CUBIC Transportation Systems

Intelligent Travel Systems

Making Cities of Tomorrow a Reality Today

A CITY ON THE VERGE OF TRANSFORMATION

There is no denying that today many of the world's cities are seen as reliable engines of sustainable, economic growth. Urban areas are often the incubators of innovation, centers of commerce and wealth, important nodes of scientific research, cultural and societal growth. In the United States cities play a special role in the country's economy.

In 2010, large American cities generated almost 85 percent of the American GDP – a contribution far greater than that made by large cities in other countries. But American cities are not only great players on the home turf, they are also hugely important on the global stage – in the next 15 years, 259 large U.S. cities are expected to generate more than 10 percent of the world's GDP[1]. Mid-sized cities are also set for growth – as more and more young people choose an urban lifestyle, medium-sized cities in the U.S. will grow at three times the rate of other urban areas.

It is for those reasons that it is now more important than ever that cities and urban areas deal with the problems which have been plaguing them for decades. Half a century of worsening air quality, growing traffic congestion, unsuitable parking, suburban sprawl and deteriorating public transportation infrastructure, has undermined the urban spirit and led to a lower quality of life in American city cores. People living in urban areas are more likely to suffer from stress and fatigue than those living in rural areas and a recent study found urban living raised the risk of anxiety disorders by 21 percent[2]. Yet, many cities are no closer today to solving their problems than they were 20 years ago, even as a new set of challenges, driven by advancements in technology, changing social forces and consumption trends, is starting to emerge.

Take the driverless revolution – this hugely important technological trend is not only redefining how people commute to and within the cities, signaling a move away from car ownership, but in the coming years it will also have a significant impact on the urban landscape. According to McKinsley, a consultancy firm, by 2050 cities might do away with a quarter of the parking spaces currently used, potentially slashing the size of parking lots in the U.S. by 2000 square miles – roughly six times the size of New York City[3]. This would allow city authorities to repurpose vast amounts of public space to create new parks and realize a whole new spectrum of innovative commuter projects, such as bicycle shacks, car-pooling pick up points or electric charging stations, that are likely to find resonance with emerging new models of consumption. One of them is the growth of the servicing model, which means many commuters are increasingly expecting 'on-demand' travel – both in the private and the public sector, pushing demand for coordinated, integrated, multimodal public transportation. Meanwhile, a greater focus on shared experiences, fueled by the growth of Big Data and applications, means modern city dwellers are more open to sharing basic information about how and when they travel and being more flexible with their travel choices, if it means cities can improve public transportation service and ease congestion in return.

> MANY COMMUTERS ARE INCREASINGLY EXPECTING 'ON-DEMAND' TRAVEL – BOTH IN THE PRIVATE AND PUBLIC SECTOR ...

For a while now, the use of information and communication technology (ICT) has been considered as one of the best means to solve the city's economic, social and environmental challenges[4]. Cubic believes that finding solutions to the problems cities are facing is about more than implementing new tools

[1] McKinsley, US Cities in the Global Economy

[2] The Guardian, Sick cities: why urban living can be bad for your health

[3] McKinsley, Ten ways autonomous driving could redefine the automotive world

[4] European Parliament 2014; Centre for Cities 2014

and emerging technologies. Only when cities adopt a more integrated approach to management, open up their data and effect a change of mindset when it comes to influencing travel behavior, can they fully benefit from next-generation integrated technological platforms. In this white paper, we will examine why meeting each of these three conditions is an essential step for cities on their journey to becoming smart urban spaces of tomorrow.

PROMOTING INTEGRATION

As city populations grow and needs of city dwellers change, many of the challenges cities face exceed the capacities and capabilities of their traditional institutions. At the moment, almost all major cities in the U.S. are made up of a number of governmental jurisdictions and a mix of public and private agencies and so the responsibilities for different transportation services are fragmented across various institutions. With a number of stakeholders, all of whom have their own commercial interests, board expectations and financial targets, agreeing on a single, coordinated administrative policy or a new technology implementation that would benefit the entire region naturally comes with inherent challenges. As a result, transportation decision-making in cities is becoming increasingly difficult, transportation projects more costly to implement and finding new revenue streams progressively harder. When innovative technologies are adopted to realize smart city projects, they are usually implemented at an agency level and on a small scale, often improving the operational effectiveness of a single agency, but in reality doing little to help the city address and, therefore, deal with the overall problem.

