CUBIC Transportation Systems

Transit Management as a Service

The journey toward service-oriented travel and transit management for small and medium agencies

INTRODUCTION

Mobile, Big Data, Cloud Computing, Open Source, and the Internet of Things (IoT) have each transformed the way services are consumed today. Across several industries, including retail, healthcare, and mass media, increasingly tech-savvy users have learned to make the most of the new technologies, enjoying real-time information and personalized capabilities at the press of a button. The transportation industry is no exception — used to the immediacy of services driven by the technological revolution of the 21st century, consumers expect nothing less, if not more, from their transportation service providers.

Although most public transit agencies today crave the flexibility to be more innovative, small and mid-sized agencies face the toughest challenges. They often cannot afford a comprehensive operational transformation typically associated with the adoption of modern technologies, while their limited resources diminish the ability to conduct a sophisticated analysis of the needs and priorities of the traveling public, hindering short- and long-term capital planning. This slows the pace of transit innovation and translates into very real problems with ridership. According to the Federal Highway Administration, in 2016, transit ridership has decreased in almost every major city in America;[1] in some regions, ridership fell by as much as a tenth percent, with smaller carriers reporting declines that reach nearly 25 percent.[2]

Meanwhile, private companies offering ride-hailing services, such as Uber and Lyft, have attracted public attention, offering riders a more personalized, on-demand, and more convenient travel experience. Researchers at the University of California, Berkeley, found that 66 percent of the trips completed through Uber and Lyft would have taken at least twice as long if riders chose to use public transit instead — assuming a service was available nearby.[3] It comes as no surprise that in many cities across the U.S. private players are starting to undercut public transit; they have so far claimed as much as six percent of bus riders.[4]

Partly in response to this growing threat and partly in an effort to keep pace with the rapidly changing technology and offer riders a better, more innovative service, public transit agencies have been trying to provide a more intelligent and real-time travel experience by evolving one of the most strategic tools in their arsenal — the transportation management function.

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In this white paper, Cubic will examine the evolution of transportation management, in particular a move toward a new model called “Transit Management as a Service” or “TMaaS," look at its impact on transit agencies, communities and travelers, and offer ideas on how small and mid-sized transit agencies at different stages of their transportation management journey can take part in a modern transit revolution that’s unfolding before our eyes.

[1] 3.2 Trillion Miles Driven on U.S. Roads in 2016, Federal Highway Administration: https://www.fhwa.dot.gov/pressroom/fhwa1704.cfm

[2] Billions spent, but fewer people are using public transportation in Southern California, Los Angeles Times: http://www.latimes.com/local/california/la-me-ridership-slump-20160127-story.html

[3] How Uber and Lyft have exploited long waits, slow travel and poor service to crack open transportation, The Washington Post: https://www.washingtonpost.com/news/wonk/wp/2015/01/19/how-uber-and-lyft-have-exploited-long-waits-slow-travel-and-poor-service-to-crack-open-transportation/?utm_term=.463b36188c12

[4] Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States, 2017 paper by The Institute of Transportation Studies at UC Davis

EVOLUTION OF TRANSPORTATION MANAGEMENT

Traditionally delivered as one-time purchase, complex amalgamations of hardware, the first transportation management solutions were slow to respond to change and subject to system failures. In most cases, they were procured as long-term solutions, with lifecycles of 10 to 15 years. Since the software that ran on those early platforms was specifically tied to a particular type of hardware, the only way an agency could introduce new features and innovate was to replace the system altogether. Often, early replacement of hardware could have a significant impact on the agency's capital planning and was not worth the investment fiscally, especially if resources were scarce.

Then came the era of transportation management software packages, which automated many transit management functions and subsequently helped to cut some of the costs relative to hardware alternatives. Those software packages allowed for an introduction of simpler, general-purpose, off-the-shelf hardware solutions, which were more straightforward to manage, both from a talent and technology perspective. The software lifecycle became independent of that of hardware, empowering agencies to take advantage of the new technologies without the need to replace the underlying infrastructure every time. With transit intelligence now wrapped in software, hardware started playing more of a supporting function, allowing agencies to introduce new capabilities and features quicker and in a more cost-effective manner.

