KPMG

Future of public transport

October 2022 | kpmg.com

Foreword

These are pivotal times for public transport. The landscape is changing rapidly as the sector looks to leave the impact of COVID-19 behind and boldly embrace the future.

In our view, this sector will continue to experience an increasing amount of disruption over the next 5 years. Forward looking players can ride this wave successfully given they act now. Public transport organizations should take the time to pause, reflect and map out a new future of enhanced customer experiences and integrated services, along with decarbonized and digitalized operations, while securing stable finances.

KPMG International, in a commissioned survey conducted by Forrester Consulting, engaged 483 leaders from public transportation organizations across the globe to understand their perspectives on the sector's future. Participants included public transport ministries and authorities, operators and outsourced vendors.

In this report, we explore the potential that a connected public transport enterprise has in forging powerful enterprise-wide business and delivery models that can drive excellent customer experience while enhancing efficiency and contributing to the prosperous future we all want to see.

To support this journey, the report documents current industry trends, presents compelling hypotheses on the sector's future, and charts the way forward.

If you would like to discuss how KPMG professionals can help you evaluate and accelerate your organization's journey towards customer-centric digital transformation, please contact us or your local contacts listed.

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Executive summary

The traditional model of public transport service delivery is being challenged as never before.

Public transport has traditionally been provided by heavily subsidized public-sector bodies operating discrete/siloed transportation modes. This approach made sense from an asset-management perspective, but it led to journey options for citizens when timetables, ticketing and customer service were not always aligned to expedite travel across various transit systems. Additionally, agencies typically took a monopoly mindset to protect revenue and market share.

Today, new market entrants are changing the last-mile equation through enhanced services and convenient new offerings. Disruptive transport technologies are on the horizon. Frictionless service interactions in other sectors have raised customer expectations of public transport. Joined-up services, seamless payments and enhanced customer experiences are the way forward for mature transport systems.

Priorities are shifting as decision-makers listen to the voice of their constituents and look beyond the operation of transport infrastructure, fleets and workforce to fully consider the advantages of a connected, 21st-century ecosystem. The signals of change, covered in detail in Section 1, are powerful and unmistakable:

- Evolving customer and community expectations for connected personalized services will require organizations to be even more responsive.
- Public transport can be a key enabler of sustainable economic growth and equitable access to opportunity.
- The need to minimize environmental impacts and urban congestion are becoming central to future planning.
- New public transport modes, entrants and enabling technologies such as autonomous vehicles, air taxis and hyperloops are poised to change how services are delivered.
- Mobility-as-a-Service and autonomous vehicles have the potential to be cost competitive with public transport services and more convenient in servicing the last mile of customer journeys.
- The pace of innovation is accelerating and exceeding the rate at which regulatory systems can adapt. Regulation will need to be dynamic amidst ongoing innovation.

In addition to these signals, the profound impact of the global pandemic has reshaped workforces, lifestyles and reliance on public transportation systems. It remains to be seen how demand for services may evolve as many citizens embrace hybrid work models or replace urban lifestyles with more-affordable suburban settings. But KPMG believes that vibrant cities will remain relevant and prosper and transport systems will evolve to serve citizens, drive equity and meet net-zero targets. With a tested, research-based approach, we have built *KPMG Connected Enterprise for Public Transport* assets that take eight core capabilities to the deep level needed for leaders and teams to navigate the transformation journey ahead.

The future of public transport is here

Public transport agencies must become smarter and more agile. They should aim to focus on the essential core of public transport operations to evolve networks, service patterns, fare policy, investment strategy and asset custodianship. In their role as market steward, agencies should direct modern ecosystems in partnership with the private sector to meet cost pressures, public expectations and environmental goals. Agencies should position themselves to meet these challenges by:

- Considering if their operating model enables multi-modal planning.
- Redefining their role as commissioner of markets within new regulatory frameworks.
- Deploying policy and behavioral change initiatives to meet net-zero targets.
- Implementing new funding models and revenue sources to help ensure financial sustainability.
- Understanding how planned investments can drive social and economic opportunity.

As change unfolds and the pace of change accelerates, we present seven thought-provoking predictions on the future of public transport:

1. Political influence over public transport is expected to grow as it is increasingly seen as a lever to drive social and economic opportunity.
2. Agencies will likely become the commissioner of markets rather than the deliverer of services.
3. Future transport algorithms will likely nudge customers through the network, balancing individual preferences with network and social requirements.
4. Decarbonization of transport operations will likely become a strategic business priority.
5. Public transport is expected to be free for some citizens and communities and funded in innovative new ways.
6. Agencies will likely require more in-house technology and digital transformation. Automation will likely result in a reskilled and redeployed workforce.
7. Outcome and risk-based regulation are expected to be required to embed flexibility.

At a glance — KPMG global survey highlights

KPMG reached out to 483 leaders from public transportation organizations across the globe with a commissioned survey conducted by Forrester Consulting to understand their perspectives on the sector's future. Organizations included ministries, public transport operators and outsourced vendors. Rail freight operators were not included. Here are some highlights of what was learned:[1]

- Forty-one percent of public transport leaders surveyed said improving customer experience is a top strategic goal.
- The need to expand the transport network was identified by authorities and operators as one of their top five strategic goals.
- Two-thirds of public transport organizations are investing or will invest to improve customer service and meet customer expectations by enhancing the reliability, usability and integration of public transport modes.
- Forty-one percent say their organizations will need to seek a more financially sustainable fare and non-fare revenue model over the next 5 to 10 years.
- Many organizations are investigating new or expanded revenue sources such as toll roads (17 percent) and road-use fees (12 percent) to strengthen funding models and fund the high cost of building and delivering transport infrastructure.
- Fifty-eight percent of organizations are investing or will invest toward ESG priorities and 28 percent believe the "need to meet decarbonization agendas" is the political factor with the greatest potential to change the landscape for public transport.
- Sixty percent of organizations are currently investing (28 percent) or will invest capital (33 percent) toward utilization of emerging asset classes, Artificial Intelligence, Internet of Things and other technologies to enable seamless services, deliver safe travel and reduce customer costs.
- Regulatory support for multi-modal operations was cited by transport leaders as the regulatory factor with the greatest potential to change the landscape for public transport.

[1] A commissioned study conducted by Forrester Consulting on behalf of KPMG, March 2022

Base: 483 customer-centric strategy decision-makers at public transportation organizations

2040: A look into the future of services

Public transport agencies are the commissioners of the transport ecosystem, delivering a place-based approach to services.

1. **Activation of spaces and accessibility for citizens:** To help increase participation and economic activity as well as facilitate better connections to essential services and employment opportunities.

2. **Electrified network to help meet net-zero targets:** Aiming to reduce air and noise pollution with ubiquitous electric vehicles (EVs) can create healthier communities.

3. **Mobility-as-a-Service (MaaS) solutions:** Single customer interface to enable easy to understand journeys in a broad market of transport services.

4. **Algorithms nudge customer choices:** Movements can be dictated according to network needs and user preferences.

5. **On-demand services:** Localized services that respond to customer needs — a transition away from the traditional hub and spoke model to point-to-point services.

6. **Integration of new and emerging modes:** Last-mile offerings, hyperloops, e-helicopters, autonomous vehicles.

7. **Autonomous services:** Enabled by Internet of Things, smart technologies and 5G connectivity.

8. **Redeployed workforces:** The number of drivers will likely be reduced. Skills of maintenance workers may change due to integration of electric vehicles. Employees will likely need to be reskilled and retrained.

9. **Targeted free services:** To encourage public transport use over private vehicles, and achievement of environmental and social equity goals.

10. **Outcome and risk-based regulation:** To facilitate greater market entry for new and emerging modes. Creation of innovative partnerships will likely drive delivery of seamless services.

Signals of change

Forward-looking service providers are responding to the signals of change amid the profound impact of digital technology and the ever-evolving preferences of today's mobile and connected customers.

- Customer and community expectations are changing — today's travelers are demanding modern services that are digital, personalized, flexible and universally accessible.
- Public transport is a key enabler of sustainable economic growth and equitable opportunity. Leaders should aim to balance investment with the long-term financial sustainability of the state.
- The need to decarbonize and minimize pollution is becoming central to public transport and place planning for the future. Environmental sustainability is becoming a focus of reporting and reflects the demand for greater transparency.
- Emerging digital transport and business technologies are disrupting the status quo. New operational technology is in the early phases of reshaping networks and will likely link with customer, asset and enterprise technologies to enhance operations and decision-making.
- Mobility-as-a-Service and autonomous vehicles have the potential to be cost-competitive with public transport services. This introduces a new level of competition for ridership and presents the need for public transport services to balance financial sustainability as well as delivering environmental and social outcomes.
- The speed of innovation increasingly exceeds the rate at which traditional regulatory systems can adapt. Regulation frameworks should become more dynamic in order to respond in a timely and aligned manner to emerging modes, services and new private-sector players.

