BT Means Business

5G private networks: Building the bridge between secure connectivity and competitive advantage

Foreword

How to get the most from Industry 4.0 technologies is a hot topic, when discussing future direction with organisations. The use cases for Augmented Reality (AR) and Virtual Reality (VR), machine learning and Artificial Intelligence (AI), robotics and automation, and the Internet of Things (IoT) are stacking up. Companies see competitors using these technologies as a foundation for growth and efficiency, and they want do the same.

However, they're frustrated by how best to connect these Industry 4.0 technologies with their existing networks, struggling to fit essential 5G capability into their operating environments.

Alongside Nokia, we commissioned a global research study to investigate where 5G private networks come into this picture, asking 633 IT, Operational Technology (OT) and other business executives in nine countries to share their opinions.

What emerged was strong support for 5G private networks as an enabler of both Industry 4.0 technologies and competitive advantage. However, although eyes are firmly fixed on the prize, organisations are being held back by a lack of internal expertise.

Global suppliers that are a part of 5G's evolution must offer organisations the hand of partnership, sharing their deep knowledge to co-produce tailored 5G private network solutions. Together, they create solutions that integrate seamlessly and securely with existing networks to provide the data security, coverage, speed and improvements in operational productivity that organisations want.

As a leader in 5G technologies, it's clearly time for us to promote how we can help our customers use 5G private networks to achieve their goals.
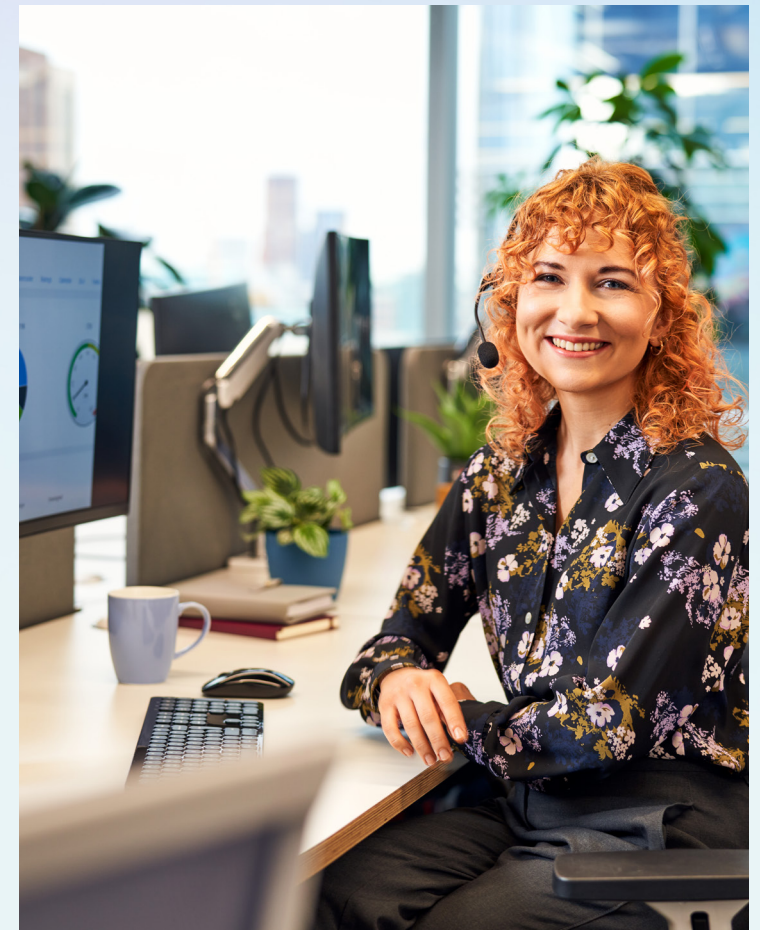
Executive summary

Global IT and OT executives are focusing on how to use Industry 4.0 technologies to gain a competitive advantage within a demanding and evolving business landscape. Executives anticipate 5G private networks will provide the bridge to the secure connectivity required for emerging technologies. These are expected to boost productivity and operational efficiency, bringing greater commercial success. Here are some of the key findings from our research:

Existing networks aren't delivering the increased bandwidth, lower latency and data security needs to support Industry 4.0 technologies

Over 90% of executives agree that Industry 4.0 technologies such as AI, IoT and autonomous robotics will have a transformational or significant impact on their organisation. However, because their existing networks are insufficient for these technologies, half of global organisations say they have or plan to implement private mobile networks. Indeed, 87% of executives agree 5G private networks will bring competitive advantage.

5G private networks are seen as the future of connectivity

They're perceived to provide a wide range of benefits, including data security (61%), improved customer experience (61%, better productivity (59%), faster time-to-market (57%), improved revenue (56%) and enhanced competitive advantage (54%) – and investment is underway. By 2024, a third of organisations intend to have between 6-10 sites using private mobile networks.

Organisations are inspired and motivated by new industry specific use cases.

They're looking for detailed industry knowledge from potential 5G private network suppliers to explore what's possible and to help them move from proof of concept to full rollout of new capabilities.

Internal expertise levels are a key barrier to implementation

A lack of skills would prevent 73% of organisations from investing in 5G private network solutions, causing them to look for supplier partnerships to fill the gaps. Half of executives want an external provider to build and manage their 5G private network.

Organisations are looking to suppliers for strategic implementation and support

When researching 5G private networks, nearly half of all executives (45%) would take advice from current suppliers. Organisations are looking for comprehensive support to integrate 5G private networks into their operations, but security is a priority - 61% consider network and cyber security capabilities to be critical when choosing a 5G private network supplier.