At the same time though, the software revolution opened the doors to many private sector players, eager to get a piece of the public transportation cake for themselves. Ride-hailing and carpooling companies quickly swept the market, their business models based on complex, data-driven analysis and the latest, open source technologies. In an attempt to keep up with the software "arms-race" and attract riders back to public transportation, many transit agencies started exploring the possibility of investing in the development, integration and maintenance of the latest software-based transportation management solutions in-house, mirroring the trend observed in other industries, where non-core technology businesses made the transition into tech companies, following in the footsteps of the Ubers, Amazons and Googles of the world.

> THIS NEW SERVICE-CENTRIC APPROACH TO TRANSPORTATION MANAGEMENT, "TRANSIT MANAGEMENT AS A SERVICE" OR "TMAAS," CENTERS ON THE IDEA OF THE SMART PROVISION OF FULLY INTEGRATED, REAL-TIME, OPEN ARCHITECTURE, ON-DEMAND TRANSIT SERVICES.

Yet, as the complexity of software grew, so did the needs for in-house talent that was able to understand and best apply software solutions to the needs of an agency. Site designers and engineers who played a key role in the hardware-centric stages of transportation management, and who, at the time, were responsible for drawing out detailed product specifications, were quickly replaced by software and information architects whose primary responsibility was to identify best commercial software packages and oversee their smooth integration as well as provide continuous support. As the intermediaries between the agency and software providers, the list of their responsibilities continued to grow — covering such aspects as software security, manageability, coding standards and more, putting a strain on smaller transit agencies who lacked the resources and the capacity to support an ever-expanding IT function. Some agencies soon started to realize that while software-centric transportation management offers riders a better travel experience, they simply cannot afford the transformation into a software company in a way larger agencies can, nor can they reasonably justify such a cost to the public.[5]

The good news is, they don't have to. A new trend — one that brings all the modern technologies together to enable the next generation of transit environments – is starting to emerge. This new service-centric approach to transportation management, "Transit Management as a Service" or "TMaaS," centers on the idea of the smart provision of fully integrated, real-time, open architecture, on-demand transit services. It involves transforming the acquisition and use of hardware, software, and services from a one-time purchase to a pay-as-you-go model, empowering smaller transit agencies to reimagine themselves as technology companies without the accompanying hardware or software overhead. Such an approach to transportation management shifts the burden and complexity of providing, integrating and maintaining highly sophisticated hardware- and software-centric solutions to service providers, freeing agencies to dedicate resources where they matter most and switch focus back to their core function, i.e., providing transportation services to passengers. By allowing

[5] Software is still eating the world, TechCrunch: https://techcrunch.com/2016/06/07/software-is-eating-the-world-5-years-later/

agencies to turn to solution providers for service rather than tool delivery, TMaaS not only enables them to better concentrate on understanding and communicating the needs of their customers, but also brings multiple benefits to communities and travelers.

THE SERVICES SHAKEUP

Benefits for Agencies

The first big beneficiaries of a TMaaS approach to transportation management are the public transit agencies themselves since TMaaS provides them with functionality that extends far beyond the traditional boundaries of a transit management system.

To begin with, TMaaS transforms transit planning. Through smart use of real-time data and sophisticated analysis and reporting tools, it allows small and mid-sized agencies to focus on optimal allocation of service to users, rather than mapping resources to requirements, thus enhancing transit planning efficacy. In addition, it introduces true business agility to public transit agencies — not only by enabling them to easily scale and adapt to rider demands without an exponential rise in costs thanks to the pay-as-you-go model, but also by simplifying the introduction of new, more optimal routes and stops, multiple transportation modes and new vehicles. Because TMaaS grants agencies the ability to take advantage of real-time passenger information (RTPI) systems, which are otherwise expensive and fairly complex to implement, it not only facilitates better — and faster, decision-making – it also improves service and can have a direct impact on ridership numbers. A study of Chicago's bus routes found that access to real-time transit information increased average daily ridership by 2 percent and cut down waiting times at bus stops by 15 percent, greatly improving passenger satisfaction.[6]

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Furthermore, the nature of TMaaS applications makes integration with future services and products from multiple vendors quick and simple, allowing smaller agencies to benefit from the same diverse ecosystems of services and products available to their larger counterparts and avoid closed, vendor-based environments. In fact, integration itself can be one of the services available to agencies through TMaaS, alongside all management and technology-related services, such as fare payment, transit operations, optimization and more. Since agencies experience solutions as a service, individual product components are abstracted, removing product limitations and opening up the ability to take advantage of and experiment with emerging technologies, various architecture designs and product options at minimal cost. With TMaaS, past product decisions no longer limit options for years or decades to come and transit environments are no longer fixed and hard to update. This means agencies are free to implement future capabilities, such as in-vehicle infotainment, capacity information, or mobile ticketing, as soon as they identify such a need.

