know what habitats I'm going to impact and in what ways… I can't manage the transportation system well unless I understand its impacts on human health in a variety of dimensions." Morgan noted that additional data inputs come from the EPA and the Centers for Disease Control, the departments of Agriculture, Interior and more[10].

---

10 Jory Heckman. *Keys to success for a chief data officer: Automation 'with a purpose' and willing workforce.* Federal News Network. December 17, 2019.

The Safety Data Initiative

The U.S Department of Transportation's (DOT) Safety Data Initiative (SDI) which began in 2018, seeks to integrate existing government data sources across federal, state and local sources, and to integrate external sources as well. The goal is to improve safety by better understanding what causes vehicle crashes and how to prevent them. The idea is built around harnessing big data and predictive analytics tools to develop new ways to prevent vehicle crashes. The long term goal is to develop data models that can estimate the timing and location of crashes to inform emergency responders, traffic management centers, and law enforcement so that they can proactively allocate resources to locations with the highest potential to prevent crashes and save lives.

Part of the vision includes[11] developing "an integrated data eco-system for rapid, rigorous, and innovative safety data analysis and insights using new datasets and new analytic tools across surface transportation modes, accessible to decision-makers to support policy decisions." Funding and program activity will include data visualization, data integration and development of predictive analytics models to identify risk patterns and develop insights that anticipate and mitigate safety risk to reduce injuries and fatalities. To do this, DOT is building internal data analytics capability and is establishing data integration collaborations outside the organization with academic as well as public and private sources.

The Solving for Safety Visualization Challenge

The Solving for Safety Visualization Challenge was launched to explore ways that data visualization could reveal new insights on how to prevent serious crashes on roads and railways not seen through traditional data analysis. The goal was to reach out to innovators and entrepreneurs across many sectors in the business and research communities -- technology companies, analytics firms, mapping and visualization companies, transportation companies, industry associations, research organizations and universities. The competition sought two types of visualization tools – those that could uncover new insight on existing trends and patterns, and those that could develop predictive models for simulations and scenario planning.

The procurement method was innovative, with a first stage that invited ideas and a second stage in which five semi-finalists had a four week timeframe to develop a proof of concept and prototype. In the third stage, two finalists received partial funding to create a full working version of their tool. The final award was a grant made in November 2019 to the University of Central Florida for a tool that uses advanced analytics, including machine learning and Artificial Intelligence (AI), to predict elevated crash risk in real time and suggest safety countermeasures.

Over 50 organizations participated in the challenge including teams from Ford and Uber. The winning submission, the Real-Time Crash Risk Visualization Tools for Traffic Safety

[11] https://www.transportation.gov/SafetyDataInitiative

Management[12] provides real-time crash risk visualizations real-time and static data, providing predictive analytics and diagnosing real-time traffic safety conditions. Using traffic data, weather, history of past accidents and violations, and other data, the tool will be able to predict if the risk of an accident increases or decreases given a specific scenario, and then presents the results in an easy-to-understand visual readout and map. The goal of the tool, when deployed is to allow local transportation safety officials to identify dangerous roadways, intersections and conditions before crashes occur there.

Waze Pilot

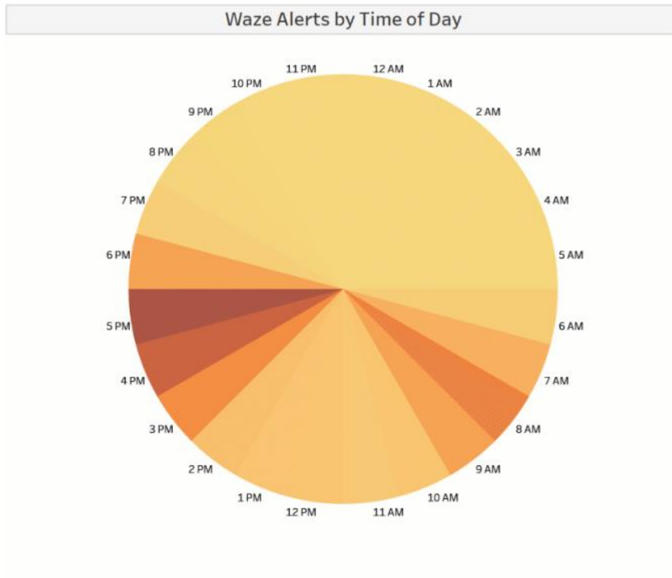
The Waze app passively collects real-time information from its users about traffic conditions where they are. It also allows users to report accidents, traffic jams, road closures, and road hazards, essentially crowdsourcing additional intelligence in real time on roadway safety. A partnership between Waze and DOT is providing access to a terabyte of data that is updated hourly on vehicle crashes on national highways across the US. Looking at prevailing speeds from anonymized data will help DOT identify where there are design changes that can be made in roads to reduce the likelihood of crashes by reducing average speeds at the most dangerous locations. Connecting to Waze data will help DOT examine if user-reported hazards can help predict, and in the future prevent, crashes.

