This edition of THINK offers insights into transportation innovation in American cities.

A Tale of Three Cities
Houston, Denver and Gainesville are demonstrating how innovation and partnership are improving mobility in the short term while preparing the way for tomorrow.

Paradigm Shift
Sylvester Turner, Mayor of Houston, explains how one of the nation’s fastest-growing metro areas is optimizing its transportation system to enhance service and reduce congestion.

Mile-High Transformation
David Genova, CEO of Denver’s Regional Transportation District, relates how strong regional cooperation and innovative financing are helping to make transit a lighthouse for innovation.

Real-World Testbed
In Gainesville, a dynamic partnership among the City, the University of Florida, the state’s DOT and a range of stakeholders is poised to test new technologies that will shape the future of transportation.
Paradigm Shift

Houston is creatively reshaping its mobility approach to address today’s traffic challenges while building a system that can meet tomorrow’s ever-rising population.

By Mayor Sylvester Turner | City of Houston, Texas

Houston is known for many things: we’re the energy capital of the world, the most diverse city in the nation and a leading economic driver for the state of Texas. We’re also among the fastest-growing metro areas in the country, and we expect to increase our number of residents 50 percent to 4.3 million by 2035.

The growth of Houston and the surrounding region continues to be a blessing. It delivers more jobs and economic opportunities for people, and helps us generate the tax revenue to deliver enhanced services to our residents. This growth, of course, also has brought some tough challenges, among them severe traffic congestion. Yet, Houstonians – and I know this well, as a lifelong resident – such challenges are not discouraging but rather a resounding call to action to come together and get creative.

We are a growing, dynamic area with lots of elbow room for developing a new paradigm for transportation in our region. This includes expanding access and availability of public transit while making our highways more efficient and safe for everyone.

As our city has grown outward and built up over the decades, the result has been suburban sprawl and the creation of a car culture that has put a greater strain on our highways and roads. As a result, Houston is often on lists of U.S. cities with the worst traffic congestion.

A Tale of Three Cities

Across the United States there are nearly 20,000 cities, each with unique geography, historical milestones and cultural nuances. Their one common feature – which often defines the vitality of their economies and quality of life – is the responsiveness and resiliency of their transportation assets.

Cities may plan, build, maintain and evolve their transportation systems in subtly different ways, but the chief goal is always to provide mobility options that are accessible, safe and affordable.

In this edition of THINK, we pay tribute to the creativity and resourcefulness of America’s cities by featuring insights from leaders in three cities that are pursuing ambitious transportation strategies:

Houston: Shifting the Transportation Paradigm

Already the nation’s fourth-largest city with highly congested highways, Houston is predicted to grow its population 50 percent by 2035. The city is pursuing a multi-pronged strategy to improve capacity on its existing highways, creatively enhance transit’s reach and efficiency and harness high-speed rail as a way to enhance economic growth and regional synergies. Houston Mayor Sylvester Turner tells the city’s story on page 5.

Denver: Leading Mobility Integration Regionally

Nearly 15 years ago, voters in Denver approved a sales tax increase to fund public transportation improvements in the region – which led to the creation of a multimodal system that serves nearly 3 million people across 2,300 square miles. Now, the city’s transit agency is stepping up to a broader challenge: leading the integration of quickly emerging transportation options to create an efficient and sustainable system. David Genova, the General Manager and CEO of Denver’s Regional Transportation District tells the city’s story on page 10.

Gainesville: Putting Tech to the Test in the Real World

The City of Gainesville is on course to make history as an innovative partner ship launches a transportation technology “smart tested” – the first to be implemented in a real-world environment, and the first to operate an autonomous transit service that serves the public while sharing roads with cars. The three figures leading the charge are University of Florida’s Lily Elefteriadou, Ph.D., Florida Department of Transportation’s Tom Byron, PE, and the City of Gainesville’s Anthony Lyons. Read the story on page 14.
congestion. The most recent Kinder Institute Annual Survey found that congestion was the number one problem cited by residents of Harris, Montgomery and Fort Bend counties—above even flooding, crime and the economy. Unfortunately, this issue threatens to only get worse as the region’s population continues to grow and residential development spreads further out on the edge of the metropolitan area.

