

Accelerating enterprise
innovation and
transformation
with 5G and Wi-Fi 6

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Introduction

In our hyperconnected era, the number of networked devices may reach 29.3 billion by 2023—more than three devices for every human being on the planet.¹ Next-generation wireless technologies such as 5G and Wi-Fi 6 are poised to become a crucial part of the networks that link machines and people. By offering significant performance improvements—such as faster speeds, increased data capacity, lower latency, greater device density, and precise location sensing—these new wireless technologies are already enabling novel solutions, including autonomous vehicles, precision automation and robotics, telemedicine and telesurgery, immersive retail and entertainment experiences, and augmented-reality workplace collaborations.

Innovative solutions such as these are why leaders across industries see advanced wireless networks as increasingly essential to their strategies. And rising urgency is accelerating a shift in focus to 5G and Wi-Fi 6, far faster than what executives forecast less than a year ago.

In early 2020, Deloitte surveyed US-based networking executives to understand how US enterprises are approaching advanced wireless technologies and how they expect to benefit from the new capabilities.² Shortly after that survey wrapped, the COVID-19 pandemic plunged the world into a time of extraordinary disruption, spurring a global recession with substantial workforce and IT implications.³ To obtain a global perspective on advanced wireless adoption and assess attitudes during the crisis, we extended our survey

in Q4 2020 to 437 networking executives from nine additional countries, representing organizations with plans to adopt 5G and/or Wi-Fi 6 (see sidebar, “Methodology”).

We uncovered key insights about how and why organizations around the world plan to adopt advanced wireless:

The pandemic has accelerated the shift in focus to advanced wireless. The COVID-19 pandemic has catalyzed a shift in priorities: Remarkably, half the global networking executives we surveyed report that the crisis has spurred their organization to accelerate investment in wireless networking. They’re focusing on newer technologies such as 5G and Wi-Fi 6, which they view as a way to bolster their ability to address current and future disruptions, as well as an opportunity to create new solutions. Our earlier survey indicated that executives planned to take up to three years to shift their attention to 5G and Wi-Fi 6 from older wireless technologies, but priorities have changed much faster than anticipated.

Advanced wireless is foundational to innovation and transformation. As the latest in a decades-long evolution of wireless technologies, 5G and Wi-Fi 6 promise performance and operational improvements over previous generations. More significantly, they enable innovative usage scenarios that aren’t merely incremental advances.⁴ Indeed, networking executives expect next-gen wireless to be integral to their business success and transformational for both their enterprises and industries, representing an opportunity to change

how they operate, innovate, and sell. Leaders view advanced wireless technologies as foundational to their efforts to implement innovative technologies at the heart of their digital transformation efforts, including big data analytics, artificial intelligence (AI), Internet of Things (IoT), cloud, and edge computing. More than ever, these technologies are converging in enterprise innovation initiatives, with advanced wireless at the core.

The ecosystem is complex and evolving. Adopters engage with myriad

telecom and technology vendors (for example, application providers, cloud companies, wireless carriers, network equipment providers, component vendors, and consulting firms/integrators) and often with multiple vendors of each type. Two-thirds of adopters prefer to purchase best-of-breed components, and many seek help with integration. With seven in 10 adopters indicating they're open to exploring new relationships, it will become increasingly important for vendors to carve out and solidify their position.

Methodology

To understand how enterprises around the world are adopting advanced wireless technologies, including motivations, challenges, and preferences, Deloitte in Q4 2020 (during the COVID-19 pandemic) surveyed 437 IT and line-of-business (LoB) executives in nine countries, who are responsible for connectivity at organizations in the process of adopting 5G and/or Wi-Fi 6 or planning to adopt either technology within the next three years. The countries represented: Australia (51 respondents), Brazil (51 respondents), China (50 respondents), Germany (50 respondents), India (51 respondents), Japan (51 respondents), Netherlands (50 respondents), Portugal (29 respondents), and United Kingdom (54 respondents). Eight in 10 executives decide networking investments; 7 in 10 manage implementations.

Seventy-one percent of respondents are IT executives; the rest are LoB executives. Fifty-nine percent are C-level executives, including CIOs and CTOs (48%) and CEOs, presidents, and owners (10%); 22% are senior VPs/VPs/business unit heads; and the remaining 19% are senior directors/directors. In terms of company size, 15% have an annual revenue of US\$50 million to US\$500 million; 20% have revenues of US\$500 million to US\$1 billion; 34% have revenues of US\$1 billion to US\$5 billion; and 31% have revenues of US\$5 billion or more. Six industries are represented in the survey: consumer, retail, and automotive (25%); technology, media and telecom (19%); energy, resources and industrials (19%); financial services (22%); life sciences and health care (8%); and education (6%).

Note: Our prior survey of 415 US networking executives⁵ was conducted in Q1 2020, before the effects of the COVID-19 pandemic were felt in the United States. Both surveys have similar respondent profiles.



Networking executives have rapidly shifted their focus to advanced wireless

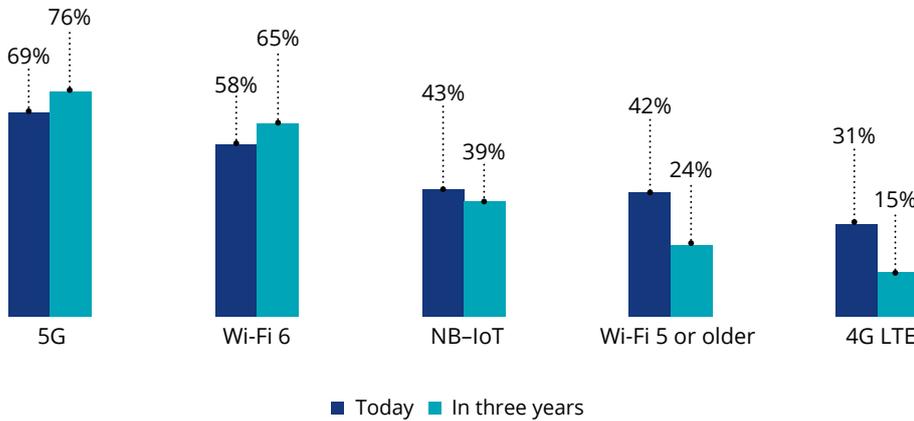
Deloitte's early 2020 study found that US-based networking executives still viewed 4G/Long Term Evolution (LTE) and current (or previous) versions of Wi-Fi as the most critical wireless technologies for their businesses. Most viewed 5G and Wi-Fi 6 as up-and-coming over the next few years.⁶

Attitudes shifted quickly: Nine months later, global networking decision-makers regard 5G and Wi-Fi 6 as the most

critical wireless technologies for their business initiatives (figure 1). And in the next three years, as physical 5G infrastructure is built out and 5G devices become more available, leaders expect the new technologies to become even more significant.⁷ It's worth noting that executives now see 5G and Wi-Fi 6 as higher priorities than 4G LTE and Wi-Fi 5 (and older versions) in nearly all the countries we studied.⁸

Figure 1 : Networking executives already regard 5G and Wi-Fi 6 as the most critical wireless technologies for their business initiatives—and their importance will continue to grow

Percent ranking each a top-three critical wireless networking technology for their organization’s business initiatives



Note: N=437 global networking executives.

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

About two in five executives ranked Narrowband IoT (NB-IoT) in their top-three most important wireless technologies, although enthusiasm varies considerably by country—in China and India, three in five networking executives ranked it within their top three, reflecting higher uptake in those countries.⁹ As part of the upcoming 3GPP Release-17 5G specification, NB-IoT can play a role in organizations’ 5G IoT evolution strategy.¹⁰

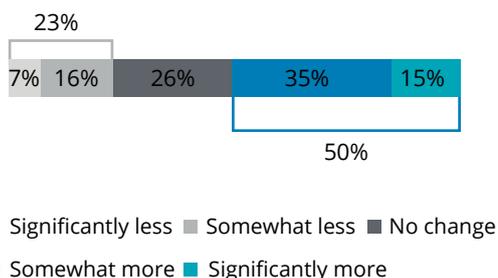
The COVID-19 pandemic is accelerating wireless investment

Why has leaders’ focus shifted toward advanced networking technologies much faster than our 2020 study suggested? For several reasons that the world saw play out in real time over the nine months that separated our two surveys. The COVID-19 pandemic caused surging demand for better connectivity to support remote working, online learning, and automation. The crisis vividly underscored organizations’ need for ubiquitous, secure, high-quality connectivity to reduce onsite personnel, maintain business operations, and support virtual employee interaction and customer engagement. And it highlighted the value of virtualization and automation capabilities that enable more flexible, remote management of enterprise operations.

