SIEMENS MOBILITY

Global Transport Sector Insight **2021**

As pressure on transport systems grows, can digital technologies lead mobility into a new decade?
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The transport sector gears up with AI and 5G for a new decade.

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Executive **summary**

To achieve climate neutrality by 2050, rail needs to be the backbone of a truly multimodal mobility ecosystem. And while the industry is stressing the importance of increasing rail capacity, little attention has been paid so far to making better use of existing capacity.

So can new technologies save the day, increasing capacity, enhancing efficiency, and delivering better, more environmentally sustainable services?

We asked 108 global executives active in road and rail what they think about new technologies and digitalization. We also found out about the challenges their organizations are facing, and their short to medium-term outlook for the transport sector.

We carried out our survey in April and May 2021, and to track developments over time we have compared this year's results with the same research from 2019.

What we found

70% of respondents say that maintenance of road and rail transport assets and infrastructure and long-term growth in demand for them are major challenges.

55% expect funding in the transport sector to be a growing challenge over the next two years – up from just 17% two years ago.

61% say that lack of investment is already having an impact on operations in road and rail.

A majority are already implementing or building use cases in artificial intelligence (AI) **(60%)** and 5G networks **(52%)** – up from 5% and 4%, respectively, in 2019.

81% say that trends in data-driven decision-making will shape their strategies in the coming years.

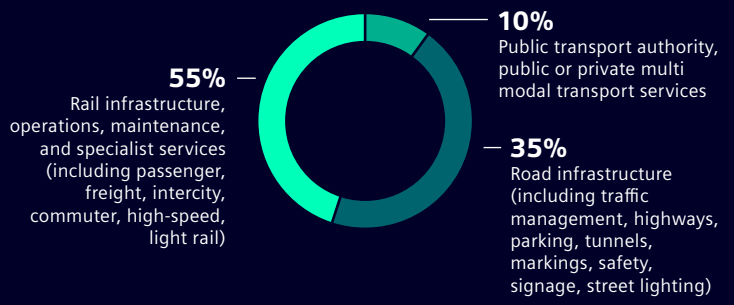
47% say they are interested in Mobility-as-a-Service, and 45% are interested in data monetization – both up from just 20% in 2019.

59% say that workforce sentiment toward digitalization continues to be a challenge. This is down from 77% in 2019, but 38% still say that their workforce is not fully ready for the new digital era.

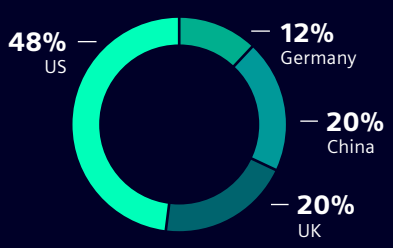
Change is being driven by the public: **75%** of respondents say that consumer views are shaping the sector's development.