**Getting More from Highways**

Recently, we’ve made improvements in the expressway system by using managed lanes and two-way, high-occupancy-vehicle lanes, but the limited number of two-way HOV lanes in many corridors is still a significant challenge for people as they travel to and from work and other activities. I am a big believer in two-way HOV capabilities, and have challenged our transit planners to envision better ways to utilize that approach to ease congestion where possible.

We have other critical gaps in our current highway infrastructure, a prime example of which is the inner Katy segment of Interstate 10 on the west side of downtown Houston. This segment serves as the region’s travel spine, but the lack of a fully connected two-way HOV system or light rail line between the Theater District and city’s Northwest Transit Center places increasing demands on an already congested facility. We are envisioning the next generation of our HOV system to offer two-way service on all freeways, seven days a week.

In a major effort to ease highway congestion, we’re about to embark on an overhaul of Interstate 45, which passes through the heart of the city, north to south.

This spring, the Texas Transportation Commission approved nearly $1.3 billion in funding for Houston infrastructure projects, and most of that investment will go toward realigning I-45 and reconstructing parts of I-69 and I-10 near downtown. These related projects—comprising the North Houston Highway Improvement Project—represent a once-in-a-generation opportunity to fix the problems that have blossomed since key Houston highways were first constructed. We’re working closely with TxDOT to explore highway and bridge design options that go beyond easing traffic snarls. These will reconnect neighborhoods long divided by existing highways, create more civic spaces and greenways and seize opportunities to build iconic or signature structures that will be uniquely Houston.

**The Transit Advantage**

As significant as these improvements will be, we know we have to do more than just invest in roads for privately owned vehicles. This is why our paradigm shift in transportation has to make the most of our transit systems so that people have interconnected options for getting around the city and beyond. Our regional transit authority, METRO, has risen to the challenge, generating greater value from the more than 1,200 buses, three light-rail lines, HOV and HOT lanes and transit hubs it operates.

Over the past few years, METRO’s complete reimagining of the region’s bus system, which we call the New Bus Network, has transformed a previously underutilized inefficient asset into a high-performing mobility option for Houstonians.

There were a few pieces to this transformation. For one, the routes have been reorganized into a vast grid from a radial design, which has extended service to more parts of the city. Also, buses now travel along these expanded routes with greater frequency. Some routes have buses arriving every 15 minutes or so, and deliver reliable service seven days a week. These changes have resulted in a far more efficient network, connecting more people to more jobs and other destinations, which has both increased METRO ridership, in contrast to national bus ridership trends, while raising the profile of METRO service and generating enthusiastic support for the enhanced high-frequency, high-capacity service.

The judicious expansion of the METRORail network also has maintained its high level of productivity while providing high quality, essential access to jobs that serve regionally significant activity centers, as well as provide improved access for transit-dependent neighborhoods.

"There must be more collaboration between all agencies, and a united front when seeking transportation funds from the federal government."
As we consider Houston’s path forward, we continue to look for ways to partner with others to improve the economic leadership of our state and our nation. One high-profile example is our partnership with the City of Dallas and the private developer, Texas Central Partners, to create a new, high-speed rail system between Dallas and Houston, which will travel at more than 200 mph to transport people between the two cities in only 90 minutes (it now takes several hours).

This high-speed rail system, scheduled to begin construction soon, will provide additional intercity capacity and enhance Houston’s competitiveness by providing fast, high-capacity service. It also will create opportunities for major redevelopment of an area in the city’s northeast, where we envision a major new multimodal hub for METRO service. By reducing the travel time between major activity and employment centers, it creates new potential to spark job creation, residential development and business activities in these areas, which further enhances the ability of METRO bus and high-capacity lines to serve people.

It’s important to note that Houston’s future won’t all be about bullet trains and interconnected bus services. We are working hard to make Houston a more bicycle-friendly city, and the first step toward doing that is to create a strong, safe, comfortable infrastructure for cyclists. We recently began to implement the Houston Bike Plan, which will build 50 miles of new bicycle facilities in a one-year period using a combination of city funds and a $10 million contribution from the Harris County Commission.