Since TMaaS evolves budgeting options, one of its greatest benefits for small and mid-sized agencies is the fact that it democratizes access to new technologies. Most smaller agencies tend to suffer from budget shortages that limit their ability to invest in latest tech. For instance, data from a 2010 study shows that only six percent of such agencies in the U.S. use Automatic Vehicle Location (AVL) technology.[7] By making traditional deployments with heavy up-front capital expenditures a thing of the past and swapping purchase of equipment for usage subscription models, a TMaaS-based approach to transportation management enables agencies to embrace technologies that would otherwise fall outside of their budget.

Benefits for Communities and Travelers

By introducing a multitude of efficiencies to public transit agencies and giving them the ability to arm passengers with better tools for urban mobility, TMaaS also brings positive change to local communities and travelers. Since TMaaS provides the means for an integration of various transportation modes and services, communities benefit from greatly improved access to an array of public transport services, greater reliability of service and at least partial elimination of the first/last mile problem. As a result, public transit becomes more inclusive, better serving areas that might have previously been underserved.

[6] World Resources Institute, Real-Time Transit Data Is Good for People and Cities. What's Holding This Technology Back?: http://www.wri.org/blog/2016/02/real-time-transit-data-good-people-and-cities-whats-holding-technology-back

[7] Technology Adoption by Small Urban and Rural Transit Agencies, North Dakota State University: http://reconnectingamerica.org/assets/Uploads/techadoptionruraltransit2010.pdf

...TMAAS ALSO BRINGS POSITIVE CHANGE TO LOCAL COMMUNITIES AND TRAVELERS. SINCE TMAAS PROVIDES THE MEANS FOR AN INTEGRATION OF VARIOUS TRANSPORTATION MODES AND SERVICES, COMMUNITIES BENEFIT FROM GREATLY IMPROVED ACCESS TO AN ARRAY OF PUBLIC TRANSPORT SERVICES, GREATER RELIABILITY OF SERVICE AND AT LEAST PARTIAL ELIMINATION OF THE FIRST/LAST MILE PROBLEM.

With TMaaS, travelers can get access to transportation related information, including weather, road conditions, service changes, traffic delays, etc., in more places. The stream of information is continuous and updated in real-time so riders no longer need to worry about missing their bus or waiting at a bus stop for extended periods of time. This provides passengers with peace of mind and restores the feeling of being in control of their journey on public transportation.

In addition, TMaaS facilitates intelligent journey planning, simplifying travel through the community. Through TMaaS, transit agencies can offer travelers the ability to plan their journeys using apps with personalized options, such as starting or ending location, preferred transportation modes, departure and arrival times and more. As such, TMaaS puts public transit agencies at the center of the mobility hub, allowing them to offer services that act as travelers' own personal travel agents that plan and coordinate the use of available transportation modes, routes, stops and vehicles, leaving public transit users to focus on their journey rather than worry about the logistics.

Furthermore, TMaaS brings about more diverse ticketing and fare options, encouraging agencies to unify pricing structures and experiment with different fare models, such as charging for distance or time, regardless of the number of transfers made by travelers, to the benefit of the traveling public. Expanded mobile capabilities also mean passengers can use personal mobile devices for electronic ticketing and payments across diverse methods, including Apple Pay, Android Pay, Samsung Pay and more, and across several modes of transport. Travelers can board and leave vehicles without slowing down to present tickets and they can automatically pay for fares using their preferred source of funds.

It's important to note that the benefits of a TMaaS approach to transportation management for travelers extend far beyond transit. The open architecture of TMaaS applications means non-core services, such as parking and retail, can be incorporated into the greater mobility experience and combined into a more ubiquitous system. All of those conveniences translate into increased ridership for agencies, a better travel experience for passengers and an improved standard of living for local communities.