Survey demographics

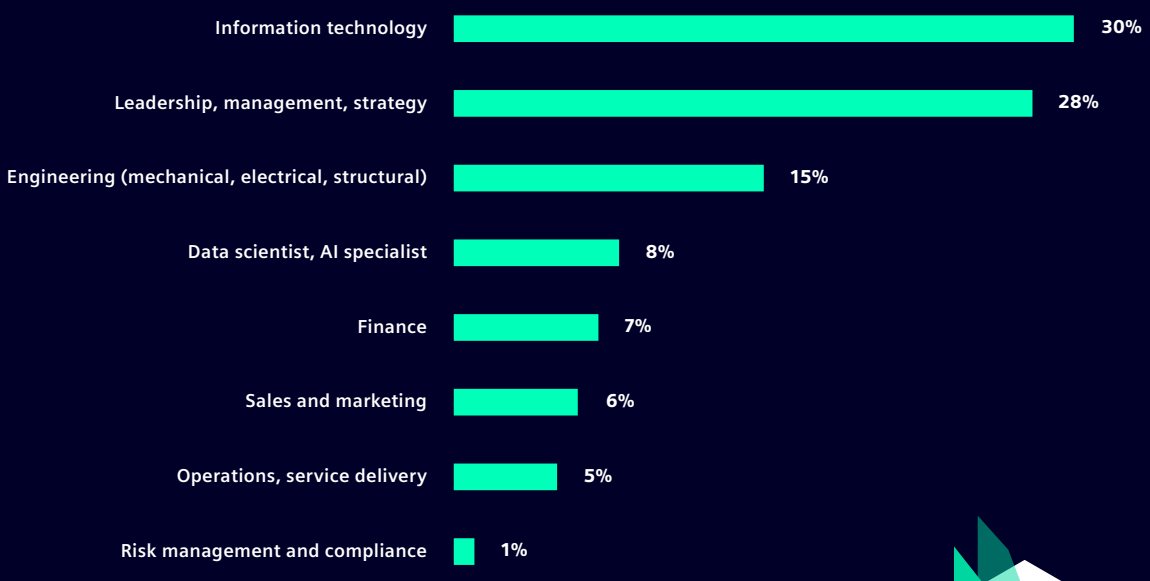
Type of company



Country breakdown



Job function



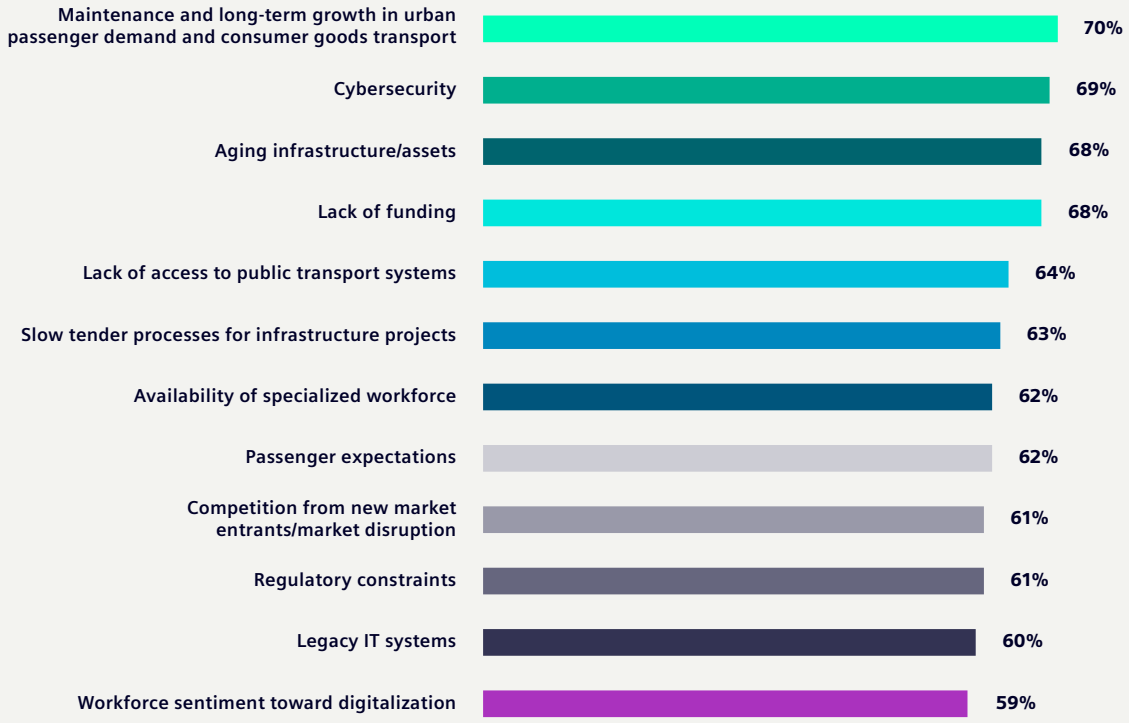
SECTION 1

Pressure on transport systems grows, and funding woes emerge

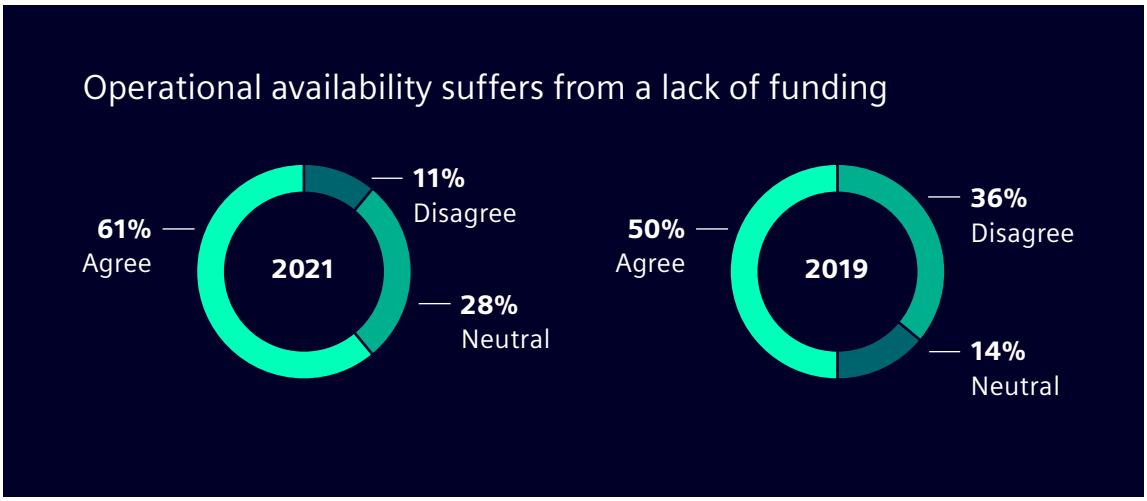
As the global population increases, the pressure on aging transport systems in middle-income and high-income developed countries and urban areas grows.