This is a great example of how teamwork among government leaders can help to improve quality of life in the community while also providing individuals with one more way to get around the city. As part of this work, we also will be upgrading certain intersections and sidewalks to improve safety for bicyclists and pedestrians alike. It’s easy to envision a day when Houstonians can ride a bike or go for a run around the downtown on safe, dedicated bikeways, along our bayous and through park spaces. This is the future of Houston!

**Coming Together**

Houston resembles every city in the United States in our commitment to providing residents with economic opportunities and a good quality of life through a well-run transportation system. And while each city has its own unique circumstances, I believe that funding constraints also are one of the constants that we’ll all continue to face in the decades ahead.

Historically, funding for Houston’s Metropolitan Transit Authority has come from federal grants and appropriations, in addition to a local sales tax. Lately, though, we find that we are collaborating more than ever with county officials who provide for projects such as bike lanes and intersection upgrades, or with sister cities such as Dallas, who are embracing the idea of strong regional cooperation.

To seize the opportunities ahead, I believe that we’ll all have to shift our thinking regarding how transportation projects are funded and built. There must be more collaboration between all agencies, and a united front when seeking transportation funds from the federal government. If we all work together in good faith – across local, state, regional and national lines – we can sustain our position as the world’s most vibrant economy and remain the magnet for growth and investment in the decades ahead.

**About the Author**

Sylvester Turner is the 62nd mayor of the City of Houston. Elected in December 2015, Mayor Turner has helped achieve more responsive and efficient delivery of city services, shored up Houston’s finances and led a remarkable rebound following Hurricane Harvey in 2017. Before becoming mayor, Turner served for 27 years in the Texas House of Representatives for District 139 and was a practicing attorney. A lifelong resident of Houston, he is a graduate of the University of Houston and earned a law degree from Harvard University.

"By reducing the travel time between major activity and employment centers, it creates new potential to spark job creation, residential development and business activities in these areas ..."
As Denver continues to grow, its public transit system is keeping pace—and moving to integrate mobility options to ensure efficiency, access and sustainability.

By David A. Genova, General Manager & CEO, Denver’s Regional Transportation District

Denver is among the fastest-growing large cities in the U.S., which has been driving ever-greater demand for transportation options that support both economic growth and the quality of life that give the city its unique character.

The organization I lead—called the Regional Transportation District (RTD)—is tasked with delivering the transit backbone for 2.8 million people spread across 2,300 square miles. That’s a big area to serve efficiently, which is why we provide an array of mobility options: bus, rail, shuttles, ADA paratransit services, demand responsive services like FlexRide, special event services, vanpools and many others. The region’s growth has generated our share of traffic congestion and air quality issues, which is why transportation issues are front and center in the regional dialogue, and why public transportation has been a major focus for investment in recent decades.

The Denver metro area has benefited from a high degree of regional collaboration across a range of critical issues, particularly transportation. A key driver of this collaboration is the Metro Mayors Caucus, a non-partisan group made up of 40 mayors spanning eight Colorado counties. In the late 1990s, the Caucus was instrumental in advancing the idea of creating a world-class transit system for Denver funded by a new sales tax. In 2004, with the Caucus’ unanimous support, we won voter support for a ballot initiative that enacted a 0.4 percent sales tax increase to fund a major expansion of transit services across the metropolitan region.

The expansion, dubbed FasTracks, has helped us to move forward with significant improvements. Among these—some completed, others in the works—are more than 120 miles of new light and commuter rail, 18 miles of bus rapid transit, 57 new transit stations, enhanced bus-rail connections, more than 30 new Park-n-Rides and 21,000 new parking spaces at rail and bus stations, new bus routes and many safety and security improvements across the system.

**Powered by P3s**

Part of our strategy for FasTracks was to pursue innovations that would ensure that the people of metro Denver received the greatest possible value for their transportation dollars. One such innovation has been our use of public-private partnerships (P3) to deliver key projects more quickly and efficiently. We’re proud to be the first city in the U.S. to use the P3 funding model for commuter rail. Our $2.2 billion Eagle P3 Project involves a 34-year concession with a private partner to build and operate three new lines. We have completed the University of Colorado A Line, which runs from Denver’s Union Station downtown to Denver International Airport, 23 miles away, including six new stations along the route. In fact, we are expanding service on this line sooner than originally planned, to keep pace with increasing ridership. We still have four projects to go, and we are borrowing and bonding to attempt to fund those projects in the absence of new state-level funds that came up short at the ballot box in November 2018.