In a 2017 pilot study[13], DOT researchers from its Boston-based Volpe Center integrated user-reported Waze crash data with crash data from the state of Maryland. Using machine learning, the team was able to estimate the time and location of likely police-reportable accidents providing estimates of crash risk within one-mile-area grid cells across the state of Maryland. As shown in the graphic below, most Waze accidents in the Maryland pilot occurred late in the work week (Thursday – Friday), and during commute hours (7 A.M. – 9 A.M. and 3 P.M. – 6 P.M.)

---

[12] https://drive.google.com/file/d/1SqRIT_LyBJ1OTPMPE9fAhG2t26-4YD_n/view

[13] Flynn et al, *Estimating Traffic Crash Counts Using Crowdsourced Data: Pilot analysis of 2017 Waze data and Police Accident Reports in Maryland*. US Department of Transportation. November 2018.



Source: Data visualization by Michelle Gilmore, U.S. DOT Volpe Center.

The pilot project was successful and is now being extended to three additional states: Virginia, Connecticut, and Utah. If successful, the Waze data analytics project may be extended to a nationwide rollout. The city of Bellevue, WA engaged in a pilot project with the Volpe Center to compare 911 and Waze crash reports in an effort to drive insight for their Vison Zero efforts to reduce traffic deaths and serious injury collisions to zero by 2030[14]. The work included developing interactive dashboards integrating crash and other data sources so that city transportation officials can identify traffic crash patterns and develop mitigation strategies for high risk times and locations for crashes. A second pilot was conducted with the Tennessee Highway Patrol to integrate the Waze data into the state's existing crash prediction model using high-resolution Waze data to develop a model to predict crash risk every hour for one-square-mile grids. The goal is to target the highest risk times and areas for proactive patrol.

A Collaborative Research and Analytics Platform, the Secure Data Commons

The DOT has created a Secure Data Commons (SDC) to advance data sharing by creating a platform for open use and sharing of data and analytic insights. The SDC enables cloud-based collaborative and controlled integration and analysis of research data and provides privacy protections for personally identifiable information (PII) and confidential business information (CBI). Only approved users can access the data and they must be approved by DOT to do so.

Nationwide Waze data is stored in the SDC and can be made available to researchers for work such as examining incident response times and use of incident frequency as a proxy for traffic volume. Analysis of the Waze data must be done within the Secure Data Commons and

[14] https://bellevuewa.gov/city-government/departments/transportation/safety-and-maintenance/traffic-safety/vision-zero

researchers may not export raw data from the SDC. Data analysis products, such as model results, figures, and tables can be exported from the SDC and shared publicly, subject to the approval of the USDOT and Waze.

Work Zone Data Initiative

Another data effort that spans federal, state and local government as well as the private sector is the Work Zone Data Initiative (WZDI)[15]. While it may seem like a simple thing, there has never before been a common data standard for sharing work zone data in a timely fashion, making it difficult and costly for third parties, such as navigation apps to access and use these data across various jurisdictions. The goal of this effort is to save lives by proactively sharing information about when work crews will be on the road, protecting the safety of roadway workers as well as the drivers, cyclists and pedestrians who might be involved in the event of a crash.

The national initiative seeks to accelerate the adoption of a standard[16] for collecting and communicating work zone activity data across jurisdictional and organizational boundaries – codifying the when and where of work zone deployment so that the information can easily and quickly be shared with the public. This group collaborated to create a conceptual data architecture for work zone data systems for collecting, storing, disseminating, managing, maintaining and archiving work zone activity data. DOT launched the data initiative with dozens of partners spanning state and local government and the private sector to jumpstart the voluntary adoption of a basic work zone data specification.