This is reflected in our data. The number one difficulty faced by 70% of the global transport executives we surveyed is maintenance and the long-term growth in demand from urban passengers and consumer goods transport.

Urban passenger and consumer goods growth is the biggest challenge



What best describes the level of difficulty presented to your organization by the following challenges? (Those who said they were a major or moderate difficulty.)



'The lack of investment in infrastructure and maintenance has impacted the operational availability of services.' (Those who agreed, disagreed or were neutral.)

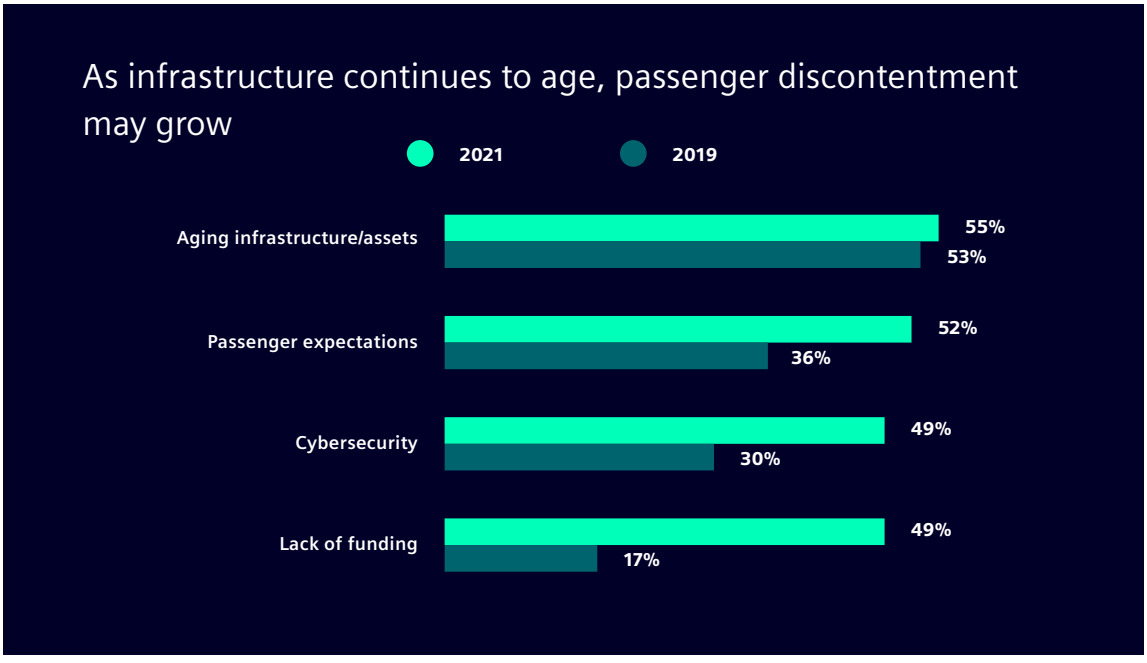
Lack of funding and aging infrastructure/assets also rank highly as concerns. The global financial crisis of 2007–09 had a significant impact on government funding of public infrastructure in many countries over the decade that followed. In the EU, the transport sector suffered the steepest decline in infrastructure investment, leaving motorways, bridges, and railways lagging behind on modernization.

More recently, the reduction in passengers during the pandemic has placed a further strain on funding. Nearly two-thirds of executives (61%) say that lack of investment in infrastructure and maintenance has affected the operational availability of services, which is up from 50% in 2019.

