Microsoft

Digital transformation in public transport

How governments can better meet traveller needs

Table of contents

More people, new challenges, increased expectations

In 2007, the global urban population exceeded the rural population for the first time[1], and the trend continues to accelerate. Rapid urbanisation is the biggest challenge facing transport today.

By 2050, it's estimated that more than twice as many people will live in urban areas (6.7 billion) as in rural ones (3.1 billion)[2].

As anyone who's spent time in a city knows, getting to work, school, shopping or an event can be a complex challenge. Do you bring your own car, figure out the best route and spend time searching for parking? Or take public transport – a bus, train or subway – or a bike or scooter-share?

Mobility choices and the time vs cost equation aren't always easy to determine. And the consumerisation of technology has increased everyone's expectations for easy-to-use, mobile access to information, payment methods and optimisations that improve daily life.

Most cities were designed around cars, not people, and re-engineering that mismatch to put people first is the long-term goal. Governments and transport agencies are also looking for ways to encourage more people towards public transport, because it moves people where they need to go most efficiently. And in the short-term, reducing traffic congestion is high on everyone's list.

For governments and public transport agencies/departments that are trying to serve travellers, the challenges are complex. They need to deliver punctual, highly utilised, affordable, inclusive and accessible services, while maintaining aging infrastructure and managing payments, timetables, routes, and planned and unplanned events – such as weather – plus a myriad of other interconnected factors.

Governments at every level are challenged with building adequate infrastructure in developing areas or modernising and transforming established systems to yield better outcomes and better intelligence for planning.

Let's take a look at some of the complex issues at play.

Congestion, congestion and more congestion

More people in cities means more travellers and ever-increasing congestion. We've all felt it, but let's look at some numbers.

87 billion USD

Cost to US commuters in 2018 due to time lost in congestion[3]

272 hours

Lost time due to congestion in Bogota, Columbia, the most of any city worldwide in 2018[4]

6 mph

Average speed during peak commute in Dublin, Ireland, the slowest city worldwide in 2018[5]

New challenges continue to emerge that impact transport policy and expenditures, including changing transport modes, the need for funding sources and the impacts of pollution.

Changing modes

The ascendance of ride-share services has changed the game in urban transport. While all those ride-hailers may lighten the need for parking, recent reports indicate ride-sharing contributes to congestion and reduces public transport usage. Driverless, autonomous vehicles will require new regulations. Drone deliveries aren't far off, and those low altitudes are local airspace to be governed.

Pollution

Transport is a major energy user and burns most of the world's petroleum, contributing to all kinds of pollution, including greenhouse gasses that drive global warming and particulates that negatively impact health globally, reducing life expectancy by 20 months[6]. Responsible transport policy has to take these impacts into account to keep cities liveable and the population healthy.

Funding

Electric vehicles (EVs) are causing cities and governments at all levels to review current funding structures. Significant EV registration fees have been proposed, and individual road charging is already taking hold across the globe. Those who choose public transport and off-peak travel times will be rewarded with lower commute costs and faster commute times as transport operators optimise travel with bus lanes and other strategies. Those who choose to pay higher fees for peak commutes will enjoy less congestion, while providing much-needed funding for infrastructure. Equity for low-income commuters and those living in areas without ready access to public transport also needs to be considered in funding calculations.

Technology in transport

The power to process and store massive amounts of data in the cloud – generated by IoT sensors, RFID tags and satellite transponders – means that various aspects of public transport can be optimised in ways that were unthinkable just a few years ago. For example, sensors can track congestion and intelligent, automated decisions can be applied to conditions:

- Lights can be timed to improve and prioritise traffic flow.
- Tolls can be adjusted based on demand for roads.
- Traffic maps and public transport schedules can be updated in real-time to give commuters the best information for planning.

By applying analytics and AI to that data, patterns will emerge that can fuel policy decision-making, indicate the best uses for funding and show how best to encourage travellers towards preferred modes of transport.

Once cities have installed and connected sensor technology, they can take advantage of that infrastructure to power additional smart city insights: for instance, sensing air quality, or even analysing emissions data to form hypotheses about the financial condition of commuters to set toll prices.

These solution examples take advantage of the automated sensing, transmission, integration, processing and analysis of vast amounts of data in the cloud. The intelligence resulting from this data can inform choices around transport policy and give government agencies the ability to better engage with communities, modernise operations and enhance services.

Engage and connect with citizens

Transport departments and agencies want to better engage with travellers, and travellers are seeking more convenient ways to get traffic, transport and parking information. Technology can help cities, transport departments and government agencies of all levels provide secure, easy ways to stay connected to the communities they serve, delivering better experiences through digital engagement. Some examples of how technology better enables this engagement include:

- Conveniently and securely interacting with travellers using tools such as traffic and transport apps, and taking advantage of crowdsourcing to provide real-time alerts and updates that keep people informed and safe.
- Using data analytics and AI to enable faster issue resolutions from the field, including predictive vehicle and road maintenance, transport breakdowns and traffic light timing.
- Providing tools, transcription and translation that make traveller engagement more accessible and inclusive for all populations, including those with disabilities, language barriers or economic disadvantages.