Others have noted the extent to which the pandemic has catalyzed change in the technology, media, and telecommunications industry, compressing what was expected to be years of gradual change into several intense months.¹¹ Our study findings corroborate this: Half the networking executives we surveyed expect to boost their wireless networking investment due to the pandemic (15% report they’ll invest significantly more), while less than a quarter report pullbacks (figure 2).

Figure 2 : Half the networking executives expect to boost their investment due to the pandemic

Compared to our planned wireless networking investments before the pandemic, the COVID-19 crisis is causing our organization to invest . . .



Note: N=437 global networking executives.

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

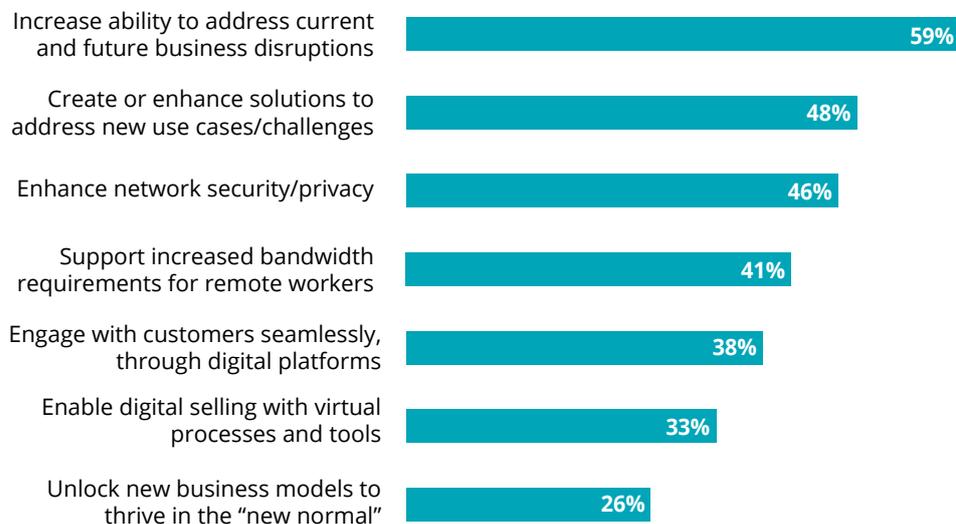
The primary stated reason for escalating wireless investment is resilience—augmenting an organization’s ability to address current and future business disruptions (figure 3). After all, the pandemic will surely not be the last crisis companies face in the next several years. Consider the example of a major telecommunications company that deployed a private 5G network on a factory production floor to address pandemic-related challenges: Leaders were able to rapidly deploy safety use cases, such as scanning employees for face masks and monitoring smart badges to ensure that workers weren’t in close proximity for too long.¹² And instead of flying in specialists to repair robots, managers outfitted local employees with “mixed reality” headsets so that remote technicians could guide them. A number of companies have been rolling out new wireless applications and services designed to keep personnel safe in the workplace, including solutions that use Wi-Fi to sense when devices enter building areas and real-time analytics to flag occupancy issues.¹³

The pandemic may well be accelerating demand for novel products and services that rely on a more robust and powerful network infrastructure. Indeed, the number-two reason cited for increasing wireless investment is to create or enhance solutions that address new use cases. As a case in point, enterprises in China have utilized 5G in a variety of crisis-related solutions aimed at limiting personal interactions, including hospital robots that performed disinfection and medicine deliveries and driverless vehicles that delivered food and medical supplies to quarantined individuals.¹⁴ Companies have also leveraged the high bandwidth and low latency of 5G networks for telehealth, including remote medical consultation and diagnosis of COVID-19 and remote, robot-controlled ultrasounds.

The number-three motivator for increased spending relates to a desire for better network security and data privacy. As the pandemic pushed more workers and their devices offsite, leaders may have realized they needed to invest more in protecting devices and data.

Figure 3: Networking executives who are increasing wireless spending due to the pandemic cite wireless’s ability to help them address disruption, create solutions to address new use cases, and enhance network security

Percent ranking each a top-three reason the pandemic is causing them to invest more



Note: N=220 global networking executives who indicated their organization is increasing wireless investment due to the pandemic.

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

Strategic importance and adoption are on the rise

Networking executives recognize the importance of advanced wireless for their business success today and believe it will be essential to thriving in the postpandemic era. Four in five currently see advanced wireless technologies as very or critically important for their business—and the same number expect to hold that view in three years. Adoption is set to take on more urgency: One-fifth of networking executives view the technologies as critically important for their enterprise today; one-third say they will be critically important in three years.

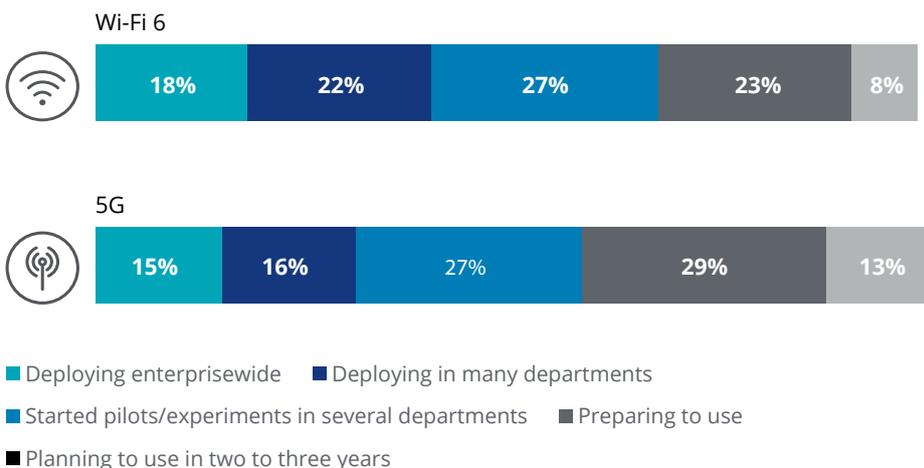
Backing up their strategic view, these executives are planning significant wireless networking investment over the next three years. Considering all the wireless technologies (such as 4G, 5G, various types of Wi-Fi) they expect to use over this period and the cost of devices

(such as 5G smartphones), hardware/equipment, software, installation, and operations services (but not including costs for spectrum), our respondent organizations estimate their three-year spending at US\$149.7 million on average. In our earlier study, US networking executives reported they would spend an average of US\$115.7 million on their wireless investments over a three-year time frame. The higher spending estimate outside the US likely reflects the passage of nine months between surveys, as well as the catalyzing effects of the pandemic.

The surveyed organizations are going all-in when it comes to adopting advanced wireless technologies. By design, our survey included respondents from organizations that are in the process of adopting 5G and/or Wi-Fi 6 or plan to adopt either technology within the next three years. In practice, we found that adoption is well past the planning stage:

Figure 4 : 67% of respondents' organizations are either running pilots or deploying Wi-Fi 6 solutions; 58% are doing the same with 5G

Level of adoption of each technology



Note: N=437 global networking executives. Numbers may not total 100%, due to a small number who reported “no plans to use.”

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

two-thirds of respondents' organizations are either running pilots or deploying Wi-Fi 6 solutions, while 58% are doing the same with 5G (figure 4). Roughly another quarter are in the process of actively "preparing to use" each technology—for example, acquiring devices/infrastructure or identifying potential providers and partners.