Executives expect these challenges to increase in difficulty over the next two years:

55% say that aging infrastructure and assets will become more of a challenge.

49% say that lack of funding will become more of a challenge. This has soared from just 17% in 2019.



How do you expect the following challenges to evolve over the next two years for your organization? (Those who said they were gradually or rapidly increasing in difficulty.)

The state steps in to fund the fightback

Cash-strapped public and private sector companies are turning to government funding in order to make improvements. They can use stimulus programs and long-term funding packages such as the EU's €1 trillion Green Deal, for instance, to develop sustainable transport infrastructure.

The Green Deal aims for a 90% reduction in transport emissions by 2050, and expansion of rail capacity is pivotal in achieving this. Rail accounts for less than 0.5% of transport emissions in the EU, but much of its potential is still underexploited: only about 7% of passengers and 11% of goods travel by rail[1].

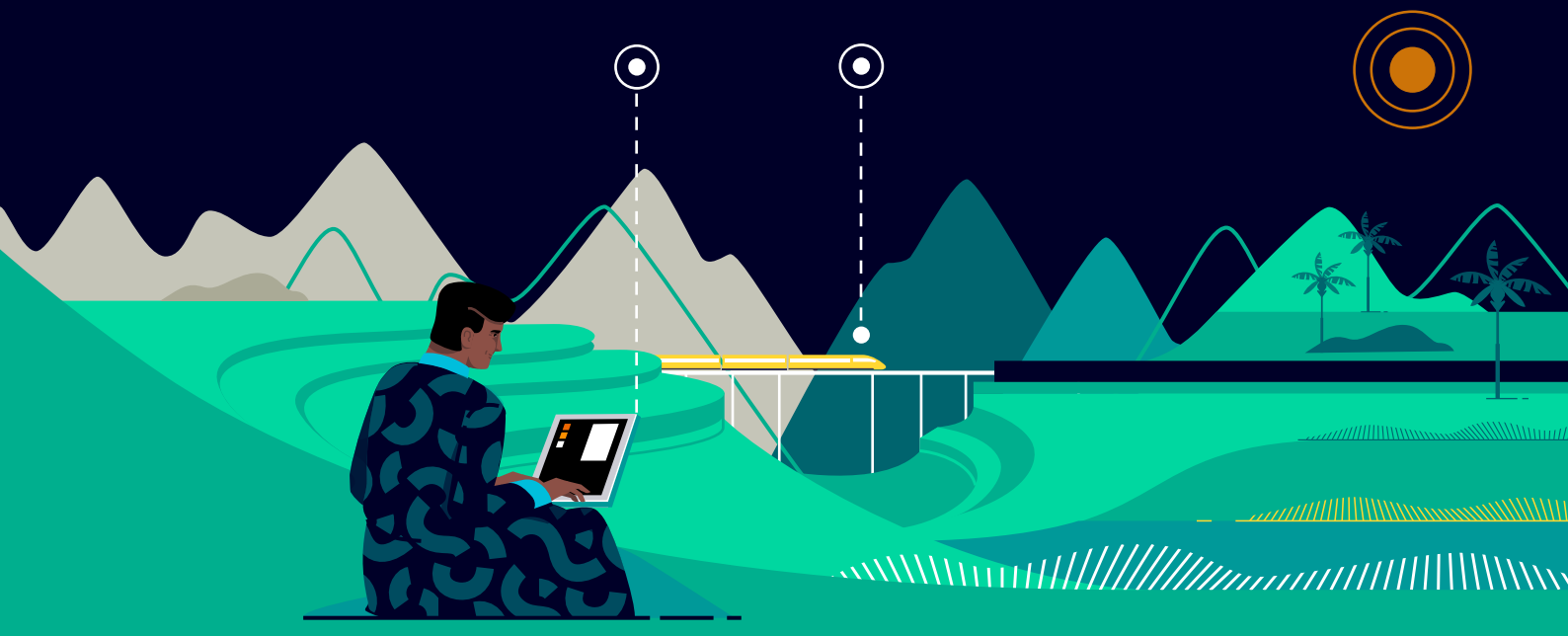
In rail, investments in digital technology rather than tracks can lead to long-term savings by reducing energy usage and increasing overall efficiency. Standardised digital control and safety technology (DLST) based on the European Train Control System (ETCS) and digital interlocking systems can increase the German rail network's capacity by up to 35%[2].

