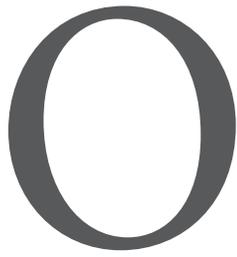


Smart Communities: From Vision to Reality

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ur communities are building future capabilities today in real life, while the reel life in cinema has been imagining it for decades. In the 2002 film *Minority Report*, Tom Cruise (as John Anderton) gets personalized advertising directed to him based on retinal scan identification while walking in a shopping mall.

In the 2004 film *I, Robot* Will Smith (as Del Spooner) rides in an all-electric Audi that operates in semi-autonomous mode and uses underground freeways that move traffic away from above-ground streets. In one scene, a couple is traveling in what looks like a short-trip specialty flying vehicle.

“Smart” is the term we hear most often for building this future—smart cities, smart communities, smart homes, smart electrical grids, smartphones, smart scooters, smart bikes, smart appliances, smart safety, smart lighting—the list goes on and on. This “future building” transformation is happening from the personal, to the corporate, to the community, to the national, to global levels—the transformation is everywhere, all around us.

In many cases, future-based films tell dystopian stories of fictional societies and cultures, but the imagined technologies and capabilities they forecast are not far removed from today’s experiences and tomorrow’s marketplace. Watching these movies again and experiencing the technologies entering today’s world can make us feel as though we are a path to machine intelligence someday matching that of humans—as in *I, Robot*.

We can unlock our phones by scanning our faces. Some cities such as London, England are examining facial recognition for fighting crime. Both San Francisco, CA, USA and Somerville, MA, USA recently banned the use of facial recognition by the police and by government agencies. While controversial, the technology is moving into mainstream uses. We get personalized advertising based on our internet search histories, not retinal scans. Just wait until traditional eyeglasses gain the technologies revealed by Google Glass devices.¹ And the market is already finding opportunity; the firm NNTC debuted facial recognition smart glasses in June of this year.²

It seems as though the entire automotive market is working on automated driving. Will Smith’s futuristic characters will have many product choices in the coming years. Elon Musk’s Boring Company sees tunnels as a future of transportation. In May of this year Las Vegas, NV, USA signed a \$48+ million-dollar contract with Musk’s Boring Company to build a 0.83 mile (1.34 kilometers [km]) underground segment using all-electric vehicles traveling at 150 miles per hour (mph)/241 kilometers per hour (km/h). They plan to be operational by early 2021.³ The flying vehicle in *I, Robot*

foreshadows the Bell Nexus vertical takeoff and landing aircraft that is planned to fly by the mid-2020s with Uber as a team member.⁴ Targeted locations for first deployments include Dallas, TX, USA, Los Angeles, CA and Melbourne, Australia.⁵

The foundation for these new services and technologies is smart design that shapes the look, the functionality, the performance, and the quality of our communities. This smart approach leverages the networking connectivity of the internet of things (IoT), the rise of computing capability throughout the network, the capability to aggregate and analyze big data sets, and building creative solutions that meet the needs of the future. 5G cellular communications networks that are being deployed today will accelerate this change and bring more of the technologies and services that have been imagined in film.

Smart Community Actions

While there is no single definition for a smart city or community, their benefits include citizens who are safer, healthier, and happier living in a greener, more efficient, more sustainable, more resilient environment. The Institute of Transportation Engineers’ Smart Communities Mission describes the smart community goal as follows: “to support livable, prosperous communities that provide opportunities for all citizens.”⁶

With urbanization on the rise and significant population growth on the horizon, this will be no small achievement. The 2018 United Nations report on *World Urbanization Prospects* predicts that by 2050, 68 percent of the world’s population will be urban.⁷ With a world population in 2050 projected to be 9.8 billion, our cities and communities will be different than today because of population, technology, and the choices we make on building that future.⁸

Citizens in cities of all sizes and circumstances are joining in to deliver positive, smart community outcomes. The following examples highlight a variety of smart efforts that address mobility, connected automated vehicles, and healthy sustainable transportation.

Smart City Challenge

The Smart City Challenge, initiated by the U.S. Department of Transportation in 2015, solicited innovative ideas for an integrated smart transportation system that would use data, applications, and technology to help people and goods move more quickly, cheaply, and efficiently. Seventy-eight cities applied, seven finalists were selected, and Columbus, OH, USA won the competition. The goals of the seven finalist cities provide examples of the big ideas within the reach of smart communities. Austin, TX offered to connect underserved communities to economic opportunities and reduce the spread of poverty. Portland, OR, USA wanted to ensure that all communities, including underserved communities, have access to new transportation options and improved methods for making informed transportation choices. Kansas City, MO, USA advanced an improved understanding of urban travel and quality of life to inform the transportation decision of citizens and public officials. Pittsburgh, PA, USA sought to jump-start electric conversion to reduce transportation emissions. Denver, CO, USA focused on making freight delivery more reliable and reduce air pollution. San Francisco desired to grow the number of regional commuters that use carpooling to improve affordability, increase mobility, and relieve congestion on roads and transit.⁹