Enterprises pursue a variety of usage scenarios

To leverage the capabilities of advanced wireless, adopters tend to target a blend of indoor and outdoor usage scenarios, and a blend of fixed and mobile networks (figure 5). Organizations use advanced wireless networks to connect employees, machines, and customers. When it comes to employee connectivity—both inside and outside the office—the top two use cases involve enhancing workplace communication and collaboration (figure 6). For example, organizations can use Wi-Fi 6 to increase the speed of voice and video, untethering workers from desktop phones and wired connections.¹⁵ And with so many professionals working remotely during the pandemic, 5G may enable new ways to improve collaboration and productivity, such as high-resolution, multiperson videoconferencing, interactive

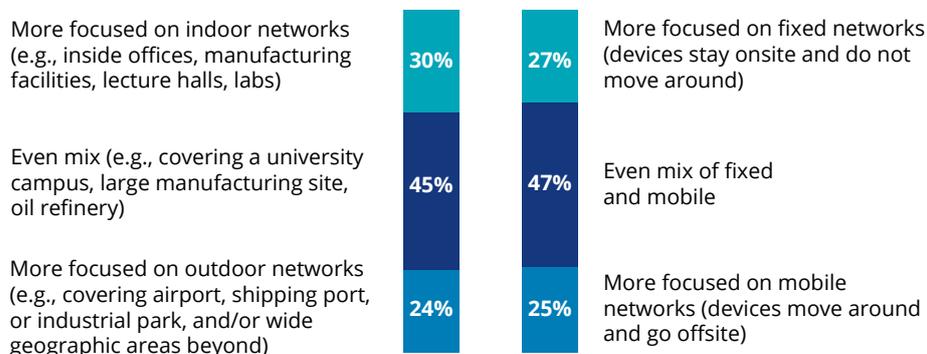
digital whiteboards, and immersive collaboration experiences enriched by virtual reality (VR)/augmented reality (AR) technologies.¹⁶

The third-most-cited use case for employee connectivity relates to IT administration and remote troubleshooting. For example, 5G is poised to play a role in remote management of workers' mobile devices, enabling IT professionals to rapidly push data-intensive updates to a large number of devices.¹⁷ Companies are already using 5G technology to connect remote 3D designers and video editors to their high-end workstations back at the office, providing 4K-quality streaming and allowing them to perform CPU-intensive tasks from afar.¹⁸ A UK water company has been using a private 5G network to enable a "remote expertise" use case: As newly hired technicians encounter issues with equipment in the field, AR headsets relay the situation to experienced colleagues who guide the troubleshooting remotely.¹⁹

Advanced networking also enables many new applications for machine connectivity—inside facilities, on campuses, and in broader areas such as shipping ports and international

Figure 5: Advanced wireless adopters tend to say they're focusing on usage scenarios involving both indoor/outdoor networks and fixed/mobile devices

Focus of company's advanced wireless networking scenarios



Note: N=437 global networking executives. Numbers may not total 100%, due to a small number who reported "Don't know."

Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.

airports. For example, video surveillance in factories can allow human operators (or AI systems) to remotely supervise equipment in real time, and 5G can deliver the ultrareliable, low-latency communication needed to drive maintenance via robots. Augmenting a smart-factory floor with wirelessly linked IoT sensors enables massive streams of data about the performance and health of equipment, and analytics can predict

problems before they occur.²⁰ Companies are also using wireless technologies to connect machines directly to other machines—for example, in vehicle-to-vehicle safety systems.²¹

Wireless technologies are also powering enhanced customer experiences. Municipalities are already employing a combination of Wi-Fi 6 and 5G to drive smart-city solutions that improve public

Figure 6: Enterprises are targeting a wide range of usage scenarios with advanced networking

	 Employee networking	 Machine networking	 Customer networking
#1	Workplace communication Faster and seamless upload/download of files from cloud, remote document sharing, messaging, accessing internet	Remote monitoring/control Video surveillance, connected assembly lines for production processes, telemedicine	Advanced customer experiences Cloud-based mobile apps, autonomous stores, immersive AR/VR/3D features, entertainment, video-based checkups
#2	Advanced collaboration tools Mobile video conferences, AR/VR/3D experiences, remote workplaces	Machine-to-machine communications Vehicle communications and safety systems, assembly/production line	Security and fraud prevention Biometric checks, geolocation transactions, smart contracts / blockchain
#3	IT administration Remote troubleshooting, managing workstations/servers/ mobile devices	Advanced analytics Insights on sensor-generated data, edge computing	Advanced analytics Insights on shopping patterns or on-floor movement, pricing, forecasting, recommendations, geofencing-based notifications
#4	Network management Software-defined WAN, network slicing	Asset tracking Inventory management, sensors in containers/goods/machines, geofencing, blockchain/smart contracts	Enhanced customer support Remote diagnostics, video chats, 3D consultations
#5	Advanced analytics Device usage, cloud usage	Automation Autonomous vehicles, remote-controlled robots or drones, delivery robots	Digital payments Mobile wallets, in-car payments, connected commerce

Note: N=437 global networking executives.

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

services, including real-time traffic monitoring/optimization and geofencing applications that can deliver personalized alerts to anyone within a predetermined geographic area.²² In health care, next-generation wireless initiatives enable real-time remote patient monitoring, high-definition video consultations, and even remote medical procedures using robots—the need for which grew more urgent during the pandemic.²³ Sports organizations are using 5G and Wi-Fi 6 to deliver more engaging, immersive stadium experiences. And retail companies are combining advanced wireless with IoT sensors and analytics to support smart inventory systems, optimize product pricing, and personalize shopping experiences.²⁴

Enterprises adopt Wi-Fi 6 and 5G in parallel

The huge amount of attention advertisers and news editors have lavished on 5G has undeniably overshadowed Wi-Fi 6. But both will have a significant role to play in the future of wireless. Unlike past generations of wireless, 5G cellular and Wi-Fi 6 networks will be able to interoperate seamlessly with one another and are widely regarded as complementary technologies in the wireless ecosystem.²⁵ Standards

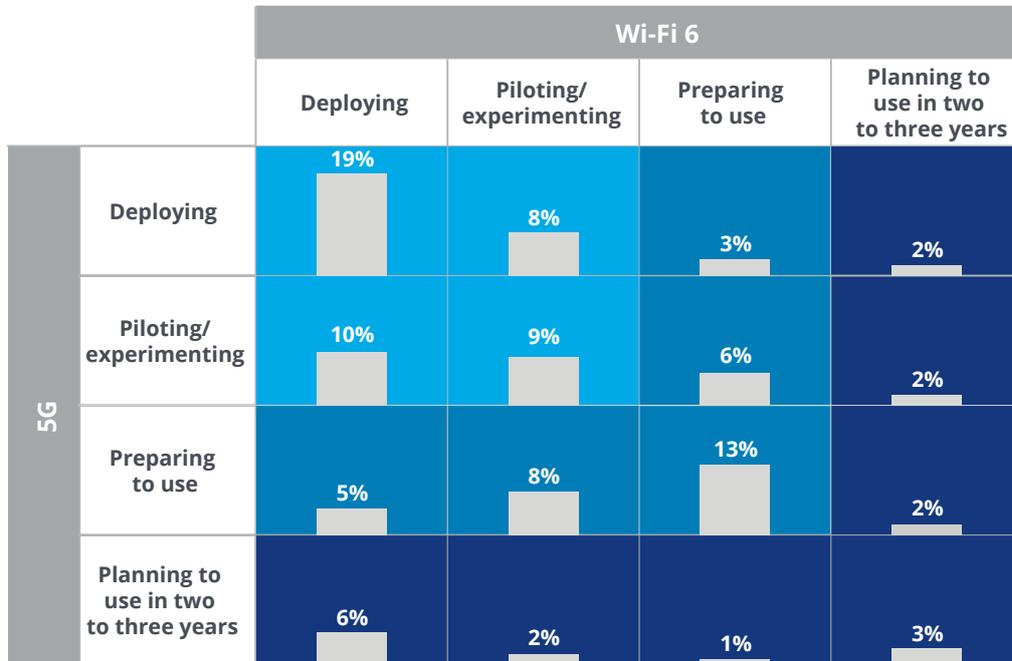
bodies and wireless alliances continue to propose solutions for the remaining technical challenges around seamless interoperability.²⁶

Networking executives report their enterprises are adopting both technologies for their wireless initiatives, indicating they prefer Wi-Fi 6 for indoor, on-campus, and fixed network situations and 5G for outdoor, off-campus, and mobile network environments. Adopting the technologies in parallel makes sense. Fully 45% are already deploying both Wi-Fi 6 and 5G in their business or piloting/experimenting with them, with another 35% actively preparing to use both—for example, acquiring devices/infrastructure and identifying providers (figure 7). Nearly all expect their organization to be using both 5G and Wi-Fi 6 within the next two to three years. Projected investment reflects coadoption as well: Over the next three years, these organizations expect to split their wireless spending fairly evenly between Wi-Fi (48%) and cellular technologies (52%).