"The 2020s could be a golden age for railways," says Prof. Dr. Jens Braband, Principal Key Expert at Siemens Mobility. "But we need to be quick to bring innovation into the field. For example, the Digitale Schiene Deutschland program aims to digitalize Germany's railways and is a big investment, but we must roll out our innovations in this decade or that investment is lost."

[1] https://ec.europa.eu/commission/presscorner/detail/en/IP_20_2528
[2] https://digitale-schiene-deutschland.de/en/digital-rail

"The 2020s could be a golden age for railways, but we need to be quick to bring innovation into the field. For example, the Digitale Schiene Deutschland program aims to digitalize Germany's railways and is a big investment, but we must roll out our innovations in this decade or that investment is lost."

Prof. Dr. Jens Braband
Principal Key Expert at Siemens Mobility



SECTION 2

Data and artificial intelligence (AI) drive strategy

As the pressure on transportation networks to move more people and goods grows, how can operators respond?

More and more are turning to digitalization and automation to relieve traffic and create more seamless interchanges between different modes of transport.

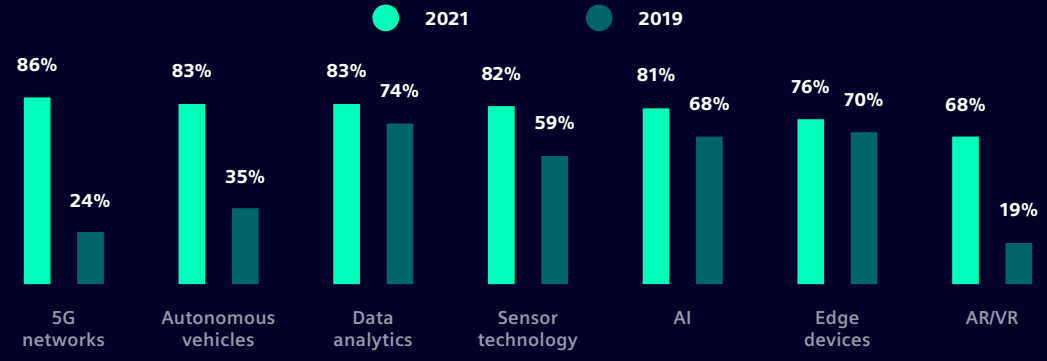
"There is a limit to how much new railway infrastructure we can build, and investment is also limited, so we need to take this digital approach," says Dr. Claus Bahlmann, Head of R&D Department AI and Principal Expert for AI and Computer Vision at Siemens Mobility. "The technology is there to increase capacity while making rail travel more reliable, comfortable, and inclusive."

"The technology is there to increase capacity while making rail travel more reliable, comfortable, and inclusive."

Our survey respondents are recognizing this. Compared with two years ago, they now see much greater potential in autonomous vehicles, for instance, and the technologies that underpin them – 5G, AI, data analytics, and sensor technology: 83% say that autonomous vehicles have the greatest potential to improve their organization and the transport industry as a whole over the next three years. This is up from 35% in 2019.

"Increased automation can make public transportation better in many aspects: it can grant more flexibility, reliability, efficiency, comfort, and inclusiveness, and it can also be greener," says Bahlmann. "And the key to automation is AI."

Autonomous vehicles and the technologies underpinning them have the most potential



Which technologies have the greatest potential to improve your organization or industry in the next three to five years?

"Digitalization can increase capacity on almost all rail networks globally by about 30%. Autonomous rail without a driver, for example, saves time, cost, and energy. For subway systems, automated rail is already state of the art, but it also makes sense for long-distance rail."

Michael Peter
CEO of Siemens Mobility

How automation changes the game

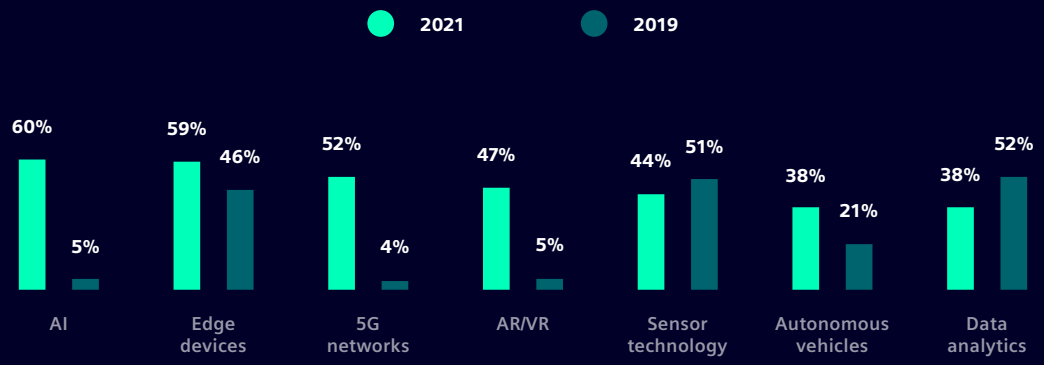
Automated rail systems are becoming increasingly attractive because they can increase network capacity, with more trains on the same number of tracks, by optimizing the system with AI, sensors, and the Internet of Things (IoT). They also reduce downtime by allowing for predictive maintenance.