Customer signals

Customer and community expectations are changing. They are demanding services that are digital, personalized to their needs and preferences, accessible and equitable.

Public transport agencies have and continue to recognize the importance of customer experience and the need to make it simpler and easier for customers to engage with diverse services. KPMG research shows that 41 percent of public transport leaders surveyed stated improving customer experience was one of their top strategic goals.[2]

At the same time, shifting customer expectations and rapidly evolving technology have created a significant level of complexity for public transport agencies to deliver on the promise of simplicity. Two-thirds of the organizations surveyed say they are currently investing or will invest to improve customer service and meet customer expectations by enhancing the reliability, usability and integration of transport modes.

Today's connected and mobile citizens expect public transport agencies to develop and deliver existing and new services safely, efficiently and digitally — much like today's banks and retail organizations. Increasing expectations of reliability and digital-first interactions were cited in our survey as the customer-related factors having the greatest potential to change the transport landscape.[3]

Citizens expect personalization, empathy, to be kept informed and to be heard. Tomorrow's transport services should be:

1. **Seamless** — Customers want integrated digital solutions to guide their travels. This includes dynamic journey-planning capabilities, harmonious connections between modes, seamless omnichannel experiences and streamlined, unified payment processes.
2. **Tailored** — Customers are looking for personalization that goes beyond "know me" to "understand me" — enhancing communications with a range of offers, services and routes based on where they want to go and when, fare information, and how services are packaged for convenience.
3. **Responsive** — Today's 'on demand' economy has established a culture of immediacy which is impacting public transport. Customers now expect flexible services that are responsive, frequent and meeting their individual needs, rather than fixed timetables or routes.
4. **Accessible and equitable** — Customers expect services to be universally accessible, including customers with mobility and vision disabilities, as well as people from low socio-economic areas or rural/suburban settings. Modern transport systems also need to connect people to vital services and employment opportunities.
5. **Reflective of demand** — Customers want services which understand the places they serve. 'Essential worker' travel now makes up a higher percentage of demand, with traditional hub-and-spoke models transitioning to point-to-point models.
6. **Aligned to public values** — People are becoming more aware of the environmental and social impacts of their choices and demanding more ambitious ESG goals and actions from public transport agencies.
7. **Price sensitive** — Customers expect services to be reasonably priced and cost competitive with other transportation modes. If fares are considered too expensive or on-par with more-convenient modes such as driving, many customers may continue to choose convenience over sustainability.

[2,3] A commissioned study conducted by Forrester Consulting on behalf of KPMG, March 2022

Metrolinx
Toronto, Canada

Partnered with a local grocery chain to allow passengers to pick up their groceries from their home stations.[4]

Transport for NSW
Australia

Trialing 'On-Demand Bus Service' for regional areas. Passengers can book door-to-door service to their destination at a time that suits them.[5]

Metropolitan Transportation Authority
New York City, US

Investing in improving accessibility of subway stations to help ensure all riders are within two stops of an accessible station.[6]

[4] Loblaw signs deal with Metrolinx to let customers pick up online grocery orders at GTA GO stations, Financial Post, 2018
[5] On Demand public transport, Transport for NSW
[6] New York MTA commits $5.2B to subway accessibility, Smart Cities Dive 2019

Political and economic signals

Public transport is a key enabler of sustainable economic growth and equitable opportunity. Leaders should balance the need for investment with the long-term financial sustainability of the state.

Governments currently remain focused on dealing with the health, economic and social implications of COVID-19. Many elected officials and leaders are investigating how they can rebuild their economies in a more equitable and financially sustainable way.

Public transport is increasingly seen as an avenue to connect individuals to employment opportunities and drive economic growth.

The need to expand the transport network was identified by authorities and operators as one of the top five strategic goals.

Some countries and states are exploring alternative city planning concepts such as "15-minute cities" (also referred to as 20 or 30-minute cities) to manage future demand and help improve equity across the network. The 15-minute city concept aims to give people access to jobs and local services within 15 minutes by walking, cycling or public transport. This concept has significant impacts on land use, infrastructure and public transport planning.

Beyond expansion to reach under-served communities, services should be priced appropriately to help ensure equal access for low-income earners and individuals from low socio-economic communities.

Real world evidence from Talinn, Estonia and Dunkirk, France suggests a 100 percent government subsidized network could increase ridership and improve social inclusion.[7] Some networks experimenting with free or reduced pricing have created a tailwind of political support.

Underpinning investment decisions is the capacity for public transport to foster healthier communities via environmentally friendly infrastructure. Public transport agencies should look beyond "whole of life costs" to consider the "whole of life value" in investment decision-making:

"Whole of life value" relates to assessment of holistic environmental, customer and community benefits in relation to the resources needed to achieve it. For example, investments which seek to shorten the distance between housing, jobs and services could drive greater environmental and economic outcomes — reducing road congestion, improving air quality, reducing noise pollution and improving public health and well-being.

More than one in four (27 percent) organizations said funding to modernize and extend the system is the economic factor with the greatest potential to change the public transport landscape. Investment in enabling infrastructure is very expensive and funding is increasingly difficult to source, however.

Funding models which rely on traditional government revenue sources, such as fuel excise, are also being challenged by the uptake of new transport technologies. Fuel excise is a flat sales tax on petrol and diesel and a traditional government revenue source for many jurisdictions that is used to fund road infrastructure either directly or indirectly. As electric vehicles proliferate, government revenue from fuel excise will likely shrink and ultimately disappear. The tax system should be appropriately calibrated to discourage private vehicle ownership and encourage the shift to public transport.

The impact of weakening funding models is critical in the context of needing to increase service coverage and invest in enabling infrastructure while aiming to ensure financial sustainability of governments now and in the future.

Forty-one percent of public transport leaders say their organizations will need to transition to a more financially sustainable fare and non-fare revenue model over the next 5 to 10 years. Public transport leaders cite new and expanded revenue sources, such as toll roads (17 percent), congestion charging (12 percent) and non-fare-box revenue as potential industry game-changers.[8]

Transport for NSW, Australia

Central to TfNSW's service delivery is the pursuit of "three-cities" model which seeks to ensure individuals in the Greater Sydney area live within 30 minutes of one of the three major cities. This concept has driven multi- billion dollar investments in transit, road and rail infrastructure.[9]

[7] Maximum Opal Fares 2020–2024, Independent Pricing and Regulatory Tribunal NSW Government, 2020
[8] A commissioned study conducted by Forrester Consulting on behalf of KPMG, March 2022
[9] A Metropolis of Three Cities — The Greater Sydney Region Plan, NSW Government 2017

Environmental signals

The need to decarbonize and minimize pollution is becoming central to public transport and place planning for the future. Environmental sustainability is becoming a key focus area of reporting and reflective of the demand for greater transparency.

Most (58 percent) public transport organizations are investing or have included investment in their capital plans for ESG priorities, while 28 percent of leaders surveyed stated the "need to meet decarbonization agendas" is the political factor with the greatest potential to change the landscape for transport.[10]

As of November 2021, 12 countries had legislated their commitment to achieving net-zero by 2050 or earlier, while 52 countries were in the process of joining them. With the transportation sector being one of the largest sources of global greenhouse-gas emissions as well as air, water and noise pollution, the need to decarbonize and minimize pollution is becoming central to public transport and place planning for the future.

Many countries are investing in electrification of transport fleets as part of their effort to decarbonize. For example:

- The UK launched its Zero Emission Buses Regional Area (ZEBRA) scheme to allow local transport authorities to bid for funding to purchase zero-emission buses. Almost 1,000 green buses are rolled out with the backing of nearly 200 million pounds sterling (GBP) in government funding.[11]
- Copenhagen is investing in the electrification of public bus fleets to decarbonize the network and reduce greenhouse gases.
- The Los Angeles County Metropolitan Transportation Authority in October 2021 completed its transition to an all-electric bus fleet on a popular transit line in the San Fernando Valley, providing a quiet and non-polluting rider experience.[12]
- Sydney, Australia has developed large charging infrastructure using solar panels to support the supply of electrified public transport assets at scale.