The Columbus deployment is in progress using the theme of reinventing mobility to improve quality of life, drive growth of the economy, provide better access to jobs and ladders of opportunity, and become a world-class logistics leader and foster sustainability. Transportation is focused on access to opportunity in this initiative.¹⁰ The city of Columbus recognizes the link between transportation and health as it relates to access to health care providers. The prenatal trip assistance program as part of Smart Columbus will help provide flexible, reliable, two-way transportation to expectant mothers using Medicaid-brokered transportation services.¹¹ Expectant mothers in high-risk neighborhoods will

access the prenatal trip assistance system (via a smartphone app, a web portal, or a call center) to schedule their appointments and to arrange transportation to and from the appointment with various contracted transportation providers. The overall intent of the prenatal trip assistance system is to address the high infant mortality rate in Franklin County, OH, which is one of the highest in the nation.

Smart Columbus Operating System

The backbone of the Smart Columbus program is the Smart Columbus Operating System (SCOS), which is an open data platform repository of the city's latest mobility data. The online system houses more than 1,000 data sets originating from nearly 30 different state, regional, and local agencies and private sector companies. The operating system is a source for performance metrics for program monitoring and evaluation. It also serves the needs of public agencies, researchers, and entrepreneurs, and can assist health, human services organizations, and other agencies in providing more effective services to their clients. The SCOS is expected to make the accessibility of these data sets seamless and enhance mobility for the citizens in the region. It will be a permanent repository beyond the duration of the Smart City Challenge award period to continue to serve the city and the private sector for smart solutions in the region.

Connected Vehicle Environment – Trucks

Within the connected vehicle environment project that is part of Smart Columbus, one scenario is to provide safe and efficient movement through intersections for freight vehicles. The Alum Creek corridor is the target corridor that provides access for freight and logistics companies from I-270 to the major logistics districts in the region. Freight signal priority will be implemented in this corridor to help optimize freight operations in the corridor.



Columbus, OH, USA was the winner of the U.S. Department of Transportation's Smart City Challenge.

Montgomery, Alabama

Poor mobility costs everyone money—drivers, passengers, public agencies, and consumers. Keeping roads in good repair is a key to mobility, but presents a budgetary challenge. Funding is scarce and frequently doesn't cover all needs. The choice for a public agency is typically to prioritize the work and to fund improvements on the most critical roadway segments, until the funding is depleted. An assessment of roadway conditions is key to this prioritization. In 2018, Montgomery, AL, USA began evaluating their roadways using a smartphone-based application that uses machine learning to provide road condition data. The smart tool the city is using, from Pittsburgh-based Roadbotics, is being applied to almost 200 miles (322 km) of roads to help prioritize their \$12 million paving need. This information gathered by a smart phone-based system becomes a core building block in their data-driven pavement management program.¹²

Atlanta, Georgia

Special events can also wreak havoc on mobility. The worldwide trend for large sports centers is noteworthy for causing congestion within a large region. To address these impacts, Mercedes-Benz Stadium in Atlanta, GA, USA partnered with ParkMobile in 2017 to launch a parking reservations program. The city engaged with stadium-area parking operators to secure parking for fans, staff, vendors, and other stakeholders. The program includes more than 20,000 parking spaces from different parking operators. By allowing for pre-purchase of parking and providing real-time routing to parking facility entrances through a partnership with Waze, the smart initiative helps reduce congestion and improves safety.¹³ Since implementing the program, up to 70 percent of people attending a Falcons or Atlanta United game use reserved parking before driving to the stadium.¹⁴

Minneapolis–St. Paul, Minnesota

Transportation leaders in the St. Paul–Minneapolis, MN, USA region joined the Shared-Use Mobility Center (SUMC) to release a *Shared Mobility Action Plan* for the Twin Cities area. The plan is a unique vision for utilizing shared mobility and transit to meet the mobility challenges facing the region. It includes 10 detailed strategies for action, including policy recommendations, an analysis of existing shared mobility opportunities in the Twin Cities, suggested funding sources, and a prioritized timeline.¹⁵

Los Angeles, California

The Los Angeles, CA metro area, in conjunction with Puget Sound area transit agencies, is utilizing a Mobility on Demand (MOD) Sandbox grant from the Federal Transit Administration to explore delivery of first/last-mile-demand rides via a shared, dynamically-routed vehicle to or from three transit stations in each area. They are working with Via as a provider for this micro-transit pilot.¹⁶

