Smart Cities and Beyond

by Ben Pierce

Meeting societal needs with transportation technology solutions

What makes a city "smart?" This question was the focus of the recent U.S. Department of Transportation (USDOT) Smart City Challenge and continues to be a central discussion point among federal, state and local government entities. Defining a "Smart City" is inherently a difficult task, as what appears to be "smart" from one perspective may not be viewed similarly by others. However, when working with and discussing challenges facing cities across the country, four hallmarks of a Smart City can be clearly observed:
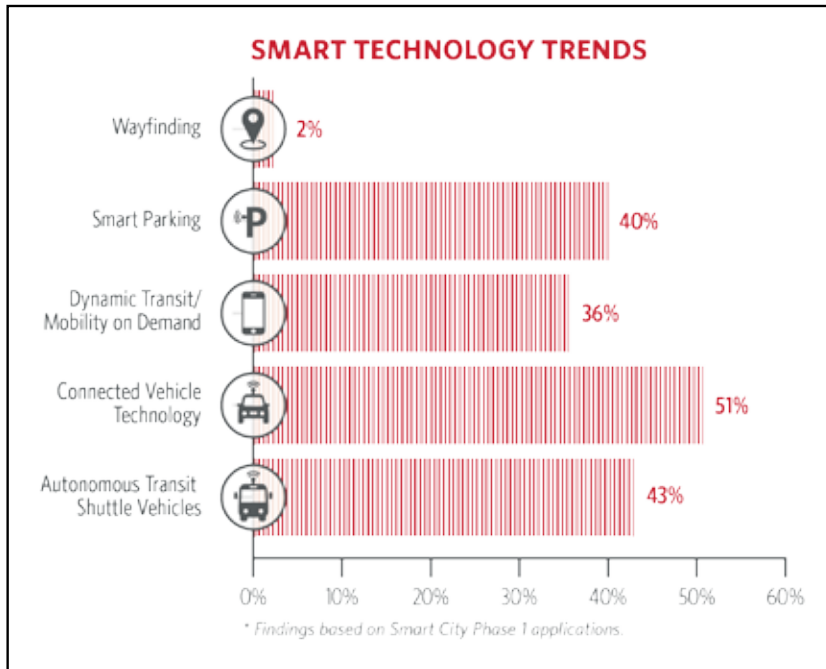
1) Smart Cities Elect Passionate and Engaged Leaders. Elected officials are at the core of a city's leadership. Certainly these public servants have already demonstrated their leadership abilities simply by committing to serve the public's interest. At the same time, a trademark of Smart City elected officials is that they are both knowledgeable about and have a willingness to employ new technologies to approach issues and challenges facing their city in a different way.

2) Smart Cities Take Advantage of Public and Private Partnerships. In today's environment of constrained resources, it is more important than ever for cities to seek alternative sources of revenue that can be used to maintain and improve transportation infrastructure. Engaging with private transportation industry partners is a great beginning, but what makes cities truly smart is when they begin to engage and form partnerships with the broader private community. Private industries have long been viewed as consumers of transportation and have been treated as customers instead of partners. Smart Cities successfully transition their mindset and actively engage non-transportation-related private industries to identify societal issues

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SMART TECHNOLOGY TRENDS

Technology	Percentage
Wayfinding	2%
Smart Parking	40%
Dynamic Transit/Mobility on Demand	36%
Connected Vehicle Technology	51%
Autonomous Transit Shuttle Vehicles	43%

Findings based on Smart City Phase 1 applications.

and community challenges that transportation solutions can address, rather than focusing on only solving transportation issues and challenges. A key characteristic of a Smart City is recognizing that transportation is the means to solve societal problems and not a problem in itself that needs to be solved.

3) Smart Cities Employ Technology Policy, Process and Planning. Technology is emerging rapidly and has the potential to be game-changing in its impact. Far too often, technology gets deployed in an effort to "do something." Doing something with technology, often accompanied by a large press release, does raise the collective awareness within a community and can give the perception that a city is advancing. At the same time, the benefits of many of these early technology deployments are over-hyped relative to the maturity of the technology, ultimately resulting in a backlash against the technology when those benefits are not realized. A Smart City is one that has engaged a systematic planning process

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that holistically incorporates changes to public policy, processes and improvements along with technology adoption. Having a technology plan is an essential component to being a Smart City.

4) Smart Cities Incorporate Technology and Innovation to Improve Connectivity. The Internet of Things (IoT) has arrived in the transportation market. The evolution of cellular technology, along with Dedicated Short Range Communications (DSRC) and other wireless communication protocols, has enabled people and their vehicles to be "connected" in previously unheard of ways. Vehicles can now "talk" to other vehicles (V2V) and to infrastructure components such as traffic signals (V2I). Real-time crash and incident reporting is available virtually upon demand. A Smart City is a city that can leverage this connectivity to improve transportation system management, provide improved mobility to its citizens and utilize the connectivity to help their citizens climb what the USDOT refers to as Ladders of Opportunity.

Smart City Technology Deployment Tendencies

The 78 different USDOT Smart City Challenge Phase I and Phase II applications from across the U.S. provide an opportunity to validate these critical components and give us insight into the types and proposed purposes of the technologies to be deployed to solve societal issues.