Many countries hope to reduce the number of diesel and petrol vehicles on the road by making walking, cycling and public transport more attractive and alternative vehicle technologies more viable.

By discouraging private-vehicle use, governments are seeking to divert more citizens to public transport services and drive achievement of environmental outcomes. For example:

- France is investing in sensors to identify vehicles that generate significantly higher noise and air pollution. The intent is to start handing out fines to vehicles that break noise-level rules from 2023.[13]
- The UK has prohibited the sale of petrol and diesel cars from 2030, and London has established Low Emission Zones (LEZ) which drivers of certain high-polluting vehicles must pay to drive through.[14]

Environmental sustainability of operations is an increasing focus area for reporting. The EU already stipulates corporate disclosure of a range of environmental and social figures.[15] Authorities in the Americas and Asia Pacific are following suit. This is indicative of increasing demand for transparency, delivery of environmentally sustainable outcomes and integration of ESG priorities into investments.

Climate-proofing public transport is emerging as another key aspect of the ESG agenda. Over the last 10 years, many global cities have experienced the effect of volatile temperatures, severe bushfires and major flooding on transport systems.

Modeling indicates that extreme weather will likely become more frequent and destructive and will likely impact the safety of transport infrastructure as well as the health and well-being of communities. In Boston, for example, coastal flooding means that a major storm could render half the subway system inoperable by the end of the decade.[16]

Initiatives to improve climate resilience is a growing area of investment for many public transport agencies. Development of climate-change modeling tools are being used by transport planners to assess vulnerabilities and address impacts.

[10] A commissioned study conducted by Forrester Consulting on behalf of KPMG, March 2022
[11] UK on track to reach 4,000 zero emission bus pledge with £200 million boost, GOV.UK, 2022
[12] L.A. Metro Now Running all Zero-Emission Electric Buses on the G (Orange) Line in the San Fernando Valley, Metro.net, 2021
[13] With Sensors on Streets, France Takes Aim at 'Noise From Hell', NYTimes, 2022
[14] Car industry lobbied UK government to delay ban on petrol and diesel cars, The Guardian, 2021
[15] Corporate sustainability reporting, European Commission, 2022
[16] How Climate-Proofing Mass Transit Can Make Cities More Equitable, Bloomberg, 2021

Copenhagen, Denmark

As of June 2021, 42 electric (zero-emissions) buses were deployed in the Greater Copenhagen region. A new depot has been built and three other depots have been equipped with the infrastructure needed to recharge the electric buses simultaneously. It is expected this will save more than 4,500 tonnes of CO^2 emissions per year.[17]

Sydney, Australia

In Sydney, 36 million Australian dollars (AUD) has been invested to transform a bus depot into a next-generation electric-charging terminal via rooftop solar panels and stationary batteries. The aim is to generate as much onsite renewables as possible to charge the battery and offset additional electricity to charge electric buses.[18]

France

New sensors or "sound radars" have been placed in seven cities. The sensors can detect and take pictures of vehicles making excessive noise. At the end of the testing period in 2023, the city plans to start handing out fines of 135 euros (EUR) to violators.[19]

United Kingdom

The UK will end the sale of new petrol and diesel powered cars and vans by 2030, with new vehicles required to be zero emission by 2035. London has two zones designed to restrict the use of high-emitting vehicles. The first is the Low Emission Zone, which covers the majority of the capital and the second is an Ultra-Low Emissions Zone which has stricter regulations and covers particular roads within the capital. Vehicles that do not meet the ULEZ requirements are required to pay a charge.[20]

Hong Kong (SAR), China

The MTR have been working with Hong Kong Observatory since 2015 to identify risks from extreme weather events across the MTR railway network.

Activities to prepare for flooding or landslides have included:

- Retrofitting station flood boards with increased height to protect the critical equipment.
- Providing specialist training to frontline staff to support passengers during heavy rain and typhoons.[21]

[17] Electric buses begin operating in Copenhagen region, SmatCitiesWorld, 2021
[18] Sydney bus depot transitions to electric with 40 e-buses, 36 chargers, 387kW rooftop PV and 2.5MW storage, Ecogeneration, 2021
[19] With Sensors on Streets, France Takes Aim at 'Noise From Hell', New York Times, 2022
[20] Ultra Low Emission Zone, Transport For London
[21] RAIL ADAPT, University of Birmingham, 2017

Technology signals

Emerging digital technologies are disrupting the status quo. New operational technology is in the early phases of reshaping networks and is expected to link with customer, asset and enterprise technologies that enhance operations and decision-making around services.

The emergence of new technologies is rapidly changing the landscape of the public transport ecosystem and the nature of how services are delivered.

Six out of 10 leaders surveyed report their organizations are currently investing (28 percent) or have included investment in capital plans (33 percent) toward the utilization of exciting new travel modes, AI, IoT and other technologies to enable seamless services and experiences, deliver safe and secure travel and reduce customer costs.[22]

Emerging travel modes such as flying taxis, autonomous vehicles and ferries, e-bikes and hyperloops — and the wider adoption of driverless high-speed trains and smart roads — are significant signals of change as to how services could be delivered in the future. They highlight the need to re-evaluate and re-configure service delivery.

Meanwhile, the development of customer, operational, asset and enterprise technologies are driving digital transformation of the entire public transport ecosystem. Enterprise technologies are driving efficiency in the front, middle and back offices. New digital solutions present the need to replace legacy systems such as licensing and automate transactional processes.

Among public transport organizations we surveyed, 27 percent said access to real-time data about service performance, location and occupancy is the technology-related factor with greatest potential to change the transport landscape.[23]

A modern train already generates 5,000 signals per second, measuring speed, vibration, temperature, location and the state of every critical component, from wheels and brakes to exterior doors. The collection and analysis of these signals is driving greater service efficiencies, such as reducing train down-time and maintenance costs, which in turn enhance the customer experience by optimizing service availability, reliability, passenger comfort and safety.

Real-time collection and analysis of operational data is being enhanced by the adoption of 5G, smart algorithms, digital twinning, artificial intelligence and automation.

5G allows real-time information flow between customer and transport providers. Smart algorithms can process this information rapidly and make live changes to schedules and routes. Digital twinning and AI can reduce the need for human intervention, improving the safety and reliability of services, and automation reduces operational costs, improving network affordability for operators. Automation, AI and IoT integration across the public transport network is also enabling the timely collection of huge amounts of passenger data.

[22, 23] A commissioned study conducted by Forrester Consulting on behalf of KPMG, March 2022

Big data insights into passenger mobility habits, preferred payment methods and non-fare-box revenue enhance understanding of an optimal customer experience and long-term needs. However, collection and use of personal data is a growing concern among privacy advocates.

They argue that there is no governing body overseeing, or a framework prescribing, how public transport agencies use the information and who else will have access to it. This concern is increasing with the emergence of private Mobility-as-a-Service (MaaS) and the integration of private services into the public transport ecosystem.

Procedures and guidelines for data collection and use will likely be critical as technology, devices and sensors are incorporated into the transport network and as transport authorities seek to enhance collaboration with private-sector players by establishing open data sources. A total of 47 percent of public transport organizations are currently investing (20 percent) or have included investment in capital plans (27 percent) to enhance inter-modal collaboration with new private-sector players to deliver better outcomes.[24]

Digitization, robotic process automation, human-machine teaming and other signals of change show how processes can be streamlined and workforces resized or redeployed to higher-value tasks — ultimately improving service affordability by helping to reduce costs.

Staffing or workforce costs are a key component of operator overhead costs. For example, driver wages within the cost structure of urban bus transport accounts for more than 40 percent of bus operation costs in Singapore.[25] In this context, should bus operations become automated, there is the potential to eliminate a key expense, improving the affordability of the network for operators. This process is underway among legacy rail operations as they convert to driverless capabilities.