Market context

Organisations recognise that Industry 4.0 technologies provide a competitive advantage, but not all organisations have networks in place that are ready to support them.

Inflation, rising interest rates, energy supply constraints and post-pandemic working practices have all disrupted global organisations. IT and OT executives are responding to this new environment by advancing digital transformation, rethinking their global networks, security and cloud strategies, and building the next generation of business value.

Executives' top priority is to gain a competitive advantage by improving productivity and efficiency, but this must be done while managing risks, particularly in data security.

Which of the following are most important for your organisation? (Select all that apply)

Improving productivity and efficiency	36%
Managing risks, including cyber-security	30%
Transformational changes to operating models using technology	24%
Better data collection and analysis to improve decision making	24%
Engaging employees more effectively	24%
Improving customer experience	22%
Industrial automation/digitalization success	21%
Managing operations within budget constraints	18%

How do executives plan to improve productivity and efficiency?

Executives are looking to Industry 4.0 technologies such as artificial intelligence (AI), the Internet of Things (IoT), and autonomous robotics to transform their competitive advantage.

How much potential do the following technologies have to transform your operations in terms of efficiency, revenue or profitability?

Technology	Transformational impact	Significant impact
Artificial intelligence	45%	42%
Private 5G wireless network solutions	44%	43%
Autonomous robotics	43%	40%
Internet of things	40%	47%
Smart surveillance	39%	46%
Virtual reality	39%	41%
Edge computing	38%	44%
Fixed wireless access	37%	47%
Teleoperations	35%	47%
Augmented reality	34%	44%
Enganced video services	34%	47%
Blockchain	32%	46%

■ It will have a transformational impact on an organisation's operations   ■ It will have a significant impact

Adoption of these emerging technologies, on the other hand, implies a rapid growth in the volume of data and the number of connected devices deployed. This rise coincides with a dramatic increase in security threats to global organisations, emphasising the importance of secure connectivity.

Network connectivity requirements are multiplying

61%

of executives predict more than a threefold increase in connected devices by 2027.

The need for evolved networks is well understood

What stands out is that executives recognise the pivotal role of the network in facilitating Industry 4.0 technologies. They see that the new and emerging technologies will necessitate greater bandwidth, lower latency and increased data security to achieve the desired productivity, efficiency and competitive advantage they want.

However, executives recognise that their existing networks aren't ready to support these new technologies. Data security is their top concern, with 48% of executives agreeing it's a problem. They are also dissatisfied with the number of devices that can connect to their legacy networks and downtime is also an issue.

Existing networks are not fit for future purposes

Less than half

of executives are very satisfied with the reliability, coverage, performance jitter and cost of their existing network.

What problems do your colleagues mention regarding your IT and communication networks? (Select all that apply)

Concerns about data security	48%
Latency is problematic	36%
A limited number of devices can be connected	35%
It requires too many access points	33%
Poor range	33%
Downtime is high	29%

5G private networks are recognised as the way forward

Private 5G networks enable every device, sensor, machine and system to connect and share more data across a dedicated, ultra-reliable, ultra-low latency ecosystem. 5G private networks, in effect, deliver a dedicated data highway free of other traffic, with the organisation able to control the capacity, speed and flow of data along the highway to meet business needs.

5G private networks are widely regarded as a game-changing technology.

88%

of executives agree that 5G is necessary to enable critical technologies for competitive advantage.

Key takeaway

Current networks aren't delivering the increased bandwidth, lower latency, intelligence and data security needed to support the Industry 4.0 applications and use cases to drive greater productivity and competitive advantage.

The case for private networks is compelling

Global organisations are making investments to ensure that they have the most effective and secure connectivity to support emerging technologies and new use cases.

Organisations recognise 5G for what it is: a fundamental catalyst for technology convergence, and they are ready to use 5G private networks to support their ambitions.

Our findings show how 5G private networks are accelerating the digitalisation of industries, through advances in pervasive and predictable connectivity for smart factories, IoT, machine learning and AI. 5G is bringing an era of new connected industry experiences – ultra-fast download speeds, remote monitoring and tracking, and seamless use of AR and VR.

It's recognised as pivotal to an excellent digital workplace experience, able to improve productivity, efficiency, safety and security. Ultrafast connectivity and ultra-low latency coupled with emerging technologies like AR and VR delivers a richer and more immersive user experience. Unsurprisingly, organisations are planning imminent investment.

There's a clear appetite for private network investment

50%
of global organisations plan to implement private mobile networks within the next year.

5G private networks are seen as a driver of competitive advantage

One in three
executives agree they would invest in 5G private networks to gain a lead over their competitors if they were the main decision maker

To what extent do you think that investing in private networks would generate the following outcomes for your organisation? (Of those who already have or are planning to implement private networks in the next year)

Outcome	
Data security	61%
Improved customer experience	61%
Better productivity	59%
Digital transformation	58%
Faster time-to-market	57%
Improved revenue	56%
Competitive advantage	54%
More engaged and better trained employees	51%
Compliance with standards, regulations and legal requirements	50%
Cost savings	45%

Global organisations recognise the need for tailored network solutions

Understanding that their operational demands on their network are unique and specific, executives accept that private networks are not a case of a one-size-fits-all, off-the-shelf solution.

They recognise that their network may include elements of wi-fi, 3G, LTE, 4G or 5G, depending on their applications, legacy equipment, geographic sites, the emerging technologies they plan to deploy and their need for secure connectivity. However, they see 5G private networks as the gold standard for future ambitions.