So, we are being as transparent with our stakeholders as possible about our progress and our process for keeping those projects moving to serve the communities that are understandably eager to see them built and operational.

Union Station is itself a P3 and a significant aspect of FasTracks’ success. We took a 100-year-old terminal building and renovated it to make it the centerpiece of a new transit-oriented, mixed-used development. We estimate that there’s been from $3 to $5 billion in private investment in and around Union Station since the transit center was opened in 2014. RTD owns the building and our lessees have told us that they are far ahead of their original financial projections.

To be honest, some people were skeptical when RTD purchased the station in 2001, but we have succeeded in restoring this historic building to be a point of pride in the community, as well as a vital transit...
and commerce hub. It’s a reminder that we cannot measure the success of public transportation investments based on ridership alone — there’s a bigger picture, which includes economic growth, well-managed development and career opportunities across the region.

**Technology and Innovation**

Upgraded transportation services require improved technology. We’re one of the few agencies nationally that’s using electric buses — 36 of them so far — to test a greener technology for one of our most popular routes. We’re also adopting new tech that can help system users plan and pay for trips, all in one app and across RTD assets and, ideally, across platforms that involve sharing services — rides, cars, bikes, scooters — as well as microtransit and even parking.

One of the biggest challenges we face — and it’s one virtually every transit agency faces — is how to collaborate with the private sector to ensure that the public wins in terms of greater options and better services. One recent example of this collaboration is our joint sponsorship of a “Ditch Your Car” campaign, working with Lyft and Zipcar. Participants were chosen at random, receiving credits for Lyft ridesharing and scooter use, one-month passes for RTD assets and a one-month membership in Zipcar. This sponsorship is symbolic of our desire to put technology and innovation to work for the people of this region.

As we move forward with these partnerships and transit enhancements, we must ensure that mobility options we offer will be accessible to people from all walks of life. We see three key barriers: physical barriers, requiring options for those who use mobility devices or have disabilities; technological barriers, meaning that we account for those who don’t have smartphones or credit cards; and, finally, affordability barriers, which impact how we price transit services across the board.

**Adapting to Economic Changes**

Like many metro areas, we are seeing light rail and commuter rail ridership rise, but bus ridership has been declining, which reflects a national trend. Some of the decline can be attributed to the booming economy. When you have low unemployment, more people buy cars and spend less time on the bus. What’s more, those additional cars on the roadways add to congestion, making bus travel times longer and less predictable. Additionally, with a great job market, it is harder to find drivers.

However, we know that it’s in our power to identify innovative ways to make bus travel more attractive and responsive across the region. For example, one of the five strategic priorities of RTD’s 15-member board of directors is to envision how to transform our transportation system to meet tomorrow’s needs.

As part of this focus on the future we placed the current bus network on a sort of “green screen,” filling in the background with a vision for the network’s future state. We’re asking questions such as, “What would an efficient, fixed bus network look like in the future?” and “What kinds of transportation solutions will be needed to fill in gaps?” Our most recent action on this front has been to conduct a district-wide bus rapid transit study to identify BRT corridors and options for addressing first- and final-mile connections to and from transit options, as well as providing more information to people so they can plan for trips more easily and enjoy smoother trips.

**Leading a Sustainable Transformation**

As I noted earlier, the population in the Denver metro area continues to grow, and that’s increasing the demands on our transportation system. All the local municipalities are eager to take advantage of the many new opportunities available in the transit world. They are beginning to move forward with pilots and programs that aim to optimize, provide congestion relief or offer new services. The upside of this activity is that there is a real appetite for innovation and technology use to improve mobility. But, the downside is that with so many unilateral moves and investments, the region as a whole may not receive the full benefit in terms of a stronger, better integrated transportation system.

This is why RTD is stepping up to play an expanded role in the region — leading the integration of transportation options by creating an ongoing dialogue among transportation agencies across the 40 cities that make up the metro area. We see ourselves as being like a lighthouse that helps to guide the region’s future transportation development through engagement and a shared sense of responsibility to the public.