The reality is that truly smart cities cannot exist without integrated and responsive regional management and governance.

TRANSPORTATION DECISION-MAKING IN CITIES IS BECOMING INCREASINGLY DIFFICULT, TRANSPORTATION PROJECTS MORE COSTLY TO IMPLEMENT AND FINDING NEW REVENUE STREAMS PROGRESSIVELY HARDER.

According to a poll conducted at the end of World Cities Summit 2014, multi-pronged, integrated policymaking is the most feasible way of helping cities respond to challenges stemming from rapid urbanization[5]. The need for integration at an administrative level is not just a 'nice-to-have'; it is grounded in the changing socioeconomic realities of today's cities. Integration is a concept gaining momentum across all industries – in transportation it manifests itself as a need for transportation delivered in a 'mobility as a service' model. Furthermore, the expectations of commuters are changing – city dwellers are not interested in the fact that their journey to work involves two or more different transportation operators. They expect a seamless, integrated, hassle-free journey, ideally paid for, planned, monitored and accessible through a single travel account. Such a journey can only be delivered if transportation agencies and other urban players come together.

Integration can be achieved on many levels and without losing each of the agencies' autonomy. Examples include Public-Private Partnership (PPP) projects and alliances, where governments, local transportation

agencies and urban solutions providers partner to develop key infrastructure projects, leveraging the latest technologies. In some cities, such partnerships can be made between the local city players, in others governing bodies can play the role of coordinators in bringing multiple interests and stakeholders together to establish platforms for collaboration and synergize existing investment in technology infrastructure. As with any situation where two or more stakeholders are involved, some element of conflicting priorities is expected and might even be desirable – bringing in a diverse leadership and many perspectives can encourage critical thinking and allow agencies to arrive at better solutions for the city.

In addition, a host of innovative technologies has been developed to help cement agency collaboration. For instance, transportation management platforms, which integrate city management on many levels and give transportation agencies situational awareness across many modes of transportation, can help city administrators effectively deal with the challenges brought by increased urbanization, the driverless revolution and the sharing economy but

[5] Eco Business, Sustainable cities need integrated policymaking

only if agencies are able to focus on the bigger picture.

The good news is that cities are starting to recognize that current practice of working in silos needs to be broken down with greater institutional integration. Cities both abroad and at home have started to actively develop strategies to ensure innovation takes place in a coordinated rather than isolated way. In London, travelers enjoy one of the world's largest integrated network of public transportation services, with train, bus, river and road systems spanning London's 32 boroughs and beyond, underpinned by a common ICT platform. In Berlin, commuters can access integrated traveler and traffic information services via fixed and mobile Internet connection, pre-trip as well as in real-time. In the U.S., the New York State Departments of Transportation and Health have partnered with the Governor's Traffic Safety Committee for a pedestrian safety campaign in New York State in the first-of-its-kind multi-agency plan.

There are of course multiple benefits of a shared vision and integrated operations. When two or more agencies can come together to save money, improve operations, increase efficiency and customer satisfaction by sharing operational expenses, they can also create new ways of generating capital. Integration underpinned by technological solutions allows agencies to enjoy improved network efficiency and resource utilization by eliminating the need to manage multiple, unconnected systems. It can also increase individual agencies' revenue, since well-developed transportation networks promote intermodality among citizens and encourage greater use of public transportation. Finally, stronger coordination with other agencies promotes lower development costs and capital expenditures, through more effective planning of infrastructure, marking a move away from 'install and operate' towards a service delivery model.