5G private networks are the future

76%

believe 5G private networks will in time be a standard upgrade to existing private mobile network connectivity solutions.
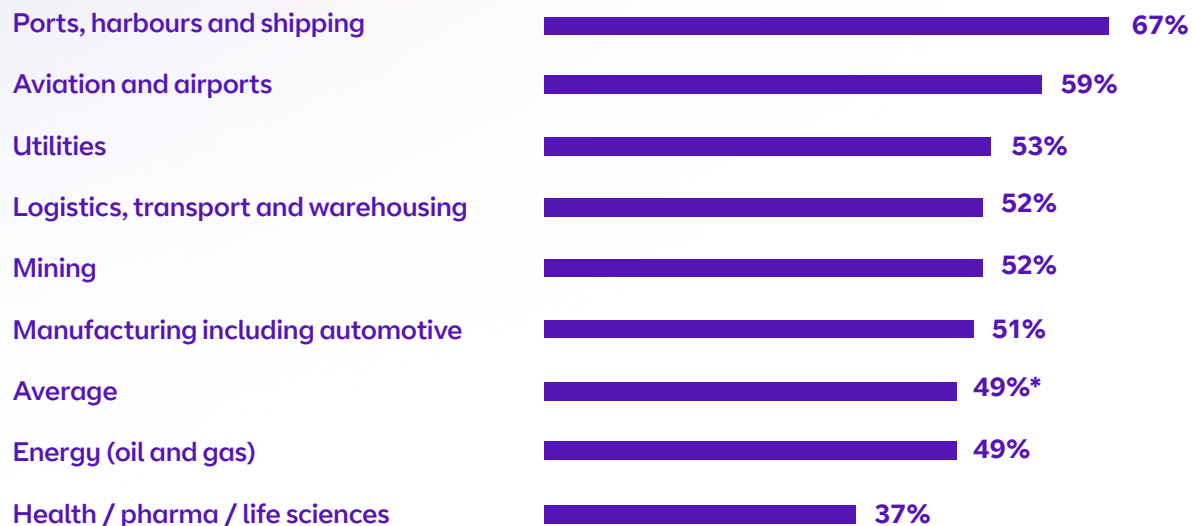
The uptake of private mobile networks varies by sector

The level of private mobile network take-up varies depending on the technology connectivity requirement involved. In ports, for example, automation is spreading from warehouses, out into rail and container yard areas, increasing connectivity demands. Whereas in the health, pharma and life sciences sector, the lower connectivity requirements of organisations that work in strictly controlled silos may be holding back take-up.

Is your organisation planning to use a private network solution in your operations? (Of those who already have or are planning to implement private networks in the next year).

Sector	
Ports, harbours and shipping	67%
Aviation and airports	59%
Utilities	53%
Logistics, transport and warehousing	52%
Mining	52%
Manufacturing including automotive	51%
Average	49%*
Energy (oil and gas)	49%
Health / pharma / life sciences	37%

* Average includes agriculture, defence and military, education, and renewable energy not shown here.

Large-scale take-up of private mobile networks is increasing

33%

of organisations plan to have 6-10 sites with private mobile networks by 2024.

Key takeaway

5G private networks are seen as the future of connectivity, delivering a broad range of benefits, including data security, improved customer experience, better productivity, faster time-to-market, improved revenue and enhanced competitive advantage – and investment is happening now.

Exploring use cases for 5G private networks

Organisations are moving beyond proof of concept to extract significant value from a range of use cases, with supply chain management the core driver.
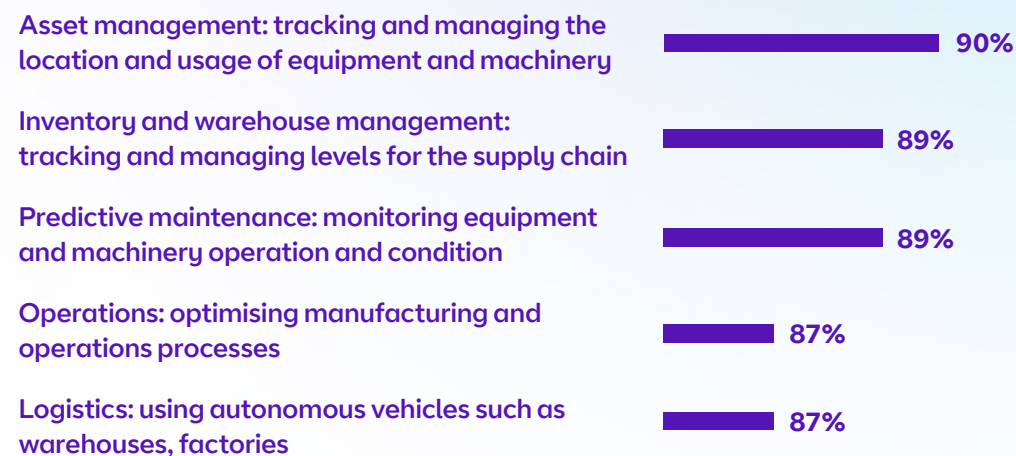
A wide variety of reasons for investment in 5G private network are already in operation – all supporting better productivity and improved capabilities, broadly falling into these use cases:

- replacing wi-fi at larger sites for stronger signal
- supporting low-latency applications
- enabling sensors with high data rates
- enhancing tracking of moveable items
- supporting advanced camera systems
- improving connectivity in areas with a high degree of metal
- increasing agility above that of LAN solutions
- monitoring and improving business critical processes
- enabling rapid site setup for smaller offices
- improving security for sensitive applications

Our research identified that supply chain management use cases are seen as having the most potential to add value to the organisation.