California, US

November 8, 2020, the first passengers traveled safely on a hyperloop.[26]

Sydney, Australia

1. Sydney Metro is the first fully automated driverless metro rail system in Australia.[27]
2. Transport for NSW has established an Open Data Hub which hosts over 200 datasets to give private developers, entrepreneurs and data analysts to stimulate innovative solutions for transport customers.[28]

Copenhagen, Denmark

Thirty-nine driverless metro trains, signaling and turnkey systems have been deployed in Copenhagen.[29]

Beijing, China

China's third magnetic levitation (maglev) train launched at the end of 2017. The S1 rapid-transit line has seven stops and runs on an 8.25-km long track at 110-km/h speeds. Note, there are six commercial maglev trains in operation around the world — primarily in Asia.[30]

Helsinki, Finland

MaaS Global operates the Whim platform in Helsinki, Finland and several other European countries and cities. This platform provides an aggregated view of transport options and a subscription payment model.[31]

United Kingdom

The UK has implemented a Bus Open-Data Service Platform which requires all bus operators to share their data on bus services, locations, fares and prices to allow for greater transparency for customers.[32]

[24] A commissioned study conducted by Forrester Consulting on behalf of KPMG, March 2022
[25] The economics of automated public transport: Effects on operator cost, travel time, fare and subsidy, Research Gate, 2020
[26] Learn more, Virgin Hyperloop
[27] Sydney Metro, Transport for NSW
[28] General information Open Data, Transport NSW
[29] Rolling Stock, HitachiRail
[30] The six operational maglev lines in 2021, Maglev.net, 2018
[31] About Whim, Whimapp
[32] Bus open data policy, GOV.UK, 2020

Competitive signals

Mobility-as-a-Service and autonomous vehicles have the potential to be cost-competitive with public transport services. This introduces a new level of competition for ridership and presents the need for public transport services to "attract" customers in order to maintain financial sustainability while delivering environmental and social outcomes.

Highly responsive ride-hailing services continue to grow in popularity. They offer customer connectivity, frictionless payments, intelligent routing algorithms and can be paid for in arrears and on account.

Uber recorded over 20 million journeys in its first 4 years in the UK.[33] Providers and models differ in geographies, but provide a highly convenient point-to-point transport solution that also removes the 'last mile, first mile' challenge for many riders. Other Mobility-as-a-Service models are emerging. We have seen sustained interest in car-sharing schemes. The VW Group already offer monthly subscriptions to customers who might previously have bought their vehicles.

Autonomous vehicles have the potential to become cost competitive with public transport fares. Autonomous point-to-point service (robotaxis, shared mobility) was cited in our survey as the competitive factor with the greatest potential to change the transport landscape. Privately owned or shared automated vehicles are competing for trips with existing public transport services because of their increased convenience, comfort, privacy and safety.[34]

Some modeling has suggested that the cost of using shared automated vehicles could be significantly lower than owning a traditional vehicle and could be comparable with public transport fares.[35]

This competitive signal reinforces the need for decision-makers to continue taking costs out of their systems, expand non-fare-box revenue and increase ease of use. More strategically, decision-makers should consider changing the public transport paradigm from competitive and monopolistic systems to models that integrate new mobility providers into a financially coherent and joined-up transport ecosystem.

Los Angeles, US

The Los Angeles County Metropolitan Transportation Authority is temporarily offering an on-demand ride-share service in the Los Angeles area for just 1 US dollar (USD) per ride with its Metro Micro program. The program will likely compete with on-demand services such as Uber but operate on slightly different terms, with riders sharing a vehicle with up to 10 people. Riders will not need a smartphone to order a ride and can only book rides during certain hours.[36]

Sydney, Australia

Transport for NSW has created a first-of-its-kind Future Transport Digital Accelerator that will enable innovators and start-ups to collaborate directly with the organization. The Accelerator will also allow multiple start-ups to fulfil the role of MaaS (Platform) provider.[37]

[33] Cross-country: The Growing Miles of Uber UK, Uber, 2015
[34] A commissioned study conducted by Forrester Consulting on behalf of KPMG, March 2022
[35] Parliament of Australia
[36] Need a ride? Metro Micro offers $1 rideshares around L.A., Los Angeles Times, 2021
[37] The Transport Digital Accelerator-About; Transport for NSW

Regulatory signals

The speed of innovation increasingly exceeds the rate at which traditional regulatory systems can adapt, presenting an inherent challenge for public transport regulators. Regulation frameworks should become more dynamic in order to respond to emerging modes and new private-sector players — helping to ensure safe, controlled, seamless experiences.

New technologies and business models are providing exciting new opportunities for public transport innovation. To support and drive changes, regulations should foster innovation that is truly beneficial to society while mitigating risk. Regulations, unfortunately, can be used to prevent disruption or protect vested interests — rather than guiding societal outcomes. It is therefore important to avoid such pitfalls by being clear about how regulatory decisions are made. A modern regulatory framework with supporting principles is the way forward.

And it is important to note that as the pace of change accelerates, there is no time to lose. You cannot always wait for legislative changes to enable change. Today's reality is challenging service providers and regulators to be more proactive and flexible. In the UK, we are seeing the use of 'regulatory sandboxes' — defined spaces where new business models, technologies and policies can be developed and deployed in a way that is safe and responsible.

Regulatory support for multimodal operations was cited by public transport leaders as the regulatory factor with the greatest potential to change the landscape for public transport.[38] We believe the regulatory framework should evolve in areas that include:

- automation
- service innovation
- new modes — especially electrically propelled micro-mobility
- new services — especially on-demand, ride-hailing and MaaS
- the availability and use of customer data.

Regulatory systems have historically proved slow to adapt to changing societal, technological and economic circumstances. This continues to be an issue for regulators today. For example, in 2021, Uber was directed to temporarily halt operations in Brussels following a Belgian court ruling that a 2015 ban on private individuals offering taxi services also applied to professional drivers, including the roughly 2,000 drivers in Brussels under Uber's payroll.[39]

[38] A commissioned study conducted by Forrester Consulting on behalf of KPMG, March 2022
[39] Uber to shutter most of its service in Belgium tomorrow after court ruling, Techcrunch, 2021

This pressure will likely continue to grow as private players expand services and capitalize on technological advancements. For example, the launch of Uber Elevate saw aviation regulations converge with traditional public transport regulations.[40] The merging of sectors has the potential to create regulatory loopholes, allowing some companies to avoid regulations that traditional public transport providers are required to abide by. These loopholes should be addressed to create a fair and safe operating environment.

Meanwhile, other technological advancements such as autonomous vehicles are making it difficult for authorities to assign liability for consumer harm. For example, if a vehicle crashes, who is liable — the manufacturer, the wholesaler or the occupant? There is an increasing need for authorities to collaborate with private companies in the development of quality and safety standards.

Private companies are establishing dedicated teams responsible for engaging with local governments and transportation companies to co-develop such standards and regulations. For example, HyperloopTT has a dedicated Safety and Regulation team with the specific purpose of working with relevant parties (including safety agencies and development partners) to enable the successful implementation of hyperloop systems.[41]

The US and European markets have been credited with making significant headway in moving forward with the development of regulatory frameworks for hyperloop systems via the establishment of the Non-Traditional and Emerging Transportation Technology (NETT) Council and Joint Technical Committee, CEN/CLC/JTC. Tunneling, hyperloop, and autonomous vehicles, are examples of new technology whose development may be impeded by jurisdictional and regulatory gaps. The NETT Council's primary mission is to identify those gaps, while the Joint Technical Committee is dedicated to hyperloop systems' standardization.[42]

These regulatory signals reinforce the need for regulatory regimes to become more dynamic, with an outcome and risk-based outlook, and for transport authorities to take a more-proactive approach to reviewing and developing regulations. We are seeing more transport authorities rise to this challenge. For example, Dubai's Roads and Transport Authority (RTA) held the first legal forum in January 2022 to review the rules and regulations governing autonomous operations, including autonomous aircraft.

According to Shehab Bu Shehab, director of the Legal Department, Strategy and Corporate Governance Sector for Dubai RTA, the process is extremely important. Without legislation and legal controls, drones pose an extremely high risk to the traffic of conventional planes.[43]

Meanwhile, the state of New South Wales in Australia will launch an e-scooter trial to determine whether there is a safe way to allow e-scooters on state roadways and to ensure e-scooter regulations are "sensible and appropriate".[44]

[40] Elevate, Uber, 2020
[41] Safety & Regulation, HyperloopTT
[42] How to ensure hyperloop will have a regulatory framework when ready for the first passengers, LinkedIn, 2020
[43] Driverless flying taxis in Dubai: RTA forum reviews traffic rules, Khaleej Times, 2022
[44] NSW councils to participate in e-scooter trial, Government News, 2022

Future of the sector

Our predictions for the future

The signals of change are clues to what the future of the public transport sector could look like. They give rise to a number of predictions which overlap in many elements, but make for worthy consideration in isolation. These considerations should be integrated to provide a helpful solution for your market.