Digital transformation in action: Johannesburg Roads Agency

"Find and Fix encourages active citizenship, and it enabled us to reduce the average time to resolve a service request from 32.4 days to less than a day."

Bertha Peters-Scheepers
Operations Manager, Marketing and Communications, Johannesburg Roads Agency

A great example of stronger community engagement is the Find and Fix mobile app released by the Johannesburg Roads Agency (JRA) in South Africa. The popular app allows motorists to easily report roadway issues through their smartphones, logging approximately 250 issues per day.

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Smart parking

Every city has a limited amount of space for parking and a limited budget to create more. Drivers looking for parking waste valuable time and fuel, increasing pollution. Plus, the lack of urban parking intersects with other issues, such as congestion.

1.1 million

Size of the installed base of global on-street smart parking spaces by 2026[7]

One solution is smart parking, which uses advanced technologies to efficiently operate, monitor and manage both on- and off-street parking. According to Navigant Research, many technologies are being used in smart parking solutions, most commonly sensors to detect vehicles, but also cameras, wireless communications, data analytics, smart parking meters and advanced algorithms. No matter the technology, the goal is to help vehicles find available spaces quickly.

Once a city has installed physical smart parking hardware – for instance, smart poles or meters – it can add other smart city solutions to those same poles or other structures. For instance, smart poles can include sensors for air pollution monitoring, noise detection or video traffic monitoring, or even serve as EV charging stations.

"Visitors want ease of planning in their recreational activities. They want to see and feel what's available, how to get there, where to park, and they expect technology to make it easier and less stressful."

Dru Garson
Chief Executive Officer, Greater Grays Harbor Inc.

Modernise the government workplace

Transport organisations need instant access to traffic- and road-related information, along with the ability to collaborate effectively for more informed decision-making and to help personnel do their jobs more effectively.

Digital transformation can help governments of all levels enable mobility, digital tools and quick connectivity between field and office personnel. Some examples of how technology can empower government employees to deliver more efficient and effective services include:

- Enabling more agency knowledge-sharing, coordination and improved productivity with cloud-enabled software, communication technology and collaboration tools.
- Increasing worker mobility and accessibility so employees can stay better connected in the field and in the office, while maintaining security.
- Supporting regulatory compliance for agencies and employees through efficient digital tools that document necessary data and processes, while maintaining privacy and security.

Digital transformation in action: SNCF

"When we implemented and explained the potential of these digital tools, we empowered each employee [...] to innovate and share their ideas on how to improve their work on a daily basis."

Magali Dupin
Manager, Technical and Maintenance Centre, SNCF

A strong example of modernising the government workplace, SNCF is France's national railway company. It digitised its business processes and launched a "Digital for All" initiative designed to help employee adoption. The initiative included online courses that were developed in-house by the company's app experts. With thousands of employees embracing these new tools, SNCF has already created more than 150 apps for its maintenance procedures and incident reporting.

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Low-friction fare and toll management

Collecting public transport fares and tolls is time-consuming and expensive. The companies that provide payment services for public transport often charge about 15% or even more, according to Michael Schwarz, Chief Economist and Corporate Vice President at Microsoft. "That's money wasted right away, just the overhead of collecting payment," says Schwarz.

One solution is contactless payment, which greatly reduces overheads, as no physical machines are required to buy and load payment cards. For public transport, travellers simply tap their card, smart watch or smartphone to a reader – for far greater convenience and faster transactions. There are already more than 100 contactless transport systems around the world in cities such as London, Vancouver and Sydney[8].

30%+
Reduction in cost of fare collection by using contactless payment[9]

Similarly, tolls can be collected in an automated way through plate readers, RFID tags or satellite transponders connected to identity and payment methods. Both tolls and fares can even be dynamically adjusted to reflect the level of congestion, helping to manage traffic based on time of day, demand, emissions, season and vehicle type. And all the data collected from these transactions can be used to improve predictive maintenance and make better decisions, such as creating tailored incentives based on travel patterns and preferences.

Enhance government transport services

Transport leaders need cost-effective ways to meet changing requirements, streamline procedures and enhance operations to better serve their citizens and communities. Using cloud, IoT and other technologies, agencies can enhance transport services for travellers by improving outdated processes and using digital tools for more informed decision-making.

Digital transformation can help governments of all levels use data and analytics to provide more predictive, reliable and traveller-focused services. Some examples of how technology can help government transport agencies enhance services include:

- Using advanced analytics for faster and more informed policy decisions that enhance transport services based on real-world conditions.
- Harnessing the power of data to anticipate and solve problems, such as traffic bottlenecks or predicting maintenance issues before they occur.
- Improving productivity by automating time-intensive and inefficient processes and adopting secure and compliant tools that can scale to serve growing numbers of travellers.