There are clear trends that can be observed among the applications with respect to technology solutions. Autonomous and Connected Vehicle technologies as well as Smart Parking, Adaptive Traffic Signal Controls and car/ridesharing were commonly proposed technology elements. The vast preponderance of cities also proposed technologies such as interactive

kiosks and multi-modal, mobile phone trip planning applications. Many of the same technologies were proposed among the seven finalists with the final, Phase II applications being remarkably similar with respect to the technologies proposed for deployment. What did differ among the finalists was why those technologies were selected and the types of neighborhoods or districts where the technologies were to be deployed. All of the seven finalists certainly addressed and included objectives associated with Ladders of Opportunity, but Columbus made transportation system technology deployments as the means for solving infant mortality a central component of their bid. This provided a rallying point for the larger community outside of the traditional transportation segment. It allowed them to become involved and pledge support and resources to the project, as well as providing a roadmap with associated societal performance measures that link transportation deployments to societal change. This highlights a fundamental shift in philosophy that other cities could and should embrace.

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Transportation is not the problem, it is the way we can link communities and partnerships to solve the real societal issues. Only by doing this will we become smart.

The Smart City Vision in the Mid-Ohio Region

Columbus, Ohio has divided their Smart City Challenge project into four "enabling" components that were determined to be the foundation for addressing change within four deployment districts or neighborhoods. First, to provide the overall connectivity, Columbus will deploy Connected Vehicle technologies, Wi-Fi access points and other similar technologies to connect traffic signals to a common Traffic Management Center (TMC) and to use the fiber backbone to capture and connect vehicles via V2I to the TMC. An integrated data exchange with open application programming interfaces (API) and software development kit will facilitate public and private connectivity to the data, either for additional analysis or for use in mobile software applications. Columbus is greatly enhancing the lives of low-income, cash-based households by deploying dual-chip card technologies that will empower these households with access to car and ridesharing services as well as traditional transit systems. This same card will also enable payments to health care providers and will link to other City of Columbus services.

Across the four districts, the city of Columbus is planning on 11 unique technology deployments ranging from smart street lights that provide free Wi-Fi to fully autonomous transit vehicles that are providing first-mile/last-mile connectivity to an existing Bus Rapid Transit line. More than 170 signalized intersections and 3,000 vehicles will be equipped with Dedicated Short Range Communications (DSRC) equipment enabling both V2V and V2I communications. Truck platooning is being deployed to improve the movement of goods
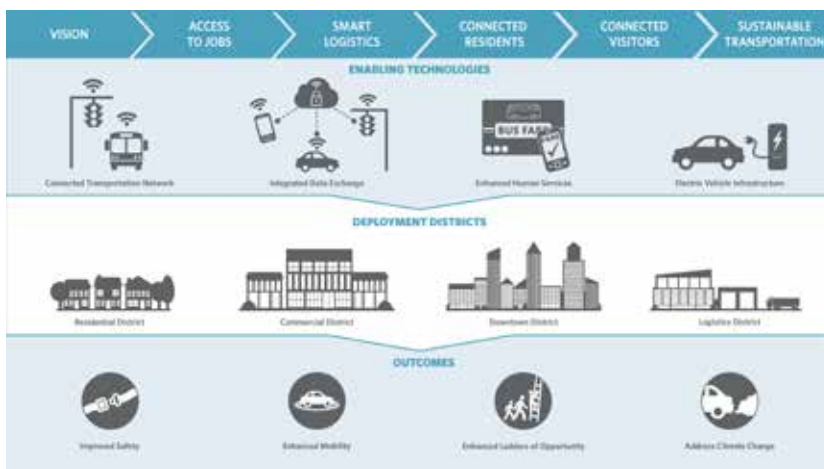
from a regional freight airport to distribution centers, while parking systems are being deployed to assist visitors and residents alike to find parking spaces in the downtown area.

The most important takeaway is why these technologies are being deployed and what societal issue they are expected to address. In the case of the Residential District, the focus of the technology deployments is on reducing infant mortality. In the Downtown District, the attention is on the environment and preventing unwanted emissions in this dense urban zone. In the Commercial District, connecting employers to employees is the driver. This promotes both opportunity for employment as well as further economic development options. Finally, in the Freight District, the focus is squarely upon safety and economic development. Moving freight goods from the airport to a distribution center quickly and efficiently will revitalize economic growth within the distribution service industry.

Being smart is hard. As transportation professionals, we have been trained and encouraged to solve transportation challenges. If a roadway is near capacity, we expand it. If a bridge is broken, we fix it. All of these things require smart, intelligent people with exceptional skills. But what makes a city and community smart is when we stop working on these problems in isolation and begin to strategize how transportation assets and technologies need to be used to solve societal issues. This will lead to engagement outside of the transportation sector bringing both additional resources and innovation to the challenge. Now that's smart.

About the Author:

Ben Pierce is HDR's National Lead for Transportation Technology and resides in Columbus, Ohio. Ben has 25 years of acquiring, managing and conducting impact studies to examine and assess transportation system policy and technology options. Ben's technical specialty is in the research, conceptual design, prototyping, and deployment of Autonomous and Connected Vehicle technologies and Dynamic Mobility Applications.