Parallel adoption of 5G and Wi-Fi 6 is also apparent when we take a deeper look by country (figure 8). In all geographies studied, more than half the networking executives report their organization



Figure 7: Organizations are adopting Wi-Fi 6 and 5G in parallel to meet the needs of their advanced wireless initiatives



- 45% are already deploying or piloting both 5G and Wi-Fi 6
- 80% are deploying, piloting, or preparing to use both 5G and Wi-Fi 6
- 98% believe they'll be using both technologies within two to three years

Note: N=437 global networking executives.

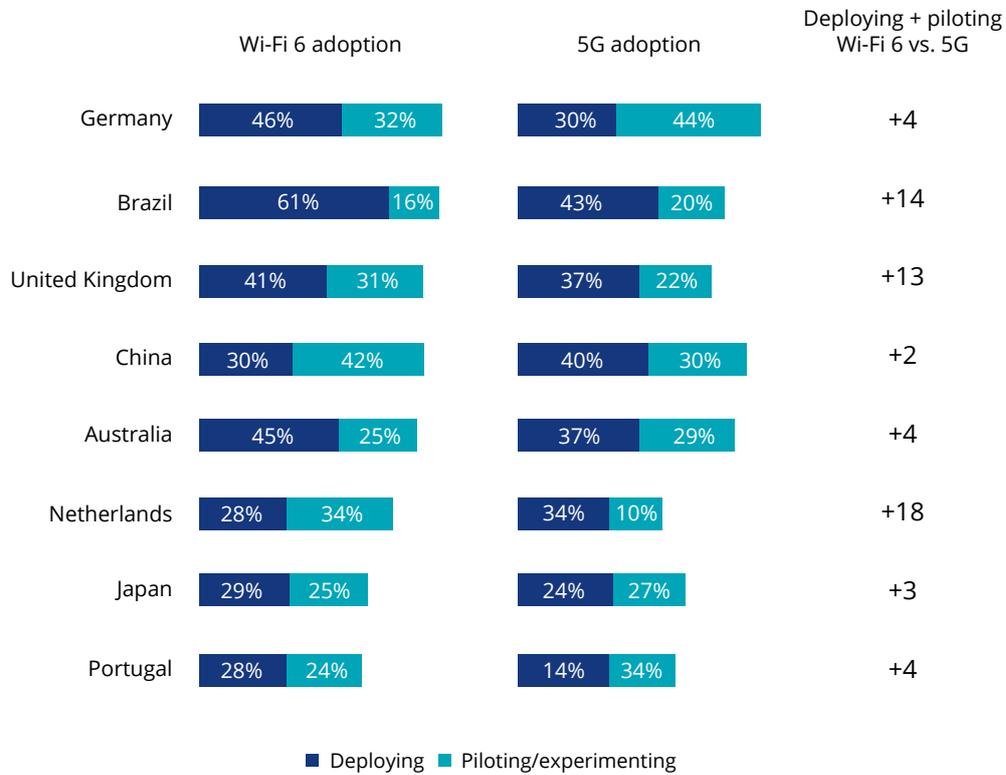
Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.

deploys or pilots Wi-Fi 6, and in Germany, Brazil, the United Kingdom, China, and Australia, the adoption percentage reaches 70% or higher. These countries also report the highest levels of 5G deployments/pilots.

Wi-Fi 6 has an adoption lead over 5G in all countries studied, but double-digit gaps are apparent in the Netherlands, Brazil, and the United Kingdom. Spectrum availability is likely a contributor to the comparatively slower pace of 5G adoption: While Wi-Fi 6 uses unlicensed spectrum (and therefore has a lower-cost path of entry), 5G initiatives generally require that government regulators auction or allocate spectrum suitable

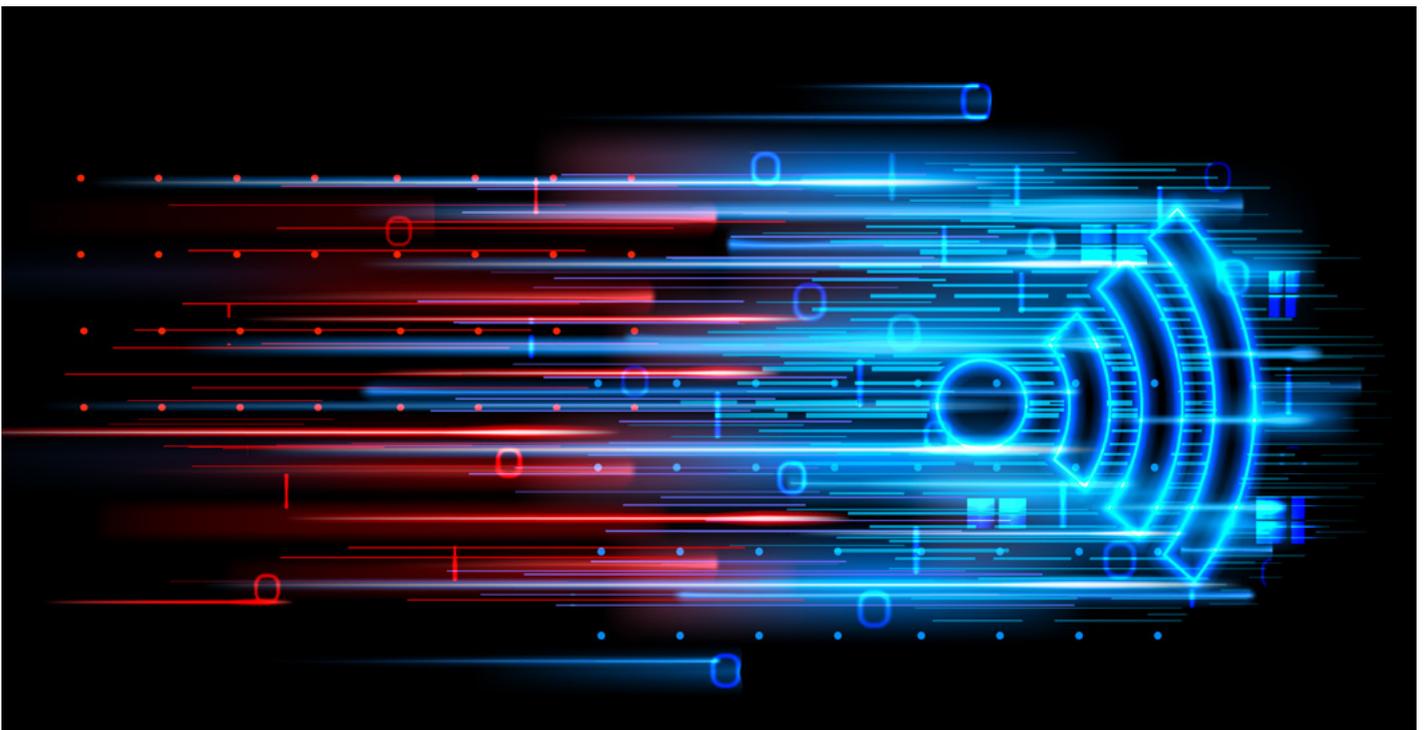
for 5G services, and some auctions have faced delays. The Netherlands didn't complete its first 5G spectrum auction until mid-2020.²⁷ Both India and Brazil had targeted 2020 for auctions, but the pandemic postponed those plans.²⁸ It's no surprise that the three countries with the highest levels of 5G adoption—Germany, China, Australia—all had 5G spectrum auctions in 2018 or 2019, giving their commercial rollouts of 5G a head start before COVID-19 hit.²⁹

Figure 8: Deployments/pilots of Wi-Fi 6 currently surpass deployments/pilots of 5G in all countries we studied, with the biggest deltas occurring in the Netherlands, Brazil, and the United Kingdom



Note: N=437 global networking executives.

Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.



India perspective

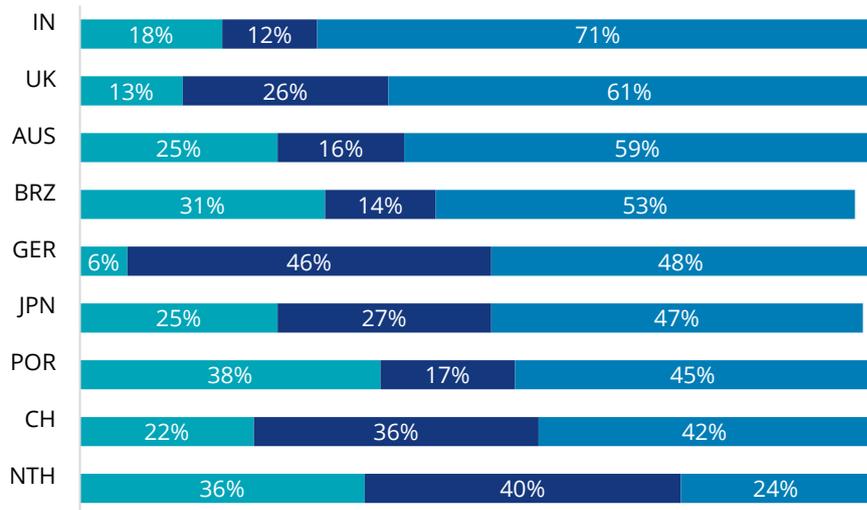
The fledgling digital ecosystem and the pandemic have accelerated the shift towards advanced wireless solution use

COVID-19 has further accelerated the digital transformation pace in India. With immense growth in broadband users, India is witnessing one of the highest monthly average wireless data consumption rates (12.15 GB) per user, reaching ~8.2 exabytes (EB) monthly, at a 265.3% CAGR during 2016-20.³⁰ This surge is expected to continue as remote working setups and enhanced connectivity solutions have become

critical for organizations to support and maintain their business operations.

Our study corroborates this: A majority of networking Indian executives (~71%) intend to boost their wireless networking investments to higher than the global average due to the pandemic. The prime investment is going towards enhancing customer engagements through digital platforms, increasing bandwidth for remote workers, and creating enhanced solutions to address new use cases.

Figure 9: More than half of surveyed executives plan to invest more in wireless networking after COVID-19; India followed by the United Kingdom and Australia are running high on investment optimism



- Causing our organization to invest less
- Causing our organization to invest at the same level as we would have without the crisis
- Causing our organization to invest more

Note: The charts above might not add up to 100% owing to a small proportion who reported 'Don't know/unsure'
 Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.

The ability to address business disruptions—coupled with increased bandwidth requirement and seamless customer engagement—by utilizing digital platforms is the top reason why Indian companies intend to increase their

wireless networking investments. Close to half of surveyed executives believe that this will be prioritized along with the capability to address new use cases and network security enhancements for seamless operations.

More than two-third Indian enterprises are not extremely satisfied with operational performances of their wireless networks

Prioritizing investments across next-generation wireless technologies

With significant deficiencies around network performances, executives in India have recognized the importance of data-driven technologies and their transformational capabilities.

Organizations are expected to invest significantly in network transformational programs for adapting to varying customer and employee needs and proliferation of next-generation wireless services, coupled with digital platforms.

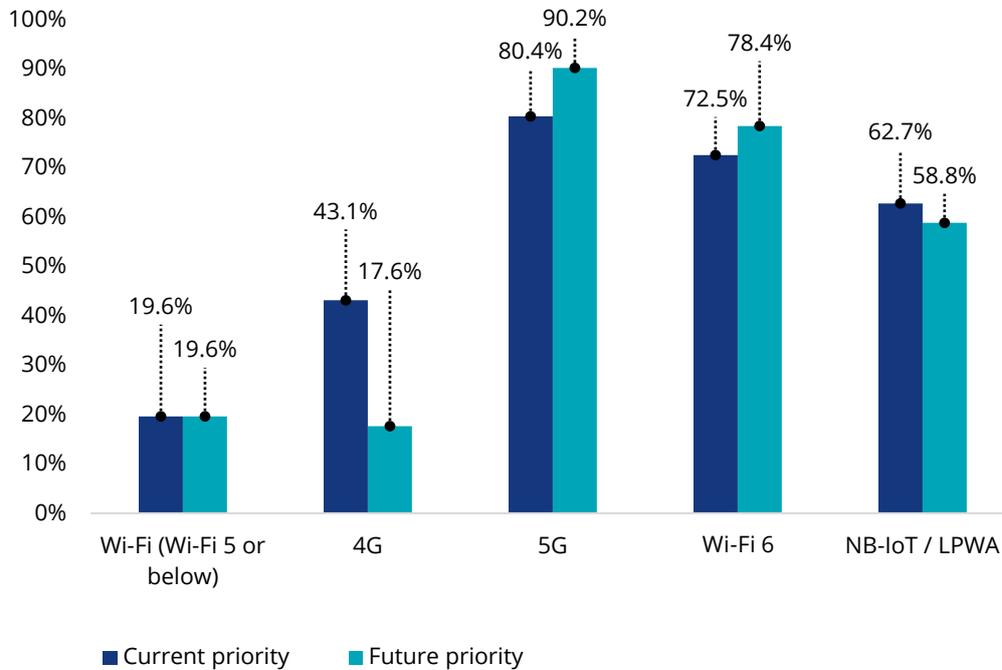
As we understand, legacy networks were either closed, complex, inflexible, or had limited scalability. These characteristics meant that networks had to be transformed for the evolving digital world where speed, agility, openness, flexibility, and responsiveness are pre-requisites for success. Almost all executives surveyed currently see advanced wireless technologies as very or critically important for their business,

and this is also expected to hold true over the next three years. Adoption is also set to take on more urgency where one-third network executives view the technologies as being critically important for their enterprises today and expect it to become more critical over the next three years.

Executives are realizing the potential benefits of next-generation technologies enabled by future connectivity solutions, and thus, plan to prioritize and invest in technologies that are essential to their business' success. Envisioning the wireless traffic across Indian enterprises, approximately 94% executives expect that utilization of 5G and Wi-Fi 6 will overtake previous network generations in next three years. Keeping that in mind, close to four out of five executives today and in the near future expect services through 5G and Wi-Fi 6-enabled platforms to be a top priority. This is followed by advanced connectivity solutions through IoT services, maximizing opportunities for machine networking and thereby, improving enterprise-wide operations and monitoring.

Executives in India place 5G, Wi-Fi 6 and Nb-IoT most critical to their business today and in future - highest among global peers

Figure 10: More than 90% Indian executives believe that 5G will become a key priority three years from now, overtaking previous network generations



Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.