"Digitalization can increase capacity on almost all rail networks globally by about 30%," says Michael Peter, CEO of Siemens Mobility. "Autonomous rail without a driver, for example, saves time, cost, and energy. For subway systems, automated rail is already state of the art, but it also makes sense for long-distance rail."

And AI, which respondents expect to transform the industry over the next three to five years, can be used in almost every aspect of mobility, including in design to make vehicles and rolling stock more efficient, in smart braking systems, and in preventive maintenance.

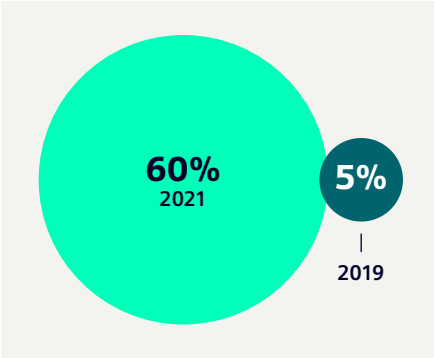
"We are at a turning point," says Braband. "AI and its certifiable applications will be big game-changers."

The transport sector's interest in AI and 5G has risen dramatically

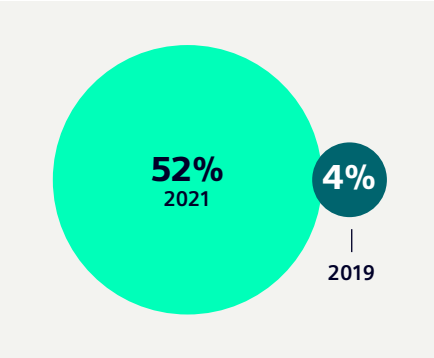


Which of these technologies are you currently implementing in your organization or are you in the process of building a specific use case for?

Our survey shows that almost every technology has gone from being a 'nice to have' to a 'must engage with', and AI and 5G are leading the trend:



60% of respondents are already implementing or building use cases in AI – a huge increase on the **5%** of 2019.



52% are doing the same with 5G networks, which is up from just **4%** in 2019.

"For transport, 5G can be both an evolution and a revolution," says Dr. Manfred Schienbein, Rail Infrastructure Mass Transit – Head of Center of Competence Railway Communication at Siemens Mobility. "The transition has already begun. With end devices that have 5G capabilities, applications that were previously based on 4G can be evolved. Completely new applications are possible with 5G such as monitoring rail infrastructure in real time with video analytics and AI. The result is an added value where 5G acts as a glue combining different technologies with each other."

"Then," he adds, "We will have a revolution once trains can be driven remotely through 5G, and sensor data from trains is evaluated on a real-time basis in the cloud while passengers stream videos or work remotely. In contrast to 4G all these different data streams are running in parallel without interfering with each other."

But greater connectivity also increases passenger comfort and convenience on rail and metro journeys. In the UK, for example, with more than 1 gigabit per second, 5G will enable train passengers to take part in conference calls, gaming, and video streaming[3].

[3] https://www.globalrailwayreview.com/news/119684/evo-rail-firstgroup-rail-5g/

Connectivity boosts transport integration

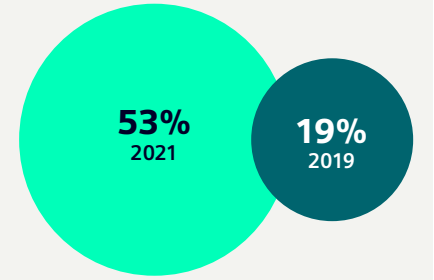
The latest generation of technology will also improve connectivity for the IoT and edge devices, and ensure connected and seamless journeys.

IoT systems and cloud-based network management are major areas of development for the mobility sector. This is because they will allow for more seamless integration of different modes, more efficient use of systems and vehicles, and better use of data.