The bottom line is to ensure the solutions we develop must be sustainable financially, in terms of operations and maintenance, while continuing to meet the needs of Denver’s unique culture, geography and spirit of open possibilities.

**About the Author**

David A. Genova is the General Manager and CEO of Denver’s Regional Transportation District (RTD), which provides public transportation services (bus, rail, shuttles, ADA paratransit, among many others), to more than 2.8 million people across 2,300 square miles. He is a 25-year veteran of the transit industry, serving at RTD in several leadership roles, and previously worked in the environmental, safety and oil and gas industries. He has served on rail and rail safety committees at the national level and is credited with building a robust safety culture at RTD. Genova earned a bachelor’s degree from the University of Colorado Boulder and an MBA from Regis University.
Real-World Testbed

In Florida, a dynamic partnership between a university, a city and a state agency and a range of other stakeholders is bringing forth the next-generation transportation solutions that will impact the nation.

An innovative transportation initiative — aimed at testing next-generation technologies — is now underway in Florida, thanks to a dynamic partnership between teams at the University of Florida’s Transportation Institute, the Florida Department of Transportation and City of Gainesville. The initiative, named I-STREET, involves the creation of a smart testbed within which a wide range of integrated transportation technology projects will take place in the coming years. Strong collaboration with the transportation industry, vendor community and technology partners is key to rolling out the I-STREET program.

But, what is most distinctive about Gainesville’s testbed is that it is taking place in a real-world environment: on and near the University of Florida campus with its more than 50,000 students. The campus is a beehive of walkers, runners, bicyclists, scooter and moped riders.

The City of Gainesville, the university community and adjoining region also rely heavily on the transit system.

Since this complexity is paired with relatively low-speed automobile traffic, Gainesville and the University of Florida campus are ideal for testing a range of technologies and interactions among several modes of transportation. The overarching goals of this three-way partnership are to:

- **Create a real-world platform** where public and private entities can develop and test advanced mobility technologies
- **Build stronger relationships** with the nation’s technology innovators and transportation research institutions
- **Improve mobility and traveler safety, and reduce congestion**, both on the University of Florida campus and the Gainesville region
- **Gain clarity** about how drivers, pedestrians, bicyclists and others will interact in an environment that includes autonomous vehicles
- **Capture and analyze** billions of pieces of data from a wide range of sources to continually refine the testbed’s operation and generate vital insights for future deployments

Although the testbed is in its infancy, several I-STREET projects are already underway, including an autonomous transit shuttle, signal phase and timing deployment, signal control optimization with connected vehicles and data analytics/visualization.

**Autonomous Shuttle: First of Its Kind**
The centerpiece of this initiative — and one of the first manifestations of the I-STREET team’s work — is the Gainesville Autobus. When it hits the streets in 2019, it will be the first autonomous transit service to serve the general public — on roads that also are being used by all travel modes in the real world.

The shuttle’s 2.3-mile route will connect the University of Florida’s main campus with the city’s newly constructed UF Innovation Square. Shuttles will travel at 10-minute intervals. The all-electric shuttles have a capacity of about 12 persons, and are expected to travel at a top speed of 15 mph.

The testing phase of the shuttle’s operation will help understand when people use the service, either as part of their daily commutes or for other purposes. Just as critical, the testing will illuminate how the drivers of conventional vehicles will behave around an autonomous shuttle.

**Partnership Success Factors**
Exciting technology experiments make for great headlines, especially when they involve innovations that will radically improve mobility and traveler safety, and reduce congestion.

**Partnership Success Factors**

**TOM BYRON, P.E.**
Assistant Secretary for Strategic Development, Florida Department of Transportation

Tom Byron, P.E., is assistant secretary for strategic development for the Florida DOT. In this role, he oversees, among other areas: transportation planning; transportation technology; research program; and intermodal strategic development. He also chairs UFTI’s External Advisory Board. He has served in the U.S. Marine Corps, in both active and reserve capacities.

**LILY ELEFTERIADOU, Ph.D.**
Director, University of Florida Transportation Institute

Lily Elefteriadou, Ph.D., is lead researcher and director of the UF Transportation Institute (UFTI) and a professor of civil engineering at the University of Florida in Gainesville. She is the principal investigator of the USDOT-funded Regional University Transportation Center for Region 4, which focuses on congestion mitigation.