Executives expected Industry 4.0 technologies underpinned by a 5G private network to unlock improvements in asset management, inventory and warehouse management, and fleet management.

Are any of the following of interest now or in the future? (Agreement it would really add value / be useful)

Asset management: tracking and managing the location and usage of equipment and machinery — 90%

Inventory and warehouse management: tracking and managing levels for the supply chain — 89%

Predictive maintenance: monitoring equipment and machinery operation and condition — 89%

Operations: optimising manufacturing and operations processes — 87%

Logistics: using autonomous vehicles such as warehouses, factories — 87%

New use cases will propel investment in 5G private networks

Feedback from executives highlighted how important detailed industry knowledge and proof of concepts are to helping organisations capitalise on the opportunities created by 5G private networks.
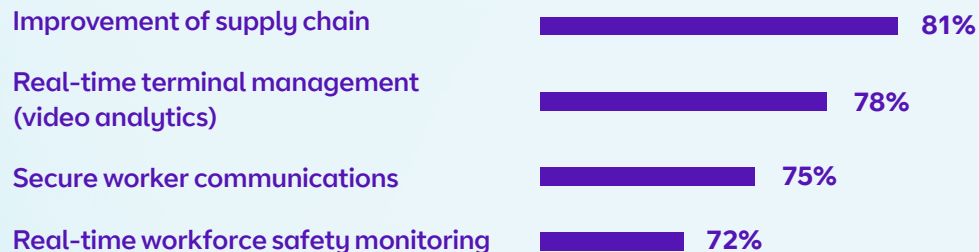
Executives need more than the broad benefits of 5G to make an investment decision. They're looking for details about use cases that can bring specific value to their industry and organisation.

Our research measured the benefits of 5G private networks in core sectors, considering up to 10 use cases for each, revealing what's likely to motivate organisations to invest.

Ports, harbours and shipping
The ports, harbours and shipping sector expected benefits in real-time terminal management as well as in worker communications and safety.
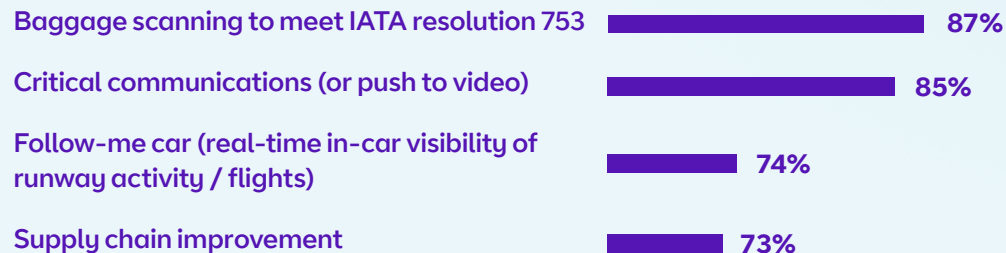
For your organisation, would the following technologies benefit from a 5G private network solution (definitely / maybe).

Use case	%
Improvement of supply chain	81%
Real-time terminal management (video analytics)	78%
Secure worker communications	75%
Real-time workforce safety monitoring	72%

Airports and aviation
Executives in aviation are more excited by the emerging technologies available than the average respondent. They believe 5G private networks will have a transformational impact (52% compared to the average across all sectors of 44%).
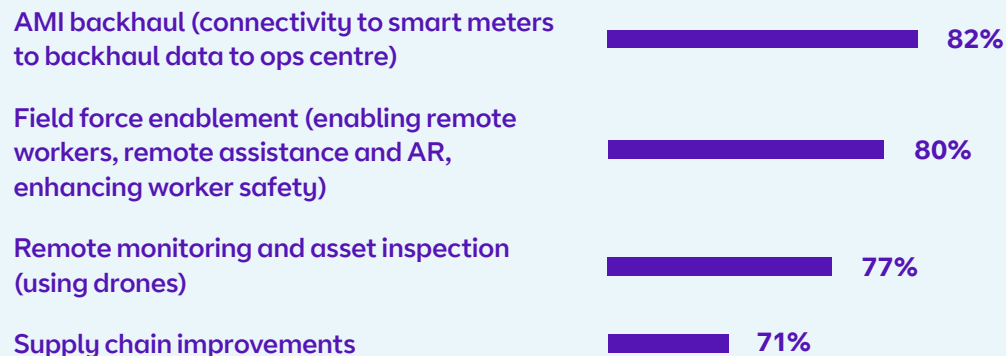
For your organisation, would the following technologies benefit from a 5G private network solution (definitely / maybe).

Use case	%
Baggage scanning to meet IATA resolution 753	87%
Critical communications (or push to video)	85%
Follow-me car (real-time in-car visibility of runway activity / flights)	74%
Supply chain improvement	73%

Utilities
The utilities sector is marginally more likely than average to invest in 5G private networks than the average sector.
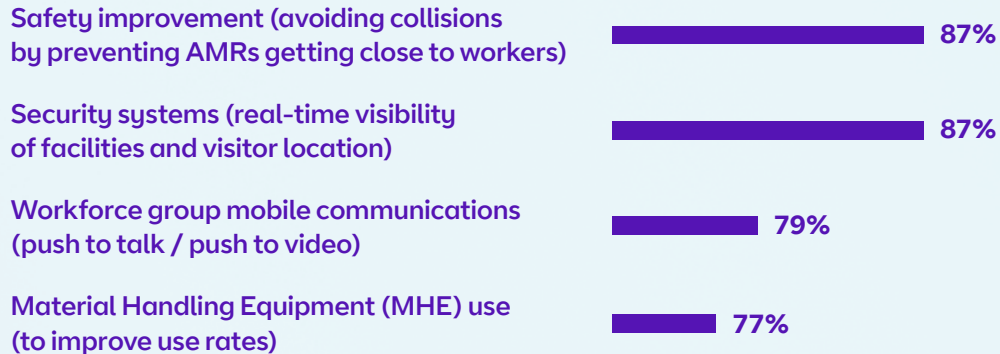
For your organisation, would the following technologies benefit from a 5G private network solution (definitely / maybe).