1. **Political influence over public transport will likely grow as it is increasingly seen as a lever to drive social and economic opportunity.** Government agencies responsible for transportation planning and land use (including housing development) will likely become one body. The future is about connecting communities through key corridors to areas of growth and opportunity to create 15 or 30-minute cities.

2. **Public transport agencies will likely become the commissioner of markets rather than the deliverer.** Franchise contracts could be replaced with strategic partnerships that incentivize the delivery of customer and policy outcomes. Partnerships may not be limited to the transportation sector but rather will likely drive a convergence with other sectors.

3. **Customer choice may be a luxury that society cannot afford transport authorities to take.** Future transport algorithms will likely seek to nudge customer movement through the network during peak periods, balancing customer preferences against network requirements and capabilities. Networks will likely work to enhance the use of services and the movement of customers in real time.

4. **Decarbonization of public transport operations will likely become a strategic business priority, not just a policy priority.** Decarbonization could drive achievement of net-zero targets but major behavioral change may also be needed to realize both expected benefits and ROI.

5. **Public transport will likely be free for some citizens.** Driven by the need to enhance social equity, increase access to jobs and services and nudge citizens toward lower carbon impact modes, politicians and policy makers will likely enable cases of free public transport.

6. **Technology will likely revolutionize service delivery and employment in the public transport sector.** Digital transformation will likely accelerate and enable the modernization of service provision with consequential impacts on workforces across the sector. Autonomous vehicles, hyperloops and flying taxis could be considered a normal part of life and the public transport ecosystem.

7. **Outcome and risk-based regulation will likely be required to embed flexibility and better accommodate the "known-unknowns" and "unknown-unknowns."** This could enable regulators to better prioritize, focus and deploy resources in proportion to the risk to regulatory outcomes being achieved.

These predictions should be reviewed in one's own context and used as a reference point to test, review and refine the overarching enterprise strategy for your ecosystem.

Prediction

01

Transport gets (more) political

Political influence over public transport will likely grow as it is increasingly seen as a lever to drive social and economic opportunities. Government agencies responsible for transportation planning and land use (including housing development) are expected to become one body. The future is about connecting communities through key corridors to areas of growth and opportunity.

Public transport plays a key role in enabling economic growth and recovery. It supports mobility and job creation through its operations and infrastructure, connects individuals to job centers and provides companies with critical access to workers, skills and customers.[45]

Connectivity is a key driver of economic growth. Economic productivity will likely grow as the transport network moves people more efficiently and connects communities to key corridors and growth areas. As such, the future is about providing convenient and reliable access for all customers to the local services needed to live, learn and thrive.

As political leaders increasingly recognize public transport's ability to drive social equity and economic growth, they could increasingly try to influence and align policy and investment with the strategic aim of creating 15 or 30-minute cities. Public transport organizations may be pushed, as a result of political commitments, to expand enabling infrastructure within key communities and places. Leaders should expect to invest in capabilities that guide and inform political leaders in order to help ensure the delivery of fit-for-purpose interventions that are reflective of need and desired outcome. Capabilities could include:

- information, analytics and data management
- economic modeling
- infrastructure costing
- future demand forecasting
- network and land-use modeling and planning
- community-needs engagement.

As populations grow in size and density, transport and city planners should work together to enhance accessibility and livability for citizens. Accessibility and livability reflect efficient coordination of services between an individual's job, home and essential services — education, health and social services — as well as the provision of green and public spaces. To meet these requirements and future demand, governments will likely drive funding into new metropolitan housing and public transport infrastructure. This funding could come with expectations for greater collaboration between planning and transport agencies in order to achieve shared outcomes.

Questions for leaders

- To what degree are you currently collaborating with agencies responsible for planning?
- Is a 30-minute city a viable strategic option?

[45] Driverless flying taxis in Dubai: RTA forum reviews traffic rules, Khaleej Times, 2022

Prediction

02

Commissioners not monopolists

Public transport agencies will likely become commissioners of markets rather than deliverers of service. Concession contracts could be replaced with strategic partnerships that incentivize the achievement of customer and policy outcomes. Rather than public transport agencies alone providing bus services, they will likely serve wider markets by allowing other players to provide commissioned services. While transit agencies will likely own the electric bus fleets, for example, service providers would bid for the right to operate them. In Sydney, for example, while the public transport agency operates the trains and networks, it commissions bus services — creating a competitive bus-franchising landscape that enhances rider services and outcomes.

Partnerships may not be limited to the transportation sector but rather will likely drive a convergence with other sectors. An irreducible core of government activity could remain in the center. Governments should play a key role in the delivery of public transport. This includes planning the network and the service pattern, setting fare policies, determining the long-term investment strategy and acting as the asset custodian. However, governments can also work with the private sector to:

- operate and maintain the core system
- own the customer interface and use data to drive behavioral change
- enhance service delivery and create a competitive advantage by enhancing point-to-point connections for customers
- collaborate with innovators to crack last-mile problems where it is not efficient to build new or extend transport networks
- commercialize data and other assets.

As a result, rather than being a public monopoly, public transport agencies will likely become the market steward. They are expected to oversee systems possessing strong commercial capabilities to contract with innovators and deliver social, economic, environmental goals via regulation and public subsidy. The challenge for transport agencies will likely be to help ensure all players are aligned on outcomes. Private and public operators should work shoulder-to-shoulder to help ensure journeys are connected and to direct citizens to the core public transport network.

City and regional transport agencies will likely converge, favoring centralization of decision-making as the need to act as market steward increases. Concession contracts could be replaced by strategic partnerships and alliances which incentivize operators on punctuality, efficiency and shared customer outcomes, governed by outcome and risk-based regulation.

The deployment of 5G in the transport sector through MaaS and autonomous vehicles will likely facilitate the entry of traditional telecommunications companies into the public transport sector. As such, strategic partnerships may not be limited to those that operate in the sector but instead will likely be sought in these areas:

- **Telco and tech** — To deploy new products and services which leverage the 5G network, computer vision with sensor fusion, digital twins, crypto assets, and quantum computing.
- **Payments** — To infuse transportation apps with the ability to pay on the go, embedding frictionless and invisible payment capabilities and eliminating the need for rail cards.
- **Energy** — To co-invest in the supply of fast-charging infrastructure and leveraging of renewable fuels.
- **Shared private mobility** — To deliver enhanced point-to-point outcomes for customers.

Regulators should aim to ensure regulations are sufficiently broad to cover new market entrants coming from other sectors that cut across traditional regulatory boundaries.

Questions for leaders

- What strategic partnerships are you using to drive efficiency and accelerate innovation?
- How can performance be assessed? What incentives can you put in place to drive delivery of shared outcomes?

Prediction

03 Directed by the algorithm

Where networks are heavily congested, customer choice may have to take a back seat. Future transport algorithms will likely direct customer movement through the network, balancing individual needs against policy considerations such as maximizing capacity in existing transport investments, decongestion and decarbonization.

The signals of change establish the need to invest in enabling infrastructure and increase public transport coverage to drive connectivity and social inclusion. Infrastructure is expensive and demands on funding are many. In the absence of being able to fund new developments, transport planners should optimize the network or 'sweat the system' by simply relying on existing capabilities.

Optimizing the network means enhancing the expected benefits that are derived from available assets. Today, this looks like prioritizing modes with higher carrying capacity. For example, a double decker bus has the capacity to carry twice the number of passengers versus a standard bus in the same road space. However, in the future, the complexity of the network — operating within numerous constraints and seeking to meet many objectives — will likely necessitate algorithms that manage the flow of modes and passengers. For example, proactively redirecting customers to underserved modes to create capacity across the network, help reduce congestion and drive efficiency.

Today, you are used to being offered choice in almost all of your interactions with service providers. The traveling customer is given the options of routes, modes, and schedules that offer choices between convenience, safety, time and cost. The signals of change acknowledge the importance of customer experience and choice. However, they also point to other factors, such as the need to decarbonize, which should also be considered.

In the future, we predict that these choices for the customer will likely be reduced. The algorithms that control the network and guide the passengers will likely be optimized for the common good rather than allowing passengers the freedom to choose.

While customers may specify their travel objectives, the public transport algorithm should consider the carbon impact, system congestion, the operating cost to the authority, the avoidance of capital investment, the need to ensure critical workers get to where they need to be, the optimal service for travelers needing additional support, special events — the list goes on.