Kansas City, Missouri

Traffic signals have relied on fixed roadside detection systems for decades. Induction-loops were saw-cut into pavement beginning in the early 1960s.¹⁷ Other roadside technologies evolved, such as radar and camera-based systems—however, over the last decade, companies began to collect and distribute data from mobile sources. Google activated an overlay of traffic conditions on their maps in 2007.¹⁸ That launch spurred the marketplace to collect traffic data from many other sources. Their roadway systems can be planned and operated more effectively if these data are shared with cities and other operating agencies. Commercial enterprises recognize the value of their data and are beginning to provide information to transportation agencies. For example, Avis is connecting their vehicles to the internet, to other Avis vehicles, and to the rental car company. This allows Avis to enhance its fleet-management operations. Avis launched their wireless car fleet in Kansas City, MO in late 2017. As part of its strategy, Avis began sharing real-time data with Kansas City so that the municipality can improve its traffic operations, as well as collaborate on ways to improve tourist experiences when they rent through Avis.¹⁹ Avis is continuing their connected fleet deployment and had more than 100,000 connected vehicles as of August 2018.²⁰

Washington, DC

Smart cities are made up of more than just advanced technologies—they represent a strategy of marrying innovative approaches with available resources. One example is the use of expanded sidewalks on weekends along M Street in the Georgetown neighborhood of Washington, DC, USA. The street is popular with residents, university students, and visitors. The combination of 8 to 10 foot sidewalks and high volumes of pedestrians leads to congested



Mercedes-Benz Stadium in Atlanta, GA partnered with ParkMobile in 2017 to launch a parking reservations program to reduce congestion on game days.

conditions. To help alleviate this problem the Georgetown Business Improvement District initiated a one-block pilot project in 2014, taking the parking lane on M Street and converting it into an extended sidewalk, using steel pedestrian barricades and water filled barriers. The positive feedback from merchants and pedestrians resulted in lengthening the extended sidewalk to additional blocks and continuing weekend operation.

Philadelphia, Pennsylvania

Bike sharing programs have become a staple in many smart cities. Using smartphone apps, GPS, and other technologies, the systems provide residents and visitors with easy access to bicycles at strategically located stations. Some programs have expanded to include electric bikes. The Indego Bike Share program in Philadelphia goes beyond this basic model to promote bicycling and enhance mobility among all population segments. Indego has focused on ensuring that its 120 stations and 1,200 bicycles include locations in neighborhoods with low-income, disadvantaged, and minority residents. The Indego Community Ambassadors champion and promote the program in diverse neighborhoods. As part of the Better Bikeshare Partnership, Indego also collaborates with the Bicycle Coalition of Greater Philadelphia to offer classes on adult learning to ride, urban riding basics, and riding skill building, as well as monthly group rides.

Denver, Colorado

Many Smart Cities are turning to electric vehicles to reduce transportation's carbon footprint. Electric buses, city-owned vehicles, and personal cars are all part of this effort. To encourage the purchase and use of electric vehicles, Denver, CO, USA has almost 300 public charging stations. The Regional Transit District (RTD) is replacing the diesel buses operating on the 16th Street Mall with electric buses. The City of Denver is also partnering with Denver Public Schools in creating a citywide air quality monitoring network to provide real-time air quality data using low-cost cutting-edge air-sensor technology. Providing the real-time air quality data will allow parents, students, and school representatives to make more informed decisions about physical activities and health.

Madison, Wisconsin

Smart communities can improve access to transportation options that support equity and expand ladders of opportunity for citizens, especially with respect to the different mobility needs for all socioeconomic segments of the population, such as citizens in low-income areas or with disabilities. The City of Madison, WI, USA is building a connected vehicle corridor that includes next-generation transit signal priority on an arterial serving low-income neighborhoods whose residents depend heavily on buses to get to work or school. The Smart Columbus program in



Indego, Philadelphia's bike-share program, launched in the spring of 2015. Indego features more than 500 bikes and 60+ stations located across Philadelphia.

Ohio is also developing an application that will help residents with cognitive disabilities empower themselves and gain mobility independence by helping them transition from caregiver-provided transportation or paratransit to fixed route bus service without assistance.

Ketchum, Idaho

Smart initiatives are not solely for large cities. Smaller communities are also leading the way with new technologies, in part because implementation is simpler at that scale to test out new ideas. For example, Ketchum, ID, USA is a community of around 2,700 residents that is implementing smart projects to improve mobility within the community. These projects range from enhanced signage for pedestrians and cyclists to smart streetlights. These investments are having big impacts on the quality of life for local residents.

The Path Forward

The above examples are just a few ways in which American communities are using smart city initiatives to improve the quality of life for their citizens. By focusing on improvements to both physical and virtual transportation infrastructure, smart city initiatives are providing access to healthy and equitable transportation. Data collection and sharing is adding value for both public and private enterprises, allowing them to better serve the customer. Transportation professionals can utilize the information and connectivity provided by these various technologies to improve roadways and surrounding public spaces for all users.

Smart communities are environments where innovative ideas can be tested and have the opportunity to flourish. They are incubators that can teach others. They are pathways to address important issues that are interconnected. Transportation continues

to be a key driver in this evolution. By imagining those futures and by engaging with these communities, transportation professionals will help shape the future. **itej**

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