Use case	%
AMI backhaul (connectivity to smart meters to backhaul data to ops centre)	82%
Field force enablement (enabling remote workers, remote assistance and AR, enhancing worker safety)	80%
Remote monitoring and asset inspection (using drones)	77%
Supply chain improvements	71%

Logistics

Logistics' executives are more excited by emerging technology than executives in most sectors, showing a high interest in autonomous robots and the benefits associated with private networks.
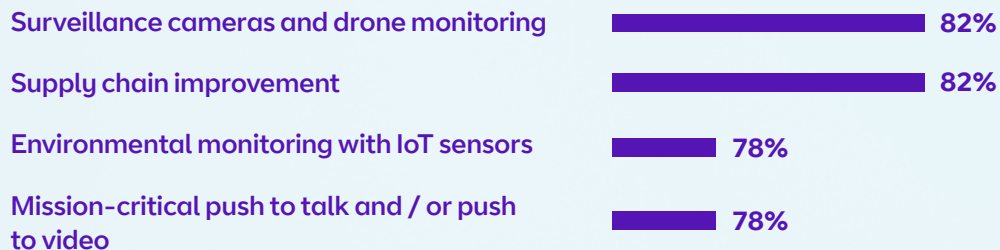
For your organisation, would the following technologies benefit from a 5G private network solution (definitely / maybe).

Safety improvement (avoiding collisions by preventing AMRs getting close to workers) — **87%**

Security systems (real-time visibility of facilities and visitor location) — **87%**

Workforce group mobile communications (push to talk / push to video) — **79%**

Material Handling Equipment (MHE) use (to improve use rates) — **77%**

Mining

Executives in the mining sector are more excited about the potential of new technology to transform their business than the average executive.

For your organisation, would the following technologies benefit from a 5G private network solution (definitely / maybe).

Surveillance cameras and drone monitoring — **82%**

Supply chain improvement — **82%**

Environmental monitoring with IoT sensors — **78%**

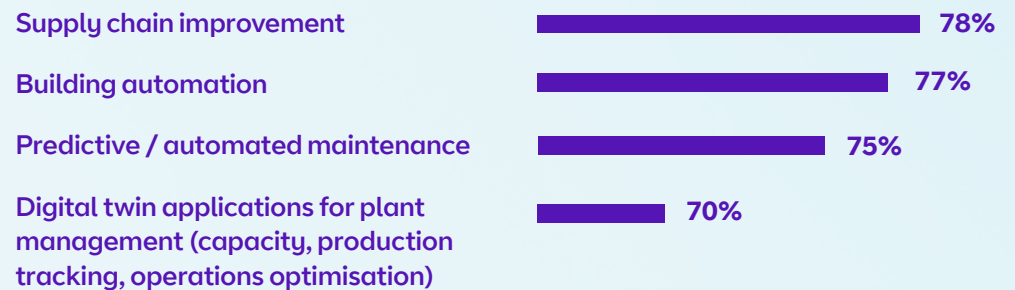Mission-critical push to talk and / or push to video — **78%**

Manufacturing including automotive

Executives in manufacturing are more likely to see potential in the new technological developments, particularly in AI and digital transformation. They are slightly more likely than average to want to deploy a 5G private network and their main concerns are data security and speed.
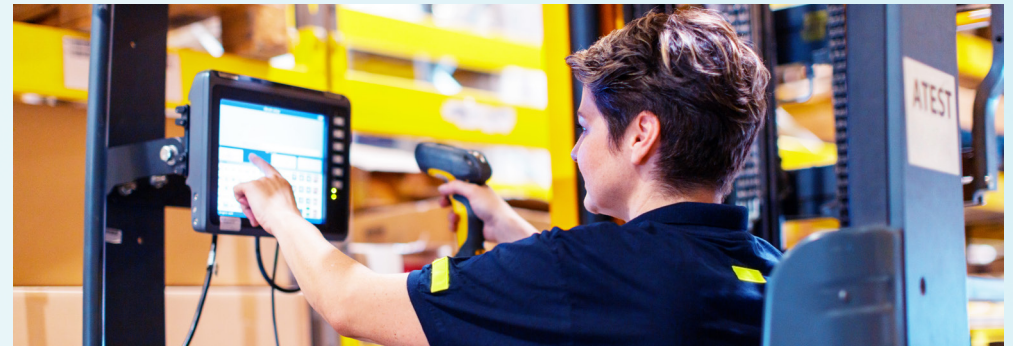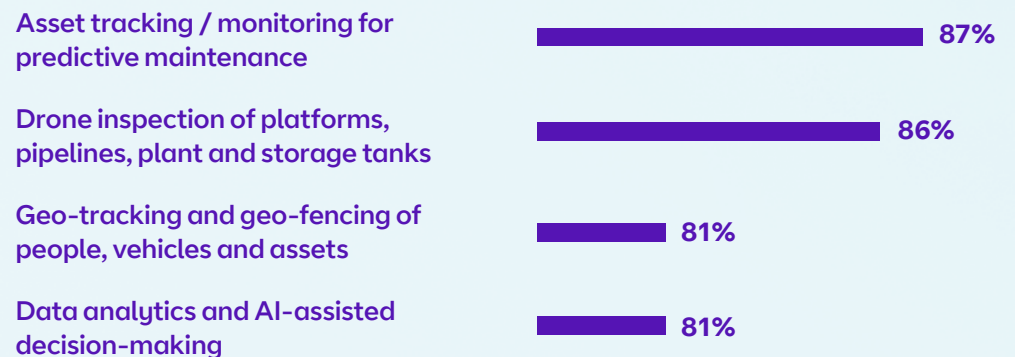

For your organisation, would the following technologies benefit from a 5G private network solution (definitely / maybe).