Algorithms should optimize service modes in ways that achieve the best outcomes or, more fittingly, the least 'impact.' The weighting of these many factors will likely depend on the politics of leadership, the concerns of the citizenry and the factors influencing transport within each geographic authority.

In the end, the network and the movement of passengers will likely be assessed against the impact on all stakeholders and optimized for economic, environment and social impacts. This could present a grand bargain for citizens. In accepting reductions in choice and allowing themselves to be directed by the algorithm for the greater good, customers could be compensated for their 'time contribution' and allowed to ride for free across the network. Those citizens that seek to retain their choice could be charged a premium or fee for service, helping to offset income lost and further incentivize public transport modes and behavioral change.

Prediction

04 Decarbonization delivers net zero

Currently, only 10 percent of public transport leaders surveyed viewed decarbonizing operations among their top strategic business priorities.[46] However, this will likely change as leaders seek to deliver on net-zero targets. Decarbonization of public transport is expected to become a strategic business priority, not just a policy priority. Decarbonization will likely drive achievement of net-zero targets but major behavioral change could also be needed to realize expected benefits and ROI. Public transport authorities and operators should embed environmental sustainability criteria into project governance and decision-making and actively mitigate the environmental impact of their services.

Electrification, sourcing of sustainable power and the transition from internal combustion engine (ICE) fleets will likely be among the key levers that leaders use to meet net-zero targets. Public transport agencies should increasingly seek to invest in:

- Active transport infrastructure (walking, cycling) to help improve the practicability of this mode, reduce air and noise pollution as well as deliver against health and wellness priorities.
- Expanding public transport networks to help improve feasibility for communities where private vehicles are the prevailing transport mode.
- Enabling wider adoption of EV through regulation and charging infrastructure.

Leaders will likely also seek to deploy policies that prohibit the sale of petrol and diesel cars in order to encourage the adoption and purchase of vehicles which drive environmental outcomes (such as EVs).

ESG criteria should be embedded into decision-making and value-for-money assessments. Tools such as environmental sustainability management and ESG reporting solutions will be used to assess and monitor ESG impacts, and enable authorities and operators to consistently mitigate impacts and deliver environmental and sustainability outcomes.

Behavioral change initiatives that drive customers from private modes (with poor environmental outcomes) to public transport (with better environmental outcomes) will likely be required. Price is expected to be a key lever of behavioral change. Public transport agencies will likely look to incentivize private ownership of electric vehicles by introducing additional charges based on environmental inefficiency. They should also seek to promote ride sharing and higher car occupancy in order to reduce air pollution and road congestion where public transport remains impracticable.

Investment in clean technologies is expected to be key to delivering on the decarbonization agenda. True decarbonization uses sustainable sources to generate power. This means additional funding will likely be required to equip facilities with solar panels or other eco-energy sources.

Questions for leaders

- Which transport modes are you seeking to decarbonize?
- Which technologies are you investing in (e.g. electrification, hydrogen etc.)?
- How are you driving behavioral change? What incentives are you implementing?

[46] A commissioned study conducted by Forrester Consulting on behalf of KPMG, March 2022

Prediction

05

Targeted free public transport

Driven by the need to enhance social equity, increase access to jobs and essential services, and direct citizens to lower carbon impact modes, politicians and policy makers should implement targeted free public transport. Alternative funding sources will likely be required to provide the resources needed to fund free services.

Policy makers, particularly in mature markets, should seek to implement a model where some or all public transport is free at the point of consumption. Choices should be made on how to segment free access. Customer experience and safety should not suffer from this process. Underpinning this decision will likely be a range of policy objectives, informed by a transit-enabled placemaking agenda.

This sustained focus on transit-enabled placemaking is expected to continue into transit-led economic development and value capture. Providing free transport to access new developments will likely accelerate demand for services at that place, engage employers in enhanced EVP discussions and provide opportunities for non-fare revenue. A free system will likely increase equitable access to employment, leisure and services.

Although some change in the landscape of cities has occurred through COVID-19, there remains an irreducible core of economic and social activity linked to large population centers. Essential workers (police, cleaners, nurses, teachers) are key to the smooth operation of society and will likely continue to deliver face-to-face services. Free transport should support a rebalancing of equality of access.

This system will likely still require funding that balances contributions from central governments and other non-fare revenue. At the strategic level, policy makers should craft systems which use free networks and route planning to create demand, then capture and monetize this value to establish new revenue sources through commercial relationships with developers, employers, commercial real estate or other service providers. More tactically, operators may seek opportunities for 'freemium' transportation modes to generate revenue, such as high-speed Wi-Fi, quiet carriages, premium carriages, or on-demand routing.

Congestion charges for private vehicles will likely support the triple goal of congestion reduction, emission reduction and free public transport through its generation of non-fare-box revenue. As EV and autonomous vehicles proliferate, this requirement could transform to a road-usage charge, replacing revenue formerly gathered through fuel taxes and helping to ensure that cities do not experience additional congestion peaks as vehicles drop off and collect their owners.

Policy makers should understand how to best segment free service. Simple models such as free within the inner city could create additional economic activity but are potentially regressive. Free service everywhere in a network could just be unsustainable for regional travel. Flat fees at peak times and free service outside peaks could provide a way forward. Means testing or free service for recipients of universal basic incomes may be of assistance, but could create additional challenges.

Having decided how to segment, policy makers will likely also need to understand how to fund historic networks, even as legacy sources of income decline. The effort could deliver economic, social and environmental benefits to all citizens within a jurisdiction.

Questions for leaders

- How would you segment free access? By geography? By mode? Through a means test? Flat fee for peak hours, free at other times? Distance traveled? To recipients of a universal basic income?
- How could free transport services impact your funding model? What alternative funding sources are available to you to help cover costs?

Prediction

06 More tech capabilities

Technology will revolutionize service delivery and employment. Autonomous vehicles, hyperloops, last-mile pods, flying taxis and EV charging infrastructure will be considered a normal part of the public transport ecosystem. The onslaught of big data, AI, RPA and human-machine teaming technologies will likely transform the operational, customer, asset and enterprise technology layers. Leaders and organizations may need a significant uplift in capability to intentionally navigate these changes. 'Always on' digital transformation will likely be the new norm to enable modernization with consequential impacts on workforces across the sector.

Technologies like 5G, computer vision with sensor fusion, digital twins, crypto assets, and quantum computing will likely continue to evolve and redefine how society consumes mobility services. Transport technologies such as autonomous vehicles and electric vertical take-off and landing (eVTOL) could reshape transportation options. Advancements in signaling technologies, predictive analytics and real-time information delivery will likely be critical for managing multiple modes and helping to ensure they operate seamlessly and autonomously. Intelligent traffic-management systems can prioritize transportation modes based on eco-friendliness, urgency and public safety. Decision-makers will likely need to build in the capabilities to imagine new futures in customer technology, operational technology, asset and engineering technology and enterprise technology.

Technology is no longer the domain of the IT shop.

Organizations will likely shape themselves to overcome the traditional IT/OT divide and truly connect front, middle and back offices. This change should be directed by an enterprise-level digital-transformation strategy that links customer experience, innovative modes and funding to help ensure authorities and operators make the right investments at the right time.

These decisions will likely change the size and shape of workforces. AI and Robotic Process Automation can reduce transactional work and increase the efficiency of teams across the board. Driving roles across all modes could be reduced. Electrification will likely simplify maintenance. Human-machine teaming can change how 'touch work' is performed. There should still be a need to provide 'humans in the loop,' for example in customer care — particularly for people needing a higher level of support during travel, for higher-value tasks, or to respond to unexpected events and emergencies.

Redeployment of existing talent will likely be simpler than sourcing new talent. Public transport authorities should invest in large-scale learning and development systems to transition in a cost effective and sustainable way, using advancements in simulation, VR and other learning systems to help increase system efficiency and effectiveness.

Questions for leaders

- To what degree are you investing in customer, operational, asset and enterprise tech?
- What impact will this have on your workforce? Will you retrench, reskill, redeploy or recruit?

Prediction

07

A modernized approach to regulation

Outcome and risk-based regulation will likely be required to embed flexibility and better accommodate "known-unknowns" and "unknown-unknowns." This can enable regulators to better prioritize, focus and deploy resources in proportion to the risk to regulatory outcomes being achieved.