BANKING INFORMATION

While closer integration is the first step towards modern innovation, open data sharing is the second. According to Fredrik Stalbard, an IoT/M2M analyst at Berg Insight, sharing information between the ever-increasing number of companies operating public transportation services is not only a must from an operational point of view, but is also a prerequisite to achieving economic competitiveness within the city transportation network on the deregulated public transportation market[6].

His argument is not without merit. Understanding the importance of data is critical to keep investment in and implementation of new technologies aligned with the ultimate purpose and a value proposition for the city. Urban traffic is complex – one needs to take into consideration factors such as multimodality, intersections, parking and multiple road operators. Making sense of all the data collected from various touch points across the city will only work if transportation agencies combine their efforts. While almost all of the largest transit agencies in the U.S. collect the General Transit Feed Specification (GTFS) data, only 28 percent of agencies have open data systems that freely provide transit times to the public[7]. Even less proactively share such data between themselves. Transportation agencies usually use the data they collect to help them improve internal management and operations and studies have shown that organizations, which effectively use data to drive internal decisions can out-perform their competitors by a margin of five to six per cent. However, sharing data with the public and partnering

[6] Internet of Business, Smart cities and advanced transport systems

[7] Smart City Challenge

in data aggregation and analysis with other agencies comes with its own set of benefits.

According to a survey conducted by the Transit Cooperative Research Project[8], 66 percent of agencies said that providing open data improved the perception of their agency with regards to transparency and openness and 78 percent also reported that it made the public more aware of public transit services. Most importantly, agencies said that open data initiatives improved their relationship and coordination with regional actors and other public transit agencies. In fact, most innovative technological solutions developed to help cities manage various aspects of the transportation network are built on the principles of open data. On a small scale this can mean that e.g. if a major accident occurs on a highway that is also a popular bus route, the bus operator is alerted to it before its drivers get stuck in traffic – giving it the time to reroute and make provisions for a change in schedule. On a large scale it means that by sharing analytics, which monitor city processes and resources, agencies can lower costs related to operations and maintenance. Furthermore, by gaining a holistic view of a city's transportation network, through sharing data from multiple feeds, such as road traffic management systems, taxi management systems, smart ticketing systems or environmental monitoring systems, transportation operators can strategically manage all traffic elements, optimize traffic flow, prioritize incidents and even predict future issues, such as formation of traffic jams. Transforming the real-time data gathered across a transportation network through payments, sensors and other touch points, into actionable data, can also help transportation agencies increase travel efficiencies without losing individual authority flexibility.

Fortunately, more and more cities in the U.S. are recognizing that open data has to sit at the heart of any deployment of smart city technology. In fact, access to and coordination of data collection and analysis across systems and sectors is becoming so important that it emerged as one of the key challenges American cities wanted to overcome during the Smart City Challenge – a 2015 initiative by the U.S. Department of Transportation. First steps in tackling this issue have already been made. In mid 2016, the department released the first version of a National Transit Map, with data on stops, routes and schedules from 270 transportation agencies across America. While intended for research and analysis purposes only, this coordinated effort marks an important milestone in transportation agencies' journey towards open data, while technologies such as transportation management platforms provide agencies with a strong commercial and operational argument to data sharing.

INFLUENCE BEHAVIOR

For many cities offering more effective, integrated public transportation service is equally important, as is, for all of their citizens to make more efficient and sustainable travel choices. Cities are made up of thousands of individuals, each of whom makes travel decisions based on a set of arbitrary reasons known only to them at any given moment – be it convenience, speed of travel, weather conditions, number of changes or a preferred mode of transportation. For years cities tried to find an effective way of influencing travel behavior considered undesirable from their perspective, such as car trips with single occupancy. However, up until recently, the current governance structures in most cities required little involvement of citizens, opting for a top-down approach instead. Cities quickly learned that simply providing citizens with a new mode of transportation or a new connection is insufficient to change travel behavior. If, for instance, the only bike route available on the way to someone's work runs alongside a busy highway, it is unlikely it will become a preferred mode of transportation over a private car.