Supply chain improvement — **78%**

Building automation — **77%**

Predictive / automated maintenance — **75%**

Digital twin applications for plant management (capacity, production tracking, operations optimisation) — **70%**

Energy (oil and gas)

Executives in the energy sector have high expectations of the transformational benefits of AI and other emerging technologies.

For your organisation, would the following technologies benefit from a 5G private network solution (definitely / maybe).

Asset tracking / monitoring for predictive maintenance — **87%**

Drone inspection of platforms, pipelines, plant and storage tanks — **86%**

Geo-tracking and geo-fencing of people, vehicles and assets — **81%**

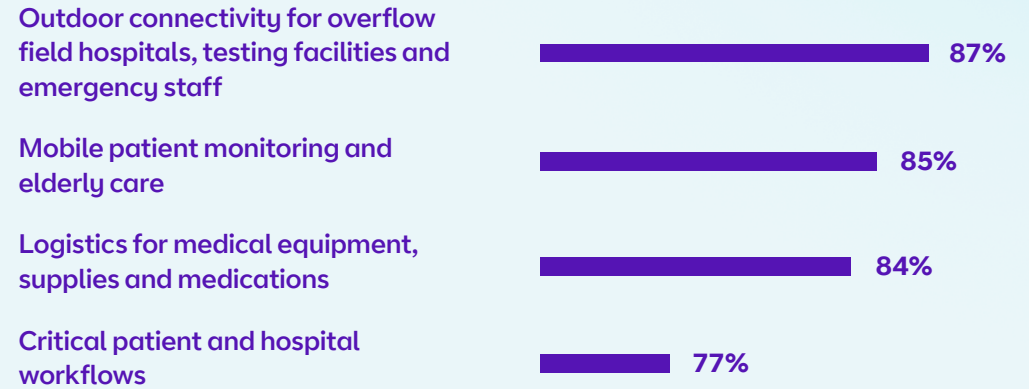Data analytics and AI-assisted decision-making — **81%**

Health

The health sector is less likely to expect transformational benefits from emerging technology although executives still feel there would be benefits from 5G private networks in terms of data security, productivity and revenues.

For your organisation, would the following technologies benefit from a 5G private network solution (definitely / maybe).

Outdoor connectivity for overflow field hospitals, testing facilities and emergency staff — **87%**

Mobile patient monitoring and elderly care — **85%**

Logistics for medical equipment, supplies and medications — **84%**

Critical patient and hospital workflows — **77%**

Key takeaway

Organisations are inspired and motivated by use cases specific to their industry and are lookingfor detailed industry knowledge from potential 5G private network suppliers to help them move through proof of concept to full rollout.

5G private network implementation

The challenge of sourcing in-house skills to build secure 5G private networks is driving organisations to look to suppliers for expertise and support.

A lack of in-house expertise is a key challenge for organisations wanting to implement a 5G private network.

Organisations recognise that a 5G private network is not a plug-and-play solution. They realise that a successful deployment means connecting the 5G private network into the broader business, reaching across IT and OT environments, edge computing, cloud, compute capability and security defences. Each system needs to be individually designed to rethink network, security and cloud strategies and, although the skills required for these designs are emerging, currently the expertise levels in-house are often lower than required.

Organisations don't have in-house 5G private network expertise

73%

of executives say a lack of skills would stop them investing in 5G private network solutions.

Our research revealed executives have significant knowledge gaps concerning 5G private networks. Only 44% of executives knew that wi-fi network technology latency reliability falls as the number of devices connected increases. Only 39% knew that that LTE / 4G / 5G technology offers automatic device registration, and only 36% correctly identified that a 5G signal can penetrate two building walls more than a standard wi-fi signal.