Maricopa County, AR was an early adopter of the initial version of the data specification and many others are now also using and providing feedback to improve the data standard. The long term goal is to have it be used widely.

Lessons Learned

Lessons from this case study include:

- **Setting data standards for vendor data levels the playing field between cities and vendors.** Before development of the MDS, when mobility vendors could submit data to cities in any format they chose, cities had to do a great deal of work to make that data understandable and amenable to analytics. By imposing a data standard for how vendors would submit their data to cities, MDS allowed cities to compare across vendors on various metrics and significantly decreased the amount of effort to normalize data across vendors. This significantly leveled the balance of power between city and vendor, enabling cities to have conversations with operators on equal terms.

[15] https://collaboration.fhwa.dot.gov/wzmp/wzdi/Forms/AllItems.aspx
[16] https://github.com/usdot-jpo-ode/jpo-wzdx/blob/master/README.md

- **Data can drive narrative.** A mobility data standards pilot project in Louisville demonstrated how data can act as persuasive evidence in support of specific, actionable narratives as data visualization created momentum for policy change.
- **Trust depends on relationships that can take time to grow.** New initiatives mean forging new partnerships. Each time a new working relationship is established, it takes time to develop into a relationship of trust.
- **Sharing networks accelerate innovation and decrease friction.** A community of practice, open source tools, and data partners can be critical to this ecosystem. The Open Mobility Foundation has demonstrated the power of network both for urban data and transportation officials, but also for idea exchange with vendors as well.

Conclusion

Mobility and transportation safety are a rich area for applying data to solving public problems and for reaching across boundaries of organizations as well as jurisdictions. This area also raises interesting questions for future consideration including integrated payment mechanisms for all mobility services in a "transportation wallet" of sorts, pricing of the curb and other regulatory moves that can leverage data for better allocation of resources in urban environments for better efficiency, mobility, safety and equity. Privacy of data and role-based access will be an emerging area for discussion as increasing numbers of private sector operators are involved in this area.

While great progress has been made in engaging public sector and university and vendor voices in the conversation, additional progress could be made in directly engaging the consumer in defining the way forward in designing the infrastructure they use.

Finally, thinking about major transit and transportation infrastructure investments in light of the interplay between equity for those of economic or social disadvantage or disability, sustainability and overall public health and well-being will be an area to continue to iterate on. Ultimately, the goal can be to enable data to transcend boundaries in the interest of advancing the public good.

Acknowledgements

The author thanks the IBM Center for the Business of Government for a grant that funded the research that made this case study possible and that supports work on a forthcoming paper on intergovernmental data sharing. The author wishes to thank Michael Schnuerle, Director of Open Source Operations at Open Mobility Foundation, whose thoughtful input helped shape the ideas for this case study. The author is grateful to John Kamensky, Senior Fellow at the IBM Center for The Business of Government for his helpful review and comments.

Sources

Clewlow, Regina. *A Practical Guide To Mobility Data Sharing*. Forbes. Aug 28, 2019.

Flynn, Dan, PhD, Gilmore, Michelle, and Sudderth, Erika PhD. *Estimating Traffic Crash Counts Using Crowdsourced Data: Pilot analysis of 2017 Waze data and Police Accident Reports in Maryland*. US Department of Transportation. November 2018.

Gardner, Betsy. *How NYC is Using Transit Data for Equity Goals*, DataSmart City Solutions. February 18, 2020.

Gardner, Betsy. *Moving Beyond Mobility as a Service: Interview with Seleta Reynolds.* DataSmart City Solutions. December 18, 2019.

Goldsmith, Stephen, and Leger, Matthew. *Mobility and the Connected City: Effectively Managing Connected Mobility Marketplaces*, DataSmart City Solutions. February 20, 2020.

Harsha, Daniel. *From Liability to Asset: Stephen Goldsmith on How Ridesharing has Transformed the Humble Sidewalk into a Valuable Piece of Urban Real Estate*, DataSmart City Solutions. February 27, 2020.

Heckman, Jory. *Keys to success for a chief data officer: Automation 'with a purpose' and willing workforce*. Federal News Network. December 17, 2019.

Open Mobility Foundation, Overview Document, www.openmobilityfoundation.org

Schnuerle, Michael. Director of Open Source Operations at Open Mobility Foundation, interview with author May 22, 2020.