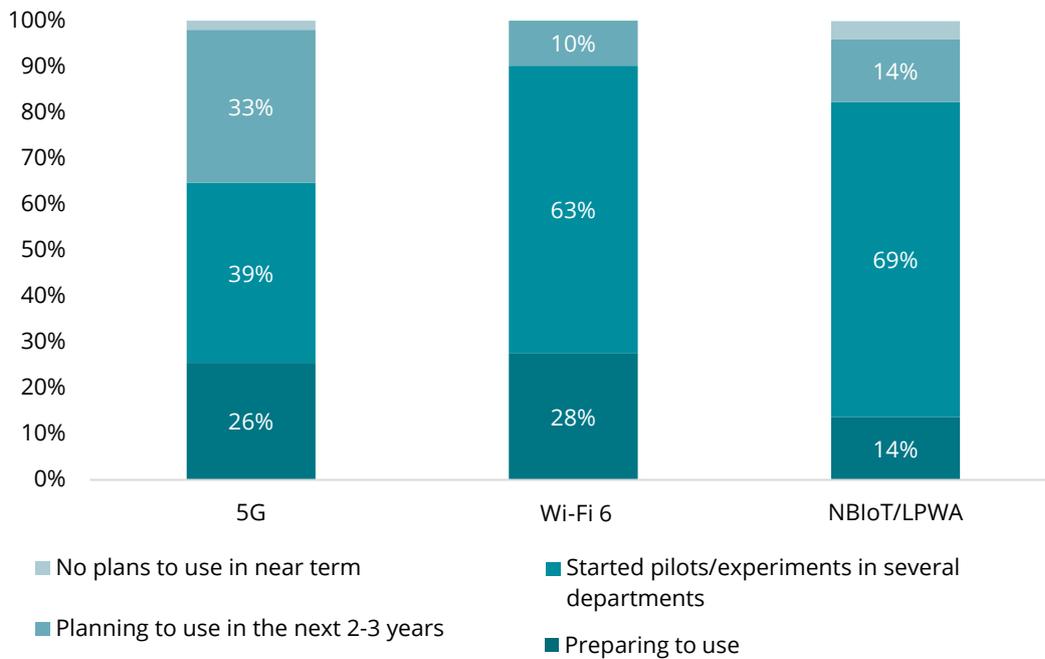
In the next three years, organizations across India, China, and the United Kingdom are poised to place the highest priorities on 5G and Wi-Fi 6 among all surveyed countries. In view of the aforesaid strategic priorities, organizations are planning significant investments across hardware/equipment, devices, software, and installation along with operations services. Our respondents across Indian organizations estimate their three-year spending at ~US\$165 million (excluding spectrum fees) on an average, only next to Japan, making India one of the leading countries with the highest spend forecast.

Businesses in India rank second among global peers in terms of willingness to spend on wireless networking technology to meet performance gaps

To make an investment choice in deploying either 5G or Wi-Fi solutions, the essential role of Wi-Fi for providing high-speed, reliable, and affordable wireless broadband connectivity should be acknowledged. With significant potential benefits, both 5G and Wi-Fi are expected to work together, rather than compete, for an enhanced user experience. As of now, around 26%

surveyed organizations are preparing to use both 5G and Wi-Fi 6 in varying capacities, such as acquiring devices/ infrastructure, identifying potential providers, and building partnerships. While 39% organizations report that they already have started 5G-enabled pilots, around 63% have gone ahead with their experiments using Wi-Fi 6.

Figure 11: 5G is a journey that has just begun in India; a long haul away from emerging in full capacity. Organizations have launched pilots across technologies to meet their advanced wireless initiatives' needs



Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.

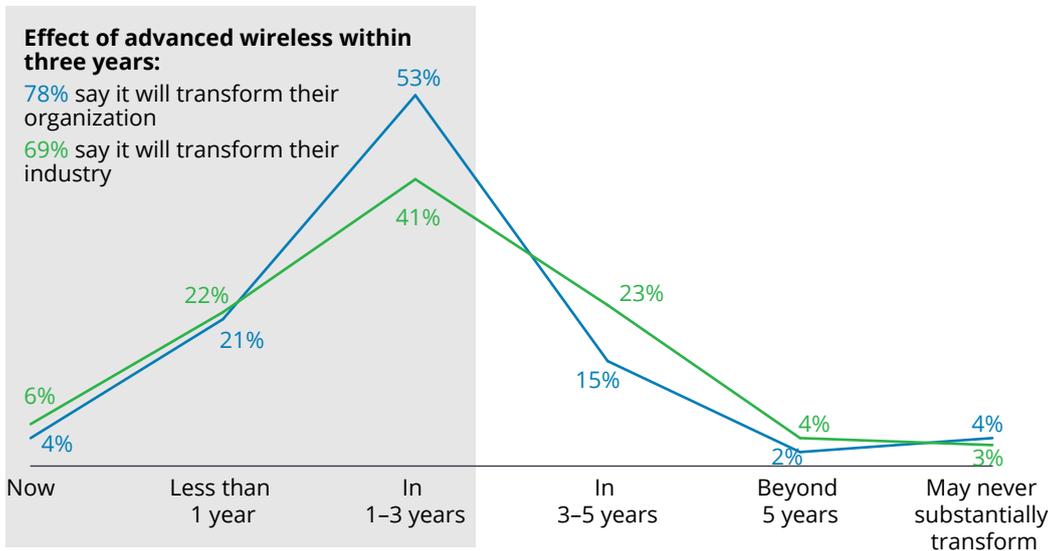


Advanced wireless is foundational to innovation and transformation

An overwhelming majority of networking executives expect advanced wireless technologies to transform both their enterprises and industries in the near term—especially remarkable considering that 5G and Wi-Fi 6 are the latest generations of technologies that have been evolving for decades. Four in five believe advanced wireless will

substantially transform their organization within three years, and nearly as many say the same about the effect on their industry (figure 12). Because their industry peers will be transforming nearly as fast as their own organizations, many of these executives are likely feeling enormous competitive pressure to quickly realize benefits.

Figure 12: Networking executives overwhelmingly believe advanced wireless will transform their organizations and industries within three years



- Advanced wireless networking will transform our company
- Advanced wireless networking will transform our industry

Note: N=437 global networking executives. Percentages may not total 100%, due to a small number who reported “Don’t know.”

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

Fueling innovation

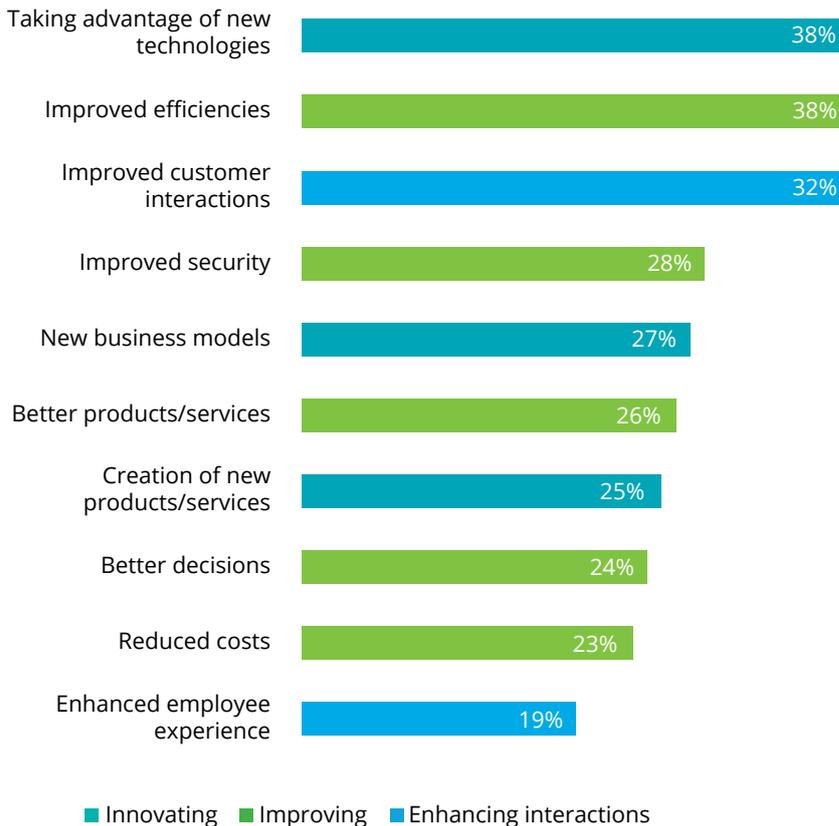
Advanced networking is becoming an essential part of organizations’ innovation architecture. Rather than merely representing the latest-and-greatest improvements in wireless technologies, next-gen connectivity is becoming an integral part of how companies are innovating and transforming—changing how they operate, develop new products and business models, and engage with customers. Indeed, three-quarters of networking decision-makers believe their organization can create significant competitive advantage by leveraging advanced networking technologies and four in five believe advanced connectivity will be critically important for enhancing customer interactions within three years.