The future demands a clear regulatory framework and supporting principles, and an evidence-based approach to decision-making. Supporting principles that inform regulation may also require a commitment to regular reviews, so that innovations do not fall afoul of regulations intended for another age.

Effective regulation and controls can lead to economic, social and environmental benefits, while poorly designed regulation can unnecessarily burden businesses and consumers and reduce a regulator's performance. Regulation should strike the right balance between providing clear guidance for operators while allowing flexibility for innovation and competition.

The deployment of outcome and risk-based regulation should be informed by data and experience. Regulatory sandboxes and testing/deployment data will likely help be used to inform policymaking on the "known-unknowns," whereas regulatory reviews and sunset clauses will likely be built in to accommodate the "unknown-unknowns." Regular monitoring of the market, and performance reporting on current regulations, can drive continuous improvement and help ensure regulations remain relevant over time.

Regulatory sandboxes will likely facilitate innovation and testing of new ideas in a safe environment. Given the complexities and uncertainties related to the deployment and corresponding legal implications of new technologies, it is essential that there is a strong link between testing and deployment data and policy formulation.

Public transport agencies should have clear plans for how data and R&D tests and trials will support and inform new regulation and eventual deployment of new technologies and solutions. One option warranting further consideration is the formation of a separate standalone body responsible for helping to ensure that each regulation is adapted at regular intervals in order to reflect the latest data from trials and testing. This would help ensure clear accountability that regulations are up to date and reflect current and future needs.

Transform or optimize: How KPMG firms can help

The future awaits — will you transform or optimize?

A bold new customer-centric future awaits public transport services and there is no time to lose for leaders to consider whether their current investment plans effectively capitalize on known opportunities, align with customer and community expectations and deliver the future we want to see. Public transport leaders should decide if they now need to transform or optimize. But make no mistake — change that meets the rapid pace of digital innovation and customer expectations has become inevitable for organizations hoping to provide modern services that support the people and communities they serve.

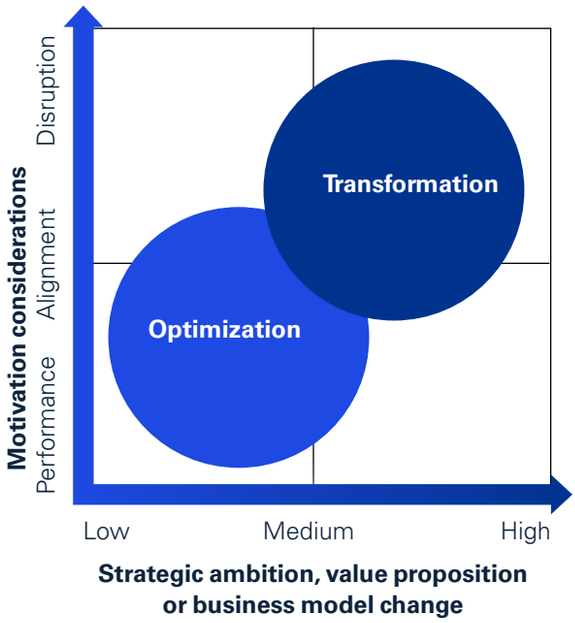
Transformation — Operating-model transformation is required where an organization has significantly changed its strategic ambition or requires a fundamental shift in its value proposition and business model. Transformers should have a greater strategic ambition and be more focused on disruption. In all cases, pervasive digitization of functions and capabilities will likely underpin the change.

Optimization — Operating-model optimization is where an organization needs to improve its organizational effectiveness and efficiency in order to help improve performance, meet its strategic ambition and enact its business model. Optimizers will likely be focused mainly on performance improvement and incremental change.

Case study

Transport for New South Wales (TfNSW) took stock of its long-term needs through its Future Transport 2056 strategy. A key action was the Evolving Transport program to transform the enterprise's operating model and make it integrated and mode agnostic — allowing for place-based planning, putting customers and communities at the heart of planning, design and delivery. KPMG Australia supported the realization of this ambition by enabling its detailed organizational design.

This was a significant transformation which flipped the organization from being arranged around its transport modes and businesses, to a primary lens of place, consisting of a Greater Sydney business and a Regional/ Outer Metropolitan business, both supported by centralized capabilities in customer, planning, commercial, safety and regulation and corporate services. This significant shift is now in place, with further optimization continuing through investments in integrated technology, processes and planning across the business.



Transform or optimize

Whichever path you choose, the building blocks are the same:

1. **Review purpose, strategy and mission —** Jurisdiction, current state and ambition will determine the quantum of change. *Future of the Sector* makes predictions that can help inform this longer-term thinking. Clarity of purpose, strategy and mission are essential to realizing change.

2. **Adopt a target-operating model —** A clear target-operating model shows how the enterprise will organize and operate itself to deliver its strategy and mission.

3. **Modernize technology —** Investment in technology will likely be key to efficient transformation, the challenge being to link seamlessly front, middle and back offices while coping with the complexity of the modern public transport ecosystem. To improve operations, reduce cost and decarbonize will likely require a significant investment in operational, engineering, customer and enterprise technology over the coming decades.

4. **Improve core capabilities to deliver the mission —** In 2018, KPMG International commissioned Forrester Consulting to conduct a study on customer-centric strategy decisions across 17 industries. This research showed that organizations which invest in all eight of the following capabilities are twice as likely to deliver customer experiences that exceed expectations, successfully execute on one or more customer-centric objectives, and achieve return on investment on one or more metrics.[46]

KPMG's Connected Capabilities:

Insight-driven strategies and actions
The ability to harness data, advanced analytics and actionable insights with a real-time understanding of the customer and the business to shape integrated business decisions.

Innovative products and services
The ability to develop compelling customer value propositions on price, products and services to engage the most-attractive customers and drive profitable growth.

Experience-centricity by design
The ability to design seamless, intentional experiences for customers, employees and partners to support customer value propositions and deliver business objectives.

Seamless interactions and commerce
The ability to interact and transact with customers and prospects across marketing, sales and services, and achieve measurable results.

Responsive operations and supply chain
The ability to operate the business with efficiency and agility to fulfill the customer promise in a consistent and profitable way.

Aligned and empowered workforces
The ability to build a customer-centric organization and culture that inspires people to deliver on the customer promise and enhance business performance.

Digitally-enabled technology architecture
The ability to create intelligent and agile services, technologies and platforms, enabling the customer agenda with solutions that are secure, scalable and cost-effective.

Integrated partner and alliance ecosystems
The ability to engage, integrate and manage third parties to increase speed-to-market, reduce costs, mitigate risk and close capability gaps to deliver on the customer promise.

[46] A commissioned study conducted by Forrester Consulting on behalf of KPMG, September 2018

The KPMG Connected Enterprise approach is designed to help public transport organizations assess their existing capabilities, identify capability gaps, and manage the transformation hurdles across the enterprise to design and embrace the future of their sector.

The eight capabilities of KPMG Connected Enterprise:

*Base: 1,299 professionals involved with customer strategy decisions.

Source: A commissioned study conducted by Forrester Consulting on behalf of KPMG, every year since 2018. The research is conducted on a sector-specific basis. Each capability is enabled by five level two capabilities. Maturity statements on each one are gathered and provide the quantified evidence base.

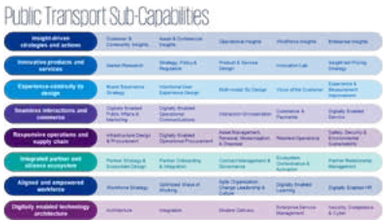
With the need for more connected and seamless digital offerings, what can good look like?

- Investing in the right capabilities to help drive effective digital-first ways of working and operating models.
- Connecting and applying these capabilities across the functional value chain.
- Making the most of technology with a platform mindset.

KPMG Connected Enterprise for Public Transport

With a research-based and tested approach, **KPMG Connected Enterprise for Public Transport** assets take the eight connected capabilities to the deep level needed for leaders and teams to navigate the journey of digital transformation, or optimization.

Public transport Sub-Capabilities & Maturity Assessment



Public transport Business Blueprint

Public transport Technology Blueprint

KPMG professionals will work with you to shape and define your digitally enabled transformation or optimization vision, using the eight capabilities and sector-specific 40 sub-capabilities to inform and evaluate plans, prioritize the roadmap and align investments.