There are other, more functional, factors at play that challenge the implementation of 5G private networks such as a lack of supporting infrastructure (31%), too few devices being 5G compatible (30%) and problems of integration with legacy systems (28%). A need for expertise runs through these issues, prompting organisations to look to suppliers for help. Half of all organisations (51%) planning to build a 5G private network in the next year are unable to meet their timescales alone, saying there's too much to do in the time available.
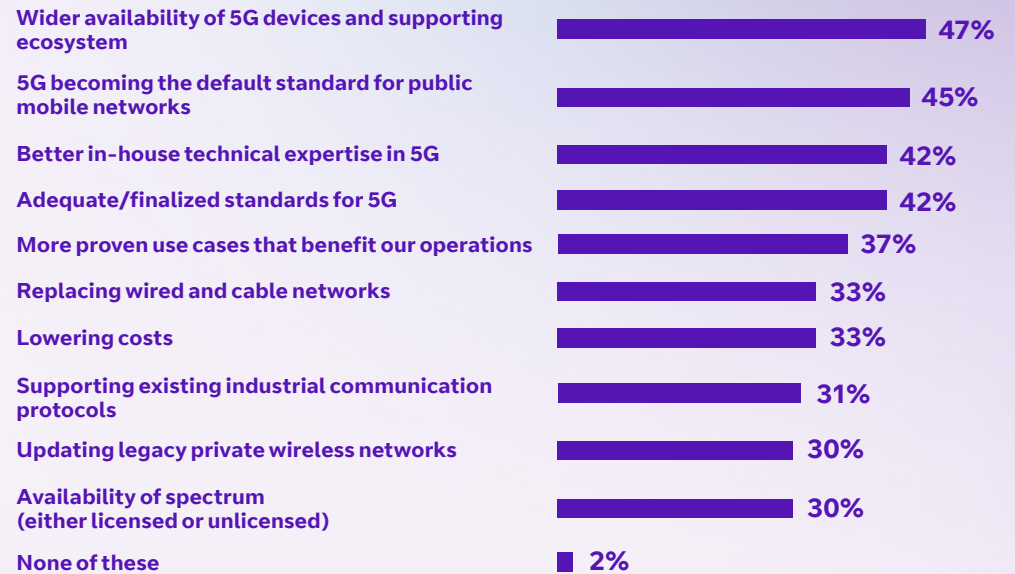
Organisations want suppliers to help with 5G private networks

One in two

executives are looking to an external provider to build and manage their 5G private network.

Asking executives what would drive their implementation of 5G private networks points to factors outside the organisation, such as the wider availability of 5G devices and a supporting ecosystem (47%), adequate and finalised standards for 5G (42%), availability of spectrum (30%) and more proven use cases (37%).

For your organisation, would the following technologies benefit from a 5G private network solution (definitely / maybe).

Technology	%
Wider availability of 5G devices and supporting ecosystem	47%
5G becoming the default standard for public mobile networks	45%
Better in-house technical expertise in 5G	42%
Adequate/finalized standards for 5G	42%
More proven use cases that benefit our operations	37%
Replacing wired and cable networks	33%
Lowering costs	33%
Supporting existing industrial communication protocols	31%
Updating legacy private wireless networks	30%
Availability of spectrum (either licensed or unlicensed)	30%
None of these	2%

Considering the significant challenges around implementation, it's no surprise that the extent of deployment leans towards the early planning stage. Of those interested in private mobile networks, 44% say their organisations are in lab trials or are performance testing networks, while 29% are deploying proof of concepts or pilots. The remaining 24% are conducting research on private mobile networks, and a few have not even started.

Key takeaway

To make 5G private networks a reality in their organisation, executives need to address the skills and knowledge gaps they have in implementation. Tapping into supplier ecosystems is a fast, effective way to push deployment towards operation.
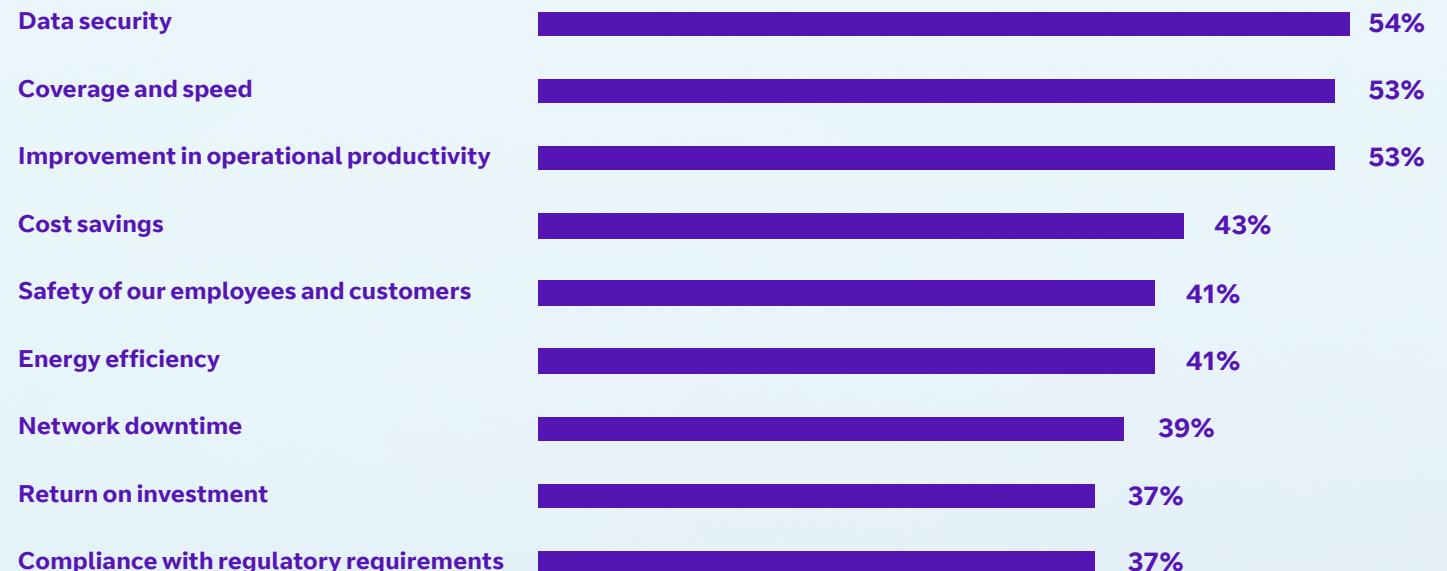
The essential capabilities of 5G private network providers

Network coverage, speed and security are considered fundamental to the ultimate success of a 5G private network implementation.