A majority of survey respondents (56%) see their company’s current networking infrastructure as preventing them from addressing the innovative use cases they want to target—and

that drive to innovate is motivating them to adopt next-gen networking. In fact, the desire to take advantage of new technologies, such as AI, big data analytics, and edge computing is a top driver for advanced wireless adoption, tied with improving efficiency (figure 13). Enhancing customer interactions rounds out the top three sought-after benefits. It’s worth noting that, in our early 2020 study, improving efficiency was solidly in the top spot, while taking advantage of new technologies placed third. The latter has now risen to first place. Another innovation activity—creating new business models—has also moved up several rungs. Leaders cited improved performance and operational characteristics of advanced wireless—such as faster data speeds, improved coverage, lower latency, enhanced security, better reliability, and interoperability—as important attributes for achieving the benefits of advanced wireless.

Figure 13: Motivations for adopting advanced wireless include innovating, improving operations and products, and enhancing interactions with customers and employees

Percent ranking each a top-three benefit their organization is aiming to achieve with advanced wireless



Note: N=437 global networking executives.

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

Taking a closer look at countries, the top three overall motivators—taking advantage of new technologies, improving efficiency, and improving customer interactions—generally resonate in most geographies (figure 14). However, some countries place high

emphasis on certain objectives outside these three—for example, new business models (Japan, Netherlands, Portugal), better products/services (Germany, Portugal), creation of new products/services (China, Australia), and reduced costs (Brazil).

Figure 14: Some countries have top objectives outside the overall most popular, such as “reduced costs” in Brazil, “new business models” in Portugal, Japan, and the Netherlands
 Percent ranking each a top-three benefit their organization is aiming to achieve with advanced wireless

	All	Australia	Brazil	China	Germany	India	Japan	Netherlands	Portugal	United Kingdom
Taking advantage of new technologies	38%	43%	31%	44%	22%	59%	35%	40%	21%	43%
Improved efficiencies	38%	39%	37%	42%	44%	35%	35%	28%	24%	52%
Improved customer interactions	32%	39%	31%	18%	30%	51%	22%	22%	45%	37%
Improved security	28%	27%	31%	24%	36%	33%	25%	14%	28%	33%
New business models	27%	24%	24%	28%	20%	18%	31%	34%	52%	22%
Better products/services	26%	20%	16%	34%	32%	25%	27%	26%	34%	20%
Creation of new products/services	25%	37%	25%	48%	20%	18%	12%	22%	17%	22%
Better decisions	24%	22%	22%	24%	26%	20%	31%	20%	34%	24%
Reduced costs	23%	22%	39%	20%	28%	22%	16%	30%	14%	11%
Enhanced employee experience	19%	24%	20%	6%	16%	20%	20%	32%	10%	24%

■ #1 objective ■ #2 objective ■ #3 objective

Note: Networking executives based in Australia (N=51), Brazil (N=51), China (N=50), Germany (N=50), India (N=51), Japan (N=51), Netherlands (N=50), Portugal (N=29), and United Kingdom (N=54).

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

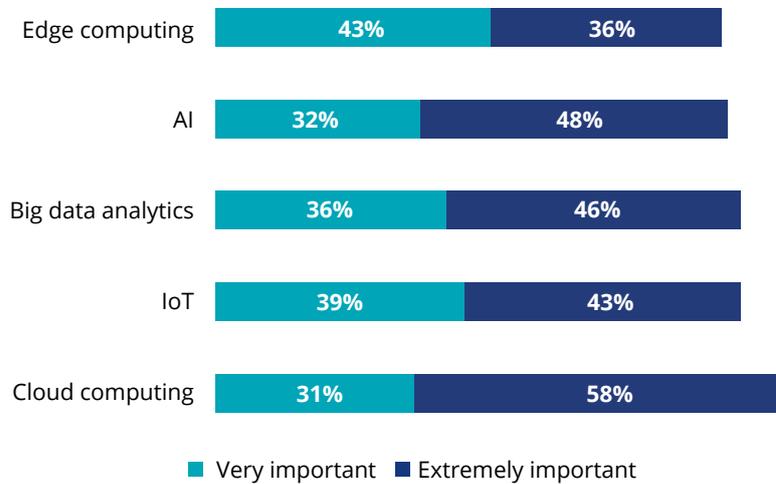
Advanced networking at the core

Networking executives resoundingly view advanced wireless as integral to their efforts to deploy innovative technologies at the heart of their digital transformation efforts, including big data analytics, cloud computing, edge computing, AI, and IoT. Remarkably, 99% of our respondents said their companies are pursuing each of these technologies in the coming year, despite it not being a requirement for survey participation. Four in five networking executives consider advanced wireless very/extremely important to their organization’s ability to implement IoT, big data analytics, AI, and edge computing—and even more say the same for cloud computing (figure 15).

More than ever, these technologies are intertwined and converging in enterprise innovation initiatives (see sidebar, “Innovating globally with advanced connectivity”). With advanced networking becoming intrinsic, how organizations adopt and architect their advanced wireless solutions is no longer a separate decision from how they implement other innovative technologies: Leaders should increasingly consider advanced networking a key component of an organization’s end-to-end enterprise architecture.

Figure 15: Executives see advanced wireless networks (including 5G and Wi-Fi 6) as foundational to taking advantage of other advanced technologies

Importance of advanced wireless to company’s ability to implement each technology



Note: N=437 global networking executives.

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

Innovating globally with advanced connectivity

Private 5G networks enable smart factories. Germany's telecommunications regulator awarded licenses for deploying "private 5G" networks, which are initially expected to support industrial IoT.³¹ The characteristics offered by 5G—ultrahigh reliability, submillisecond latency, availability, and high security—are seen as a good fit for critical industrial applications that require real-time control, such as robot and machine mobility and industrial automation.

Industrial conglomerate Robert Bosch GmbH, together with Nokia, has rolled out a private 5G network at its lead plant for Industry 4.0 in Germany—a step toward its vision of a highly efficient "factory of the future."³² The factory has an automated transport system consisting of 5G-connected automated guided vehicles that are able to move and deliver loads throughout the facility while safely avoiding other vehicles, objects, and people.

Bosch Rexroth AG—a Bavaria-based division focused on manufacturing equipment—has outfitted a production floor with a private 5G network that connects machines, robots, and precision power tools.³³ The network, along with predictive analytics and AI, allows the company to coordinate and optimize production operations.

Next-gen connectivity powers immersive experiences. The Olympics has long been a place to showcase innovative technologies, and the 2021 summer games planned for Tokyo³⁴ promise to carry on that tradition. Intel expects to run a VR experience over a 5G network at the games: A multitude of cameras installed around an arena will collect live video, and viewers around the world with VR headsets will be able to look around the venues and experience the sporting events as if they're right next to the athletes.³⁵ Nippon Telegraph and Telephone Corp. is piloting a hologram system that captures ultrahigh-definition 8K video of athletes and creates holograms that mirror their moves; the speed and low latency of 5G networks can enable spectators in other locations to watch the holograms in real time.

In Brazil, a partnership between Claro and Ericsson has already demonstrated the use of 5G technology for a real-time holographic experience: In October 2019, a musician played at the Claro Brasil offices, and the audience in a 5G-connected stadium 17km away was able to experience his performance as a hologram.³⁶ High-definition video was also set up between the orchestra and its conductor, and attendees with 5G-equipped VR devices were able to watch the real-time movements of the musicians as an immersive experience.

IoT, AI, and 5G meet at the intelligent edge for automated inspections. Haier, a global household appliance manufacturer headquartered in China, has developed a system to automatically inspect new stainless steel refrigerators in a production line, using high-definition, 5G-connected industrial cameras, edge computing servers equipped with machine-vision image-processing capabilities, and offsite servers performing AI-based training.³⁷ Conventional production involved time-consuming manual inspection of new refrigerators for scratches, dents, or other imperfections. In the new solution, cameras along the production line capture real-time video of each appliance and send it via 5G to an edge computing platform. On the edge server, machine-vision algorithms perform near-real-time image analysis to detect defects—and the results are used to increase the accuracy of the AI model over time. The system has improved both production performance and product quality monitoring.