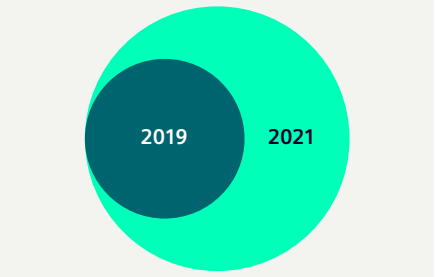
“The key to success here is to come up with the perfect match to each mode of transport, while also ensuring the transition from one mode to another – the whole journey needs to be as seamless as possible – already a reality with our MaaS platforms, which reduce complexity and provide complete planning, booking, inventory and disruption management systems,” says Devina Pasta, Head of Digital, Technology & Innovation and Strategy at Siemens Mobility.

Money matters: How digital can fund transport

Following the budgetary constraints imposed by Covid, the survey respondents are now much more open to monetizing digital service and business models than they were in 2019:

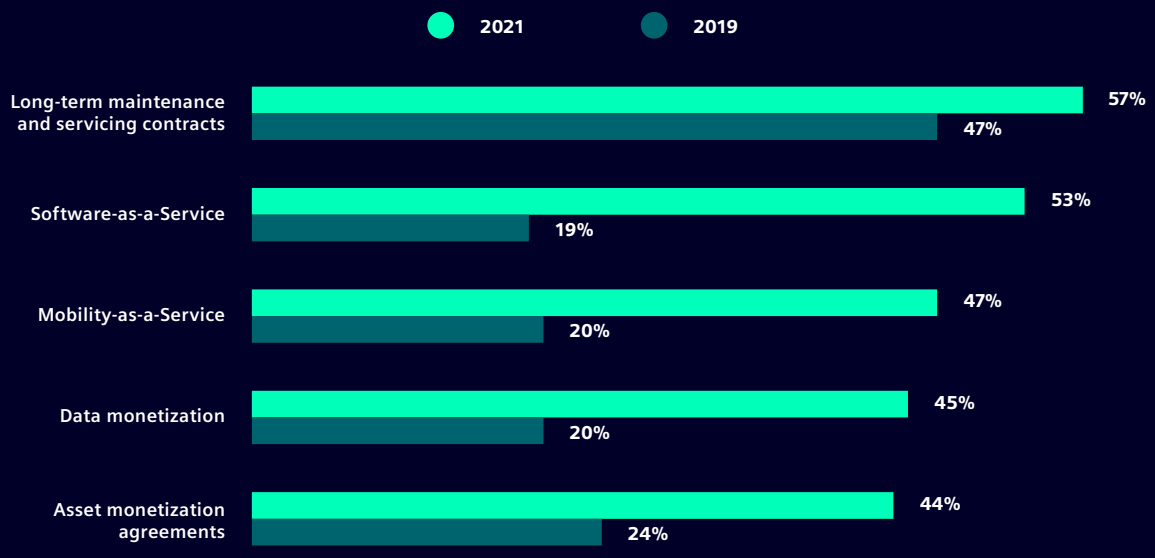


53% say they are interested in Software-as-a-Service – up from only **19%** in 2019.



Engagement with Mobility-as-a-Service and data monetization have **more than doubled** in the same period.

Transport wakes up to new business models



Which operations, partnership, business, or servicing models is your organization open to using?

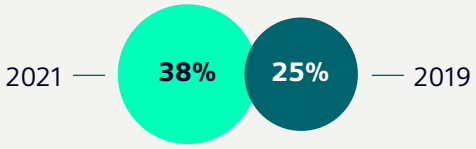
SECTION 3

Time for **digital upskilling**

With digitalization accelerating, operators in the transport ecosystem are realizing that they need to upskill their workforces.

More than a third of respondents (38%) say their workforce is not ready for the new digitalized models they want to implement in the next few years. This is up from 25% in 2019.

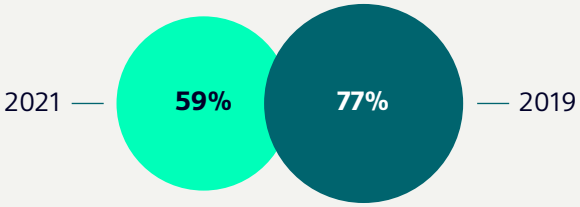
Transport is a long way from having a digitally proficient workforce



'Our workforce is not ready for the new digitalized models we want to implement in the next few years.' (Those who agreed.)