**ANTHONY LYONS**
City Manager, City of Gainesville, Florida

Anthony Lyons is the city manager of Gainesville, Florida. He oversees more than 1,600 city employees and the city’s general fund budget. He is co-author of “The Gainesville Question,” a report that crystallized the city’s vision of becoming the most “citizen-centered city in America.” Lyons also has led teams in Boise, Idaho and Claremont, New Hampshire.
reshape transportation in the coming years. But there’s an equally impressive story behind those headlines: one in which a city government, an academic institution and a state-wide agency are working in partnership to achieve goals that are important to each of them. For example, the City of Gainesville is rebuilding city government to make it truly citizen centered with an overarching goal of becoming a model for the New American City — smart, safe and providing easy-to-use, equitable services. The university, for its part, is being asked to build on its position as a leader in transportation innovation, as evidenced by federal recognitions and funding. Meanwhile, the Florida DOT, already considered one of the most innovative in the country, plans to sustain its effectiveness by testing and delivering ever-more-effective mobility options to the 21 million Floridians it serves. Safety, Mobility and Economic Development (SME) are central objectives for all of the partners.

In separate interviews, Byron, Elefteriadou and Lyons shared their views on their partnership and the success factors that have given the testbed both a strong start and a clear path forward in the coming years. Here are highlights from those conversations, which may prove useful to leaders in other states, counties and municipalities who are exploring mobility transformation projects in the near future.

Success Factor 1: Trust that’s been built over time

The University of Florida (including its predecessor institutions) has been collaborating with the City of Gainesville for more than 150 years, and each has grown and thrived as a result. Similarly, the university has been co-inventing and testing technology with FDOT for a century, beginning with pavement composition experiments back when automobiles were first gaining popularity. This long-nurtured relationship, cultivated by many generations of academics, public officials and transportation leaders, has created a foundation of trust and cooperation among the parties, which helps them to work through issues and advance quickly to agreements and solutions.

Success Factor 2: Acknowledging each partner’s distinct priorities

From the beginning there has been no presumption that all parties share identical goals for the testbed. The work taking place must fit within an overarching academic mission for the university; it must advance the city’s vision of becoming the most “citizen-centered” in the nation, in part through mobility leadership; and it must provide critical insights for FDOT as it strives to strengthen the state’s transportation network through innovation and technology. As such, the partners have been very open and direct about what each needs to gain from their concerted efforts, both to achieve their distinct goals and to preserve the support of their respective constituents.

Success Factor 3: Creating and committing to a comprehensive plan

The university, city and FDOT’s alliance is captured in one integrated plan that details what each will contribute in terms of funding, expertise and activities. In many ways, this difficult work of establishing governance procedures and form for the project is just as important as the sensors and smart vehicles that soon will be deployed on the testbed. There is a commitment to making decisions that will positively impact everyone’s goals, to unleash the potential of team members, and to keep the user experience always at the forefront of implementation. The partners believe that their planning work can serve as a model for other states who are looking at similar mobility experimentation.

Success Factor 4: Forging ahead before private firms are all aboard

Tech companies are innovating so quickly that often the hype surrounding new products outpaces their ability to deliver them. Many startups do not have the resources, processes or people required to work with companies to meet demand. As a result, states or cities find that the prototype technologies they’re poised to procure may still be months or even years away from being in full production mode. This requires that public entities do some “spec building,” or developing standards and specifications, to create a testing environment that’s flexible enough to accommodate a range of future private-sector partners. The motto: If you build it (you must believe), they will come.

Success Factor 5: Leveraging the community’s unique aspects

At the heart of the testbed is a state university with more than 50,000 students. The vast majority of students are young, tech-savvy and active — walking, running, and riding bikes and scooters around campus. The I-STREET team plans to actively enlist a broad spectrum of people from this population to get in-depth information about how, when and where students are moving. The team will use this information to supplement data from vehicle and infrastructure sensors to help improve safety and optimize traffic flow. Additionally, smartphone users may receive messages concerning a shuttle’s arrival time — or emergency alerts if they appear to be in danger of a traffic crash.