Digital transformation in action: Alaska Department of Transportation

"I am the final responsible party in northern Alaska for decisions that affect both the public's safety and the budget. With WeatherCloud in my forecasting toolkit, I sleep better at night."

Daniel Schacher
Maintenance Superintendent, Alaska Department of Transportation and Public Facilities

Staying ahead of the weather in Alaska is no easy task, but advanced technologies are up to the challenge. To keep Alaska's highways open and safe during severe winter weather, the Alaska Department of Transportation & Public Facilities uses the Fathym WeatherCloud solution and Microsoft Azure IoT technologies to make better, hyper-local decisions about deploying road crews.

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Intelligent traffic and transport management

No one likes sitting in traffic – it's simply wasted time. The congestion, emissions and delays caused by traffic gridlock are major issues for metropolitan areas. Cloud technologies are helping to modernise legacy traffic systems by providing the affordable flexibility and scalability required to adapt to changing needs.

The benefits of intelligent traffic and transport solutions are numerous and include:

- Enhancing urban mobility through new services, modality options and route optimisation across multi-modal transport options.
- Boosting public transport usage by adjusting routes and capacity according to usage trends and occupancy data.
- Decreasing congestion through intelligent transport systems (ITS), demand management and real-time system status alerts.
- Enabling rapid response times for incidents through an integrated view of transport and traffic systems, number plate reading systems, cameras and social listening.

One solution to traffic issues that is gaining traction around the world is congestion pricing or dynamic tolling, where fees are charged for the most congested roads at the most congested times, varying pricing according to demand. Singapore and London already have systems in place, Manhattan has a plan set to launch and many cities are considering their own congestion pricing models.

"Without congestion pricing, all of us are paying in time for the right to use the road."

Michael Schwarz
Chief Economist and Corporate Vice President, Microsoft

Data collected through RFID tags or satellite transponders in vehicles can be used to inform travellers of real-time traffic conditions and toll amounts, as well as provide detailed public transport tracking, so everyone can see exactly when the next bus will arrive at their stop. Cloud computing, IoT, analytics and AI can all help provide the data intelligence to power traffic and transport optimisation.

Connected fleet and asset management

Operating a safe, reliable and punctual mass public transport system is challenging, especially as rider numbers grow – along with travellers' expectations of service levels. Agencies not only need to manage and maintain fleets of vehicles, rails and roads, but also look after stops, stations, maintenance centres and an increasing inventory of digital assets including signs, signals and sensors.

"With the systems that Microsoft Services has created for us, we have improved the reliability of São Paulo public transportation by 30%."

Mauricio Lima
Information Technology and Revenue Director, São Paulo Transporte S.A.

With fleet and asset management solutions, transport agencies can take advantage of centralised tracking to handle asset and fleet operations more efficiently, while using real-time traffic tracking to ensure the best routes for drivers.

The benefits of these solutions are numerous, and include:

- Less congestion through more efficient fleet management and deployment.
- Better fleet management visibility by using fleet operation software with real-time insights that create an agile, mobile work environment.
- Lower operating costs due to decreased downtime and optimised maintenance using sensors and intelligent devices.
- Enhanced services available on demand for determining the best routes and improving driver performance.

Preventative maintenance systems can provide sensor alerts about equipment needs or machine malfunctions, optimising asset and fleet management while reducing costs. Plus, performance data analysis tools in fleet operation software allow agencies to improve driver performance and reduce fuel consumption.

Safety, security and compliance

Cloud, IoT and Edge technology all have specific security needs. Transport systems not only manage and store user data, but also rely on payment systems, financial data and live feeds from sensors and devices that require appropriate levels of security, protection and regulatory compliance.

Cities, transport operators and travellers may have concerns about the security of their data and who will have access to it. That's why it is vital to engage a cloud technology provider you trust to deliver the security, privacy, transparency and compliance needed by public transport agencies to document their fulfilment of regulatory requirements, while allaying public concerns.

Choosing technology partners with these issues in mind is important for the future of your transport projects and the success of your digital transformation. At Microsoft, trust means:

- Your agency's and your users' data is not shared.
- Your organisation owns any patents and industrial design rights that result from shared innovation work[10].
- Other government entities aren't given encryption keys.
- We work with thousands of legal and policy experts, auditors and privacy specialists across the globe to help with your regulatory challenges.

Microsoft is committed to the responsible use of AI, and has championed AI for Good to apply this technology to creating a better world for us all.

For more information about trustworthy computing, visit the Microsoft Trust Center >

Advance your digital transformation with Microsoft

After four decades of working in the public sector, Microsoft understands the challenges of operating public services in an increasingly mobile-first, cloud-first world where trust is paramount. Microsoft is committed to developing trusted solutions for government, working with industry partners, competitors, worldwide regulators, global law enforcement and, most of all, government customers.

Sources

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Learn more about government transport solutions ›

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