The good news is that employees' feelings about digitalization are improving. More than half of the respondents (59%) say that workforce sentiment toward digitalization is still a challenge in their organizations, but this is down from 77% two years ago.

Digital has not yet won over the workforce
Workforce sentiment toward digitalization is a difficulty



What best describes the level of difficulty presented to your organization by the following challenges? (Those who said they were a major or moderate difficulty.)

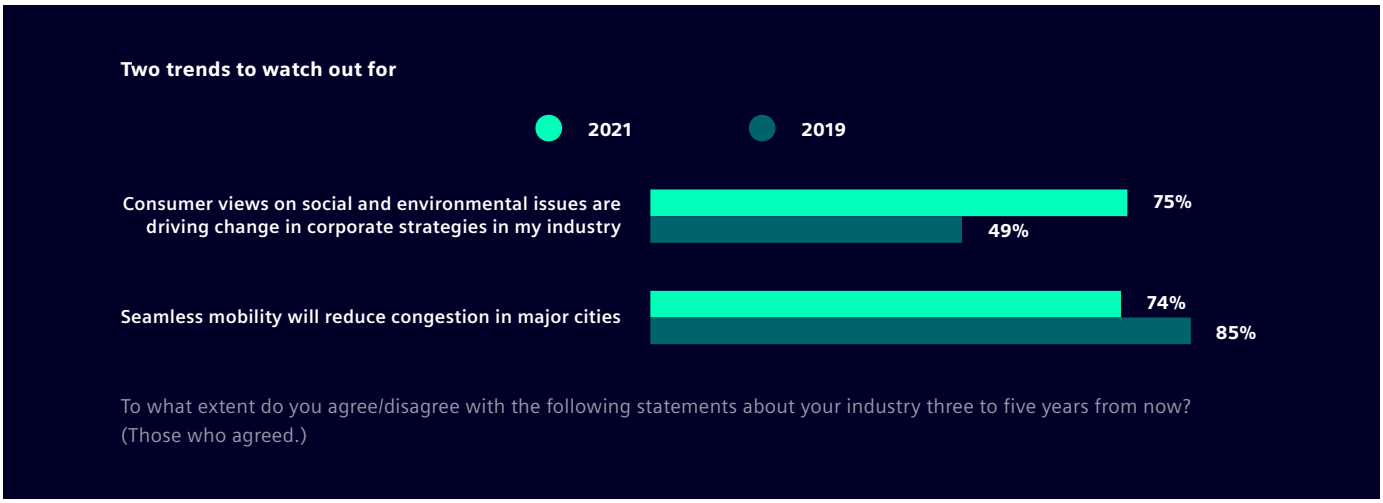
So the numbers are still low, but they should continue to increase as employees begin to use digital tools in their day-to-day work and find out what they can do.

Dr. Claus Bahlmann gives an example. “If there is a technician in the field who needs to service a tram, there are thousands of parts he is responsible for,” he explains. “In the past, he carried a printed manual. Now, he has a tablet. He can point the camera toward a part and receive all the relevant information on his display immediately, including the link to order the right spare part from a catalogue of more than 2,000 parts.”

Today’s transport employees need the skills to operate existing technology, but they also need to be able to adapt to new technologies as they become available – and to work out which will help them in their roles.

SECTION 4

Trending now: What next for the transport sector?



The pandemic has highlighted the fragility of the existing economic and social model. Combined with growing public awareness of climate change, it has pushed social and environmental concerns up the agenda.

That awareness shift matters. Three-quarters of the survey respondents say that the views of consumers are driving change in the transport industry – up from about half in 2019.

Another trend is seamless mobility. About three-quarters of respondents (74%) say that seamless mobility will reduce congestion in major cities over the next three to five years. This is, however, slightly down from 85% in 2019, which might reflect uncertainty over work commuting patterns and peak travel times in the wake of the pandemic.

Intermodal integration is already under way both physically and virtually. There are micro-mobility options linking to rail, and apps that enable passengers to choose the best way to get to their destinations, and increasingly to book and pay for trips. Mobility-as-a-Service and Software-as-a-Service will play a central role here in driving greater integration – with benefits for the environment and society, as well as for operators' finances and passengers.

Acknowledgments

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Dr. Claus Bahlmann
Head of R&D Department AI and Principal Expert for AI and Computer Vision

Prof. Dr. Jens Braband
Principal Key Expert

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