PATHS TO THE FUTURE

While it may seem that TMaaS paints a vision of transport management future that's far from the realities of most current public transit systems, in fact, its benefits are achievable and pragmatic and can be realized today. Medium and small transit

agencies can benefit from the service-centric approach to transportation management and the TMaaS architecture regardless of what stage of transit management journey they happen to be on.

For instance, agencies that are still at the hardware-centric stages of transportation management do not need to completely overhaul their systems in order to take advantage of TMaaS. The first step towards TMaaS in a hardware-centric environment is the adoption of the right mindset. Agencies that are interested in realizing the benefits of TMaaS need to further explore the concept of a service-centric approach to transportation management, without disrupting current budgeting and operations. A good way to do that is to set up a small task force — a team of individuals that can start planning and budgeting for a TMaaS-based future in parallel with current operations, and who can consider a path towards TMaaS that would work best for the needs of the agency.

The shift in thinking is of utmost importance. Agencies at hardware-centric stages tend to approach problems from an engineering and design perspective. For example, when looking for a service that would offer riders real-time arrival and departure information, they often resort to building solutions from scratch, locking themselves into long-term contracts with hardware providers. Instead of engineering a required solution,

agencies that identify a requirement for a certain service should turn to their current solution providers and partners and begin conversations about the TMaaS options they can offer in a simple package — with a focus on the rider experience, leaving it to the service provider to figure out and propose ways of integrating the solution with the current systems and operations. Once tuned into a services-focused thinking, agencies can also explore options with prospective industry partners and let them come up with ideas on how to deliver the final product.

Similar principles apply to agencies that have already evolved their transportation management function and are at the software-centric stages. In a typical scenario, such agencies have general purpose IT and data center staff that are asked to figure out how to integrate a number of different software solutions. In practice, this means the staff is asked to learn, understand, integrate, support, maintain and update a myriad collection of software, distracting them from making sure the IT and operations of the agency are running smoothly. If, for example, the end goal of an agency is to provide its transportation administrators with a live map service that shows relevant information, such as weather and traffic, to complement their existing transportation management software, instead of using up the internal resource and architecting the solution, agencies can turn to service providers to deliver, integrate and support the final product.

The key to success lies in being bold. Smaller transit agencies that aspire to provide a better service to their riders need to imagine a future where transportation operations are not bound, limited or defined by the availability of IT expertise, data base resources or software licenses. They need to reach out to their current providers and challenge them to offer service-based solutions that are scalable, flexible and upgradable and that will liberate smaller agencies from the limitations of their hardware or software.

CONCLUSIONS

When it comes to adopting intelligent transportation technologies, small and medium-sized public transit agencies face a multitude of challenges. Public scrutiny over spending, limited resources and talent, and strong competition from private players make it difficult to respond to the growing consumer expectations in a timely manner. Yet, consumer adoption of technological innovations is irreversible and requires a firm commitment from public transit authorities.

Transit Management as a Service enables smaller public transit agencies to start playing a key role in taking public transportation towards true Mobility as a Service. By applying smart, service-centric approaches to transportation management and moving beyond hardware- and software-driven models, small and mid-sized public transit agencies can provide a truly exceptional and innovative service to riders at a fraction of the cost, and revive the future of public transit ridership worldwide. That journey must start with a conversation with their current and/or prospective service provider.

Cubic's answer to the changing world of transport management starts with NextBus – TMaaS solutions for mid-sized and smaller multimodal transportation agencies and their travelers which have the potential to transform the way transit agencies deliver on promises made to their riders, marking a new and exciting era in transportation management.

BY APPLYING SMART, SERVICE-CENTRIC APPROACHES TO TRANSPORTATION MANAGEMENT AND MOVING BEYOND HARDWARE- AND SOFTWARE-DRIVEN MODELS, SMALL AND MID-SIZED PUBLIC TRANSIT AGENCIES CAN PROVIDE A TRULY EXCEPTIONAL AND INNOVATIVE SERVICE TO RIDERS AT A FRACTION OF THE COST, AND REVIVE THE FUTURE OF PUBLIC TRANSIT RIDERSHIP WORLDWIDE.

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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