Success Factor 6: Broadening the circle of experts beyond what’s been done before

Traditionally, certain specialties have been associated with transportation research and experimentation, particularly civil engineers and electrical engineers. In the case of I-STREET, however, there is a new cast of experts and novices alike who are bringing their insights to bear; in particular, the industry and technology vendors have a huge role to play:

- Traffic operations engineers (how to operate traffic signals to optimize traffic flow consisting of mixed autonomous and traditional vehicles)
- University facilities and operations directors, as well as faculty
- University students and Gainesville community members (through surveys and data sharing)
- Mechanical engineers (focused on autonomous vehicles)
- Computer scientists (harnessing data analytics)
- City and DOT traffic engineers (providing data and determining what to collect from testbed)
- Human factor specialists (investigating how people operate a mix of vehicles, each with a different level of autonomy)
- Industrial engineers (determining interfaces between vehicles, types of alerts and warnings)
- Civil engineers
- Safety specialists
- User experience designer (refining transportation systems to make them easier and more pleasurable for users)

Success Factor 7: Creating a unified workplace to optimize collaboration

The city has built a unified space downtown for team members to work together. The space is designed to be open — no doors — to allow for free exchange of ideas. This is intended to improve results by helping diverse team members build relationships, resolve thorny issues and tough questions, and ensure optimal performance and timeliness of the project as it meets its milestones.

Success Factor 8: Keeping an eye on both short- and long-term objectives

Integrated, data-driven transportation systems have the potential to optimize mobility in the near term by making commutes safer and more efficient, and by providing access to more people through innovations such as bike-sharing, scooter-sharing, ride-sharing and other services. But, researchers also are keeping an eye on long-term goals: fundamentally changing how people move, opening new career opportunities, enhancing quality of life and impacting social equity more broadly.

Success Factor 9: Sharing and collaborating with experimenters nationally

Gainesville’s work holds great promise for revolutionizing transportation in the city and across Florida. But, its greater potential lies in how it accelerates innovation elsewhere. Of note, the I-STREET team has reached out to the Texas A&M Transportation Institute (TTI), the nation’s largest transportation research agency, offering to capture data that might supplement TTI’s own pilot programs. Through this collaboration, Gainesville can efficiently incorporate some of TTI’s specific questions into its research, while gaining reciprocal assistance with some of Gainesville’s most challenging questions.
Highlights of the New Testbed

The testbed is located on the University of Florida’s main campus and extends across the surrounding roadway network. It will deploy and evaluate technologies such as connected and autonomous vehicles, smart devices, sensors, motorist and pedestrian alert systems and other innovative applications – all within an existing transportation network. Here are just a few of the key projects.

**Autonomous Shuttle Pilot**
An autonomous shuttle system will for the first time test this cutting-edge concept in a mixed-vehicle environment. The shuttle will improve the connection between the UF campus and downtown Gainesville. The team envisions that real-time information obtained from shuttle operations will inform autonomy logic and transportation planning for work being done across the country.

**Data Management and Analytics**
The university, in concert with FDOT and the city, is developing an analytics platform and data warehouse to help researchers assemble and analyze the wealth of data expected from the smart testbed’s new collection instruments, as well as existing data that has not yet been incorporated.

**Bike-Ped Safety: Accelerated Innovation Deployment**
Thirteen signalized intersections and seven mid-block crossings will be equipped with technology to broadcast information about the presence of vehicle, pedestrian, bicycle and other transportation modes. Of particular focus is the active and passive detection of pedestrians, informing vehicles of their presence. These tests will aid in the research and development of vehicle-to-infrastructure based applications for intersection control.

**I-75 Florida’s Regional Advanced Mobility Elements (FRAME)**
The testbed will help understand ways to improve safety and mobility, and handling of special incidents by integrating and sharing critical information rapidly. FDOT will deploy more than a hundred roadside units (RSUs) along I-75 and adjoining arterial roadways. These RSUs, which are fixed communications base stations placed every one to two miles, will improve data-sharing between connected vehicles on the roadways, which in turn can facilitate crash reduction, minimize secondary crashes, allow for quicker response to clear incidents and provide real-time alerts to motorists.
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