Global organisations want to use 5G private networks as a bridge to Industry 4.0 technologies and the competitive advantage that can bring. Lacking the knowledge and skills to deliver this in-house, they're looking to partner with providers that have end-to-end capabilities. They want a supplier that can deliver a complete solution – including the cyber security essential to protect data security.

Our research reveals that the ultimate success of a 5G private network implementation depends on data security (54%), network coverage and speed (53%) and improvement in operational productivity (53%).

How would your organisation assess the success of any private network solution? (Select all that apply)

Data security	54%
Coverage and speed	53%
Improvement in operational productivity	53%
Cost savings	43%
Safety of our employees and customers	41%
Energy efficiency	41%
Network downtime	39%
Return on investment	37%
Compliance with regulatory requirements	37%

Organisations are aware of the importancwe of a holistic security strategy across the entire network to protect operations, data and devices from internal and external attack. They understand that guaranteeing these security protocols and the other success factors are delivered in a 5G private network requires careful planning and careful vendor selection.

Organisations prioritise network and cyber security services

61%

consider network and cyber security capabilities essential in choosing a 5G private network supplier.

Organisations have a clear checklist of capabilities they want in a supplier, including strength in network and cyber security services (61%), support from core technology equipment providers (54%) and an eco-system of compatible devices (51%). Approximately half (49%) of executives want an end-to-end managed service, with 30% wanting consultancy.

Existing partners are a key source of guidance

45%

would take advice from current suppliers when researching 5G private networks.

In a confusing field where organisations are aware they have lower levels of expertise, executives are open to advice. Many executives would start their research on 5G private networks by taking advice from current suppliers (45%), and others would use their personal network (38%) or would attend conferences and industry events physically or virtually (36%).

Key takeaway

Organisations need to develop a framework for assessing the different methods of building or extending 5G private networks, as well as considering what they want from a supplier. The most popular metrics are network coverage, speed and security, as well as how to deliver improvements to operational productivity.

Key recommendations from BT and Nokia

Recognise the unique role of 5G and private mobile networks

The successful adoption of private networks, including 5G, needs to be rooted in a clear understanding of the scope of its potential to offer ultra-low predictable latency and ultra-reliable, predictable and secure connectivity, and how it can make Industry 4.0 technologies successful.

Set your 5G plans in the context of your overall strategy

It's critical that you position your 5G private network in the context of your broader, end-to-end strategy for driving competitive advantage, to maximise outcomes and deliver the right business benefits in your Industry 4.0 transformation journey. Make sure you set your 5G private network plans in the context of your wider connectivity needs so you can find a solution that works holistically.

Source your expertise wisely

It's critical that you position your 5G private network in the context of your broader, end-to-end strategy for driving competitive advantage, to maximise outcomes and deliver the right business benefits in your Industry 4.0 transformation journey. Make sure you set your 5G private network plans in the context of your wider connectivity needs so you can find a solution that works holistically.

5G private networks with BT

We've created our 5G private networks solution to include everything an organisation needs to securely unlock the benefits of Industry 4.0.

A totally 'private' network that's managed alongside your wider connectivity estate.

A dedicated 5G core using private 5G spectrum.

An ultra-reliable, ultra-low latency network to use as you see fit.

Our 5G expertise to ensure the deployment meets your requirements.

Seamless integration with your wider business infrastructure.

Dedicated 5G hardware and infrastructure through our core 5G partners.

A service and security wrap.

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Why choose a 5G private network with BT

We're at the forefront of 5G technology

Innovating with our partners and customers is the heart of our 5G strategy. Adastral Park, our leading innovation centre, is home to one of the most advanced 5G testing centres in Europe. We use the facilities to demonstrate 5G innovation to our customers, and inform and develop our strategy based on real world experience.

We deliver integrated, holistic 5G private networks

5G isn't just about better speed and mobile coverage. It completely changes how we think about enterprise data networks, cloud, collaboration, edge and security solutions. Working with us means you have a partner with the end-to-end capabilities to bring together the right 5G private network solution cohesively, based on business needs, not just technology type.

We've built a 5G ecosystem that delivers everything you need for success

At the heart of our 5G private networks strategy is a broad ecosystem of partnerships that foster

innovation and enable us to develop our extensive portfolio, across networking, cloud, compute and security. Through research and development with our partners, we gain the right insights to shape our solutions and be a global provider across the technology stacks, able to deploy private networks across multiple global geographies (depending on spectrum availability).

We tailor our 5G services to your organisation's needs

Using our innovative solutions and partner ecosystem as a foundation, we co-create with you to make 5G private networks an effective investment for your organisation. We focus on making sure the deployment is the right fit, end-to-end.

We prioritise security

We understand that 5G private networks raise the bar for security because they offer another dimension of complexity to cellular security architecture. As a result, we build in the ability to achieve the intricate mix of security and management required to mitigate security risks and deliver assurance and certainty, across every application, component, device and industry environment that 5G will support.

Last word

There's a clear case for using 5G private networks as the bridge to extracting maximum competitive advantage from Industry 4.0 technologies – and a distinct role for suppliers in supporting organisations to reach their goals.

If you'd like to explore how 5G private networks can benefit your organisation, visit our website for more information or get in touch.

Research methodology

In July 2022, independent research company Davies Hickman Partners surveyed 633 IT, OT and other business executives in nine countries (Australia, Brazil, France, Germany, Japan, Korea, Mexico, the UK and the USA) for BT and Nokia.

The research covered 10 sectors identified as being interested in private networks: agriculture; airports and aviation; defence and military; education; energy and renewables; healthcare; logistics, distribution and transportation; manufacturing and production; mining; ports, harbours and shipping; utilities and warehousing.

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