Insight-driven strategies and actions	Customer, Community & Economic Insights	Commercial Insights	Operational, Safety, Environment & Asset Insights	Workforce Insights	Enterprise Insights
Innovative products and services	Stakeholder Engagement	Policy, Planning, Regulation and Innovation	Network & Service Design	Infrastructure & Asset Design	Revenue & Loyalty Strategy
Experience-centricity by design	Brand Experience Strategy	Intentional Customer Experience Design	Customer Journey Mapping	Multi-Modal Integration	Experience & Measurement Improvement
Seamless interactions and commerce	Digitally Enabled Public Affairs & Marketing	Ticketing & Payments	Customer Coordination	Digitally Enabled Operational Communications	Digitally Enabled Service
Responsive operations and supply chain	Digitally Enabled Procurement & Supply Chain	Safety & Security	Asset & Infrastructure Lifecycle Management	Responsive & Resilient Operations	Environment Sustainability & Resilience
Integrated partner and alliance ecosystem	Partner Strategy, Policy & Regulations	Partner Engagement & Integration	Contract Management & Governance	Ecosystem Orchestration & Activation	Market Stewardship
Aligned and empowered workforce	Future Workforce Strategy	Digitally Enabled Workforce	Agile Organization, Change Leadership & Culture	Digitally Enabled Learning	Digitally Enabled HR
Digitally-enabled technology architecture	Technology & Data Architecture	Integration	Modern Delivery	Enterprise Service Management	Cyber Security and Compliance

Key takeaways

Capability	Key takeway
Insight-driven strategies and actions	Planning networks, assets and services requires ongoing commitment to generating insights into customer behavior, commercial performance, the state of fleets, assets and environments, and the key enablers of workforce and enterprise insights. Public transport agencies should, deepen their understanding of customers and communities, implementing capabilities to track patterns and infer when an intervention can enhance outcomes. Investment in the right capabilities — people, governance, regulation and technology — to extract meaningful insights will likely be a critical enabler for agencies. These insights can drive long-term decisions about investment prioritization. These frameworks should evolve to consider 'whole of life value' as part of asset and infrastructure management. Investment and prioritization frameworks may need to be updated to reflect the need to capture this 'whole of life cost.'
Innovative products and services	Public transport agencies should evolve the network and service design to meet the evolving expectations and needs of the people and places served. Planners should plan for, preserve and invest in future demand corridors that support local access and connect people to current and future centers of economic and social opportunity. Organizations should design pricing, revenue and loyalty strategies that consider social equity, financial sustainability, environmental outcomes and cost competitiveness among travel modes. This includes consideration of general distance-based charges/road-use fees to replace fuel excise and congestion-based pricing, as well as cordon or corridor charging. How to fund the emerging notion of 'free' public transport will likely be essential for planners. The integration of new and emerging modes into existing public transport networks is a priority consideration for future transport planners. Planners should evaluate emerging modes to determine the associated costs and potential benefits, and design strategies that are safely and coherently integrated into the network and the places served. Regulators should thoughtfully engage with emerging modes of transport to provide the necessary regulatory framework for safe operation and integration of new modes. Regulatory 'sandboxes' will likely be key.
Experience-centricity by design	Public transport authorities will likely need the capabilities to deliver an end-to-end, customer-centric experience across all modes. This can include branding, payment and network integration, and timetabling. They can choreograph online and offline experiences and enable customers to achieve their travel objectives simply and easily across different modes and channels. Develop brand, service differentiation and omni-channel strategies to create a competitive advantage over private modes of transport. Agencies will likely need the capability to measure 'Voice of Customer' to help ensure service and strategies are having the desired effect.

Capability	Key takeway
Seamless interactions and commerce	Engagement with stakeholders and customers should be digital first, location and network aware, and always on. The customer experience of all modes and suppliers will likely need to be coherent and consistent, providing seamless interactions across the network for information, planning, ticketing and coordination. Customers could expect timely information that is digital, personalized and predictive, with commercial interactions across the network delivered on a single channel. Agencies and partners should remove barriers to the free and open exchange of customer, performance and asset data across the network. Information shared between partners should be seamless and enhance customer, operator and regulator experiences.
Responsive operations and supply chain	Customers will likely continue to demand safe, integrated, on-time performance. This is expected to remain non-negotiable. Transport authorities may face increased focus on the need to reduce environmental impacts and act on decarbonization goals. As modes and partners are added to networks, authorities should implement greater, more-robust operational management capabilities, underpinned by automation and enhanced decision-making tools. Networks will likely need to enhance their capacity for Asset and Infrastructure lifecycle management, utilizing the full range of capabilities offered by digital twins, 5G and digitization. Climate impacts will likely affect network resilience as the severity of weather events increases. This may need to be factored into asset-management plans and planning decisions in order to future-proof operations and help ensure long-term economic success for the places served.
Integrated partner and alliance ecosystem	Public transport agencies will likely need to become custodians of integrated partner and alliance ecosystems to best support the communities they serve. This may mean enhancing capabilities to envisage future partnering that is aligned to strategy, and underpinned by improved capabilities to regulate, contract manage and orchestrate internal, external and third parties to deliver mobility. Agencies can work as market stewards to sensibly orchestrate public-sector operators in partnership with private-sector operators in order to provide seamless service packages. Open-data standards are a key enabler of transparency and collaboration within the market-steward role. Open access to public transport data allows private developers, entrepreneurs and data analysts to create innovative solutions for transport customers, including real-time transport apps and MaaS platforms.
Aligned and empowered workforce	The electrification of transport systems and automation of work in many roles will likely require enhanced capabilities among people functions and leaders to manage workforce transitions. Modern 'workforce shaping' capabilities, informed by asset-investment planning, can provide key insights needed to plan effectively. Many authorities will likely reskill existing workforces to support new jobs and roles, with a strong demand on enterprise learning and development functions.
Digitally-enabled technology architecture	IT will likely remain a core enabling capability, touching every dimension of operations. Agencies are expected to transition to modern IT delivery practices and to enabled, coherent enterprise architecture that allows the free passage of information among front, middle and back offices. The digitally enabled system will likely continue providing opportunities to enhance operational effectiveness and decision-making while helping to reduce the total cost of operations. Cyber threats will likely be a persistent challenge and authorities should work hard to help ensure cyber resilience across all of the distributed parts of the enterprise. Agencies will likely need to adopt adequate privacy-oriented solutions to avoid risk and help ensure data is managed responsibly and ethically. Authorities should aim to minimize threats, points of vulnerability and privacy breaches by protecting data, systems and networks.

The future of customer journeys

Overview of a typical customer journey in 2040

Journey planning and first mile

Integrated apps/platforms detailing the wide-ranging journey with reference to "known" events, network needs and user traits including arrival and departure times, total journey duration, cost and environmental impact.

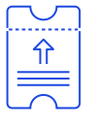
Push notifications of journey interruptions, delays and suggested alternative routes.

Geo-aware travel reminders of upcoming journey to encourage timely arrival at the public transport access point.

Integration of active transport facilities with public transport service access points.

Pre-journey

Service access point clearly indicated with physical signage and digital wayfinding (push notifications of directions).



Contactless ticketing and payment services, utilizing biometric verification technologies to enable seamless access between services.

Service access points cater to a diverse range of customer mobility (children, elderly and disabled). Push notifications with directions to customers where this is applicable.

Minimal wait times for services to arrive, supported by integration across the ecosystem, timely updates of incoming services and recommended access points based on real-time capacity data.

Journey

Enhanced concierge services help customers navigate stations, services and disruptions, using workforces released from driving needs.

Board service through recommended access points and occupancy of available seating/ standing areas.

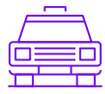
Real-time travel updates through signaling technologies and push notifications on proximity to destination arrival.

Arrival at destination with connection points indicated and announced including in apps/ platforms.

Post-journey and last mile

Packaging with additional services such as shopping and food.

Direction to Point-to-Point or On-Demand services for last-mile connections.



Real-time updates on Point-to-Point or On-Demand services.

Access to Point-to-Point or On-Demand services using a single ticket.

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A special thanks to the following who helped with the development of this report:

Anthony Hernandez
Ben Foulser
Catia Davim
Chi Sum Li
Colin Earp
Guy Wilkinson
Hifzur Rahman
Jacinta Hargan
Jodhbir Sachdeva
Jonathan Foord
Kirsty Bennett
Morsi Berguiga
Seyran Dehbokry

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Designed by Evalueserve.

Publication name: Future of public transport
Publication number: 138242-G
Publication date: October 2022