On the other hand, a smart, citizen-centric urban governance has proven to be an important aspect of informed decision making in a smart city and a final step, alongside the move towards integration and open data, in a city's journey towards becoming a smart metropolis. A study of traveler's economic decisions suggests cities focused on the needs of their citizens find ways of changing travel behavior which consider a more personal approach are more effective. Taken from behavioral science, the "nudge theory" is a concept, which relies on positive reinforcement used to influence people's motives and decision-making, and which can be easily applied to the transportation industry. In practice it means that rather than focusing on economic interventions, transit agencies can use incentives and 'nudges' to encourage the traveling public to make small adjustments to their daily travel preferences. Since traffic is a nonlinear phenomenon, even the smallest change in citizen's preferences can have a huge impact on the city. In fact, the more information cities can give their citizens, the more decisions they can make for themselves. By providing information on current traffic levels, congestion on trains, traffic accidents and more and offering not only alternative travel routes, but also incentives, in a form of e.g. a discounted cup of coffee to delay the journey, cities can positively influence the behavior of citizens and empower them to make better decisions. Such approaches already work well in practice. For example, PlayaVista Ability2Change program was implemented to decrease single-occupant-vehicles during peak hours in Playa Vista, California. By removing barriers and offering a number of different incentives, in just seven months, the program achieved a three and a half percent decrease of single-occupancy vehicles during peak time, while at the same time increasing carpooling, cycling and public transit trips.

Technology can play an important role in this effort. Travel authorities that integrate operations and infrastructure management with the help of transportation management platforms, gain a powerful tool that not only provides them with an insight into travel patterns and the ability to analyze and understand urban dynamics, but also allows them to present travelers with relevant and necessary information, which they can then use to make informed travel decisions. According to Dr Erel Avineri, a member of the U.S. Transportation Research Board on Artificial Intelligence, the right design of the way information is provided to the user through technological solutions, such as Advanced Traveler Information Systems, is an important factor in helping cities influence travel choices more effectively. With the right technology in place and a commitment to collaboration, transportation agencies can achieve a change in travel behavior collectively, rather than fighting isolated battles.

CONCLUSIONS

As the world's population moves towards urban centers, the result is greater traffic congestion, frustrated travelers and reduced productivity. Add to this a new set of challenges brought about by the driverless revolution and the sharing economy and it becomes clear cities today are on the verge of an important transformation.

In order to address those challenges and create more livable urban areas, decision makers in cities need to urgently change the direction of urban transportation development towards a more integrated future, where all modes of travel are coordinated and information is shared freely between agencies. By adopting the right mindset, focusing on collaboration and open data and adopting multimodal transportation management platforms, such as Cubic Transport Management, cities can empower their citizens to reach their own conclusions about the impact their daily travel choices have on their community and encourage them to make better decisions for themselves and for the city.

A STUDY OF TRAVELER'S ECONOMIC DECISIONS SUGGESTS CITIES FOCUSED ON THE NEEDS OF THEIR CITIZENS FIND WAYS OF CHANGING TRAVEL BEHAVIOR, WHICH CONSIDER A MORE PERSONAL APPROACH, ARE MORE EFFECTIVE.

While Cubic believes technology has a strong part to play in solving the problems of today's cities, transforming them into smart urban spaces of tomorrow is not merely a question of adopting the newest technologies but a much broader question of organizing strong collaborations between government, agencies and other stakeholders, and bringing people, technology and data together, for the benefit of all.

[8] The Transit Cooperative Research Project

CUBIC™ | Transportation Systems

CUBIC – A LEADER IN INTELLIGENT TRAVEL SOLUTIONS

At Cubic, we believe our identity is intrinsically linked with our customers, and the people our customers serve. How they get from one place to the next – how that impacts their lives, their fellow travelers and their cities – and how it feels along the way.

That's why we're passionate about developing transportation solutions that improve the way we move throughout cities. Innovation is in our culture, and our history speaks for itself. In our 45-year history, we've delivered public transportation fare collection systems to over 450 operators, including 20 regional back office systems, and traffic and transportation management systems for major cities and regions on four continents.

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CTS-WP-ITS-17MAR