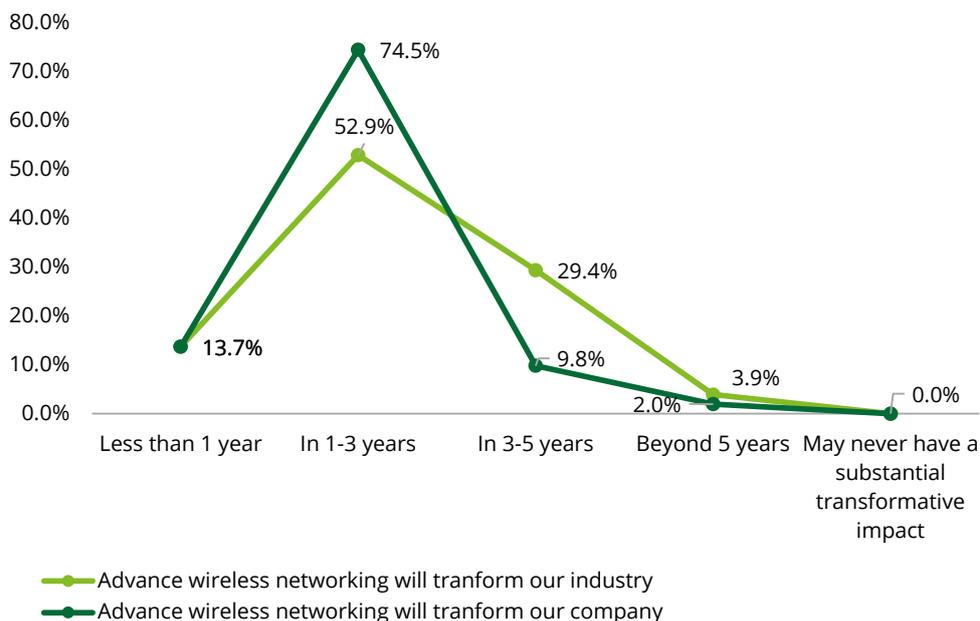
India perspective

Advent of digital disruptors that are transforming organizations

Transformation through digital disruptors such as Cloud, block-chain, AI, and advanced analytics are driving demand and deployment of new services. While building cross-sector use cases, the programs executing these transformations are expected to focus on employees, customers, and machine-centric networking. Based on various combinations of next-generation platforms and solutions, potential business value is expected to maximize through technology conquests and converging industries. To realize such opportunities presented by evolving business models, a strong collaboration between industry verticals, application providers, and connectivity providers is a necessity. In view of the aforesaid, networking executives expect advanced wireless technologies to transform both their enterprise and industries in the near future.

India is leading along with the United Kingdom and Brazil to be most optimistic in leveraging next-generation technologies to implement emerging services

Figure 16: 88% Indian executives believe that advanced wireless services will substantially transform their organization within three years



Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.

Enterprises are targeting a wide range of usage scenarios to fuel innovation

Overall, Indian organizations are expecting to witness the benefits of these technologies for themselves sooner than industry-wide change. With approximately 94% average executives now realizing the importance of Big Data, Cloud, AI, edge computing and IoT in their organization, India along with the United Kingdom and Brazil are the most optimistic in gauging and implementing such technologies in their organizations. To deliver customer and machine-centric services and to all employees, advanced wireless technologies are expected to have characteristics of ubiquitous availability, increased reliability, and higher throughput, which can be further harvested through various innovative use cases for a connected ecosystem. A majority of Indian executives rate performance efficiencies such as data speed and coverage higher than device density, followed by latency and location accuracy.

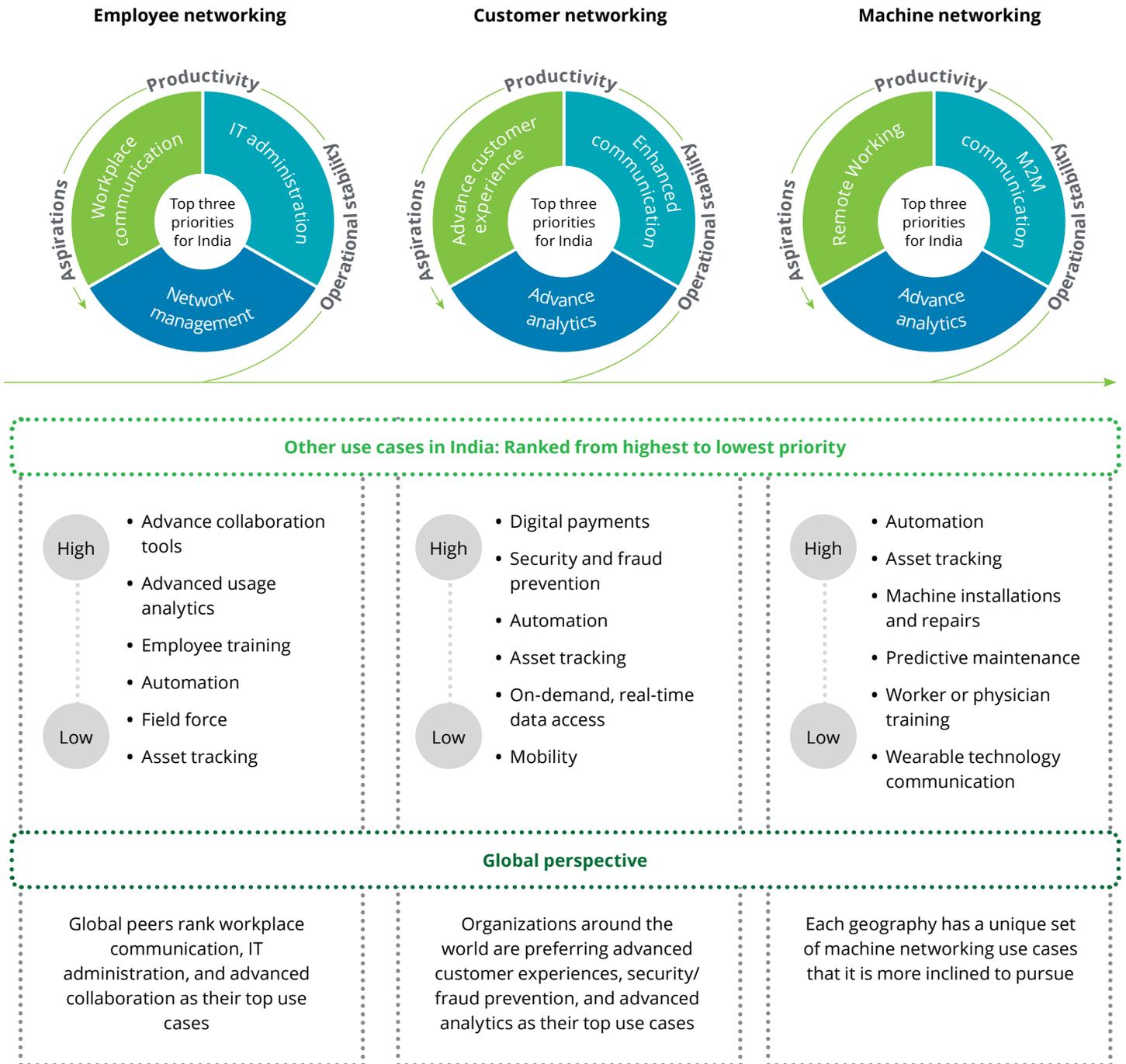
A successful use-case implementation would require multiple trials with relevant technology solutions across enterprises. Indian enterprises expect to target use cases with a blend of indoor and outdoor scenarios on top of fixed and mobile networks. When it comes to employee connectivity, both inside and outside the office, top cases may involve enhancing workplace communication along IT administration. 5G services may provide high-speed mobility access to improve collaboration and productivity through high-resolution virtual conferences and

interactive digital whiteboards, whereas, Wi-Fi 6 can replace wired connections for desktop phones and LANs for fixed wireless broadband access.

Advance networking is also expected to enable new applications for machine connectivity, which will further improve remote asset monitoring, while building intelligent vehicular, factory, or retail networks for high safety and productivity standard compliance. With regards to customer networking, next-generation wireless technologies may improve upon Quality of Experience (QoE) with reliable data across enterprise customers in health care (remote patient consultations, diagnostics, and monitoring); network edge -computing enabled digital services; deep insights; and forecasting across enterprise functions through advance analytics, etc.

Two-third organizations in India believe that existing networking infrastructure is preventing them from innovation: The highest among global peers

Figure 17: Indian businesses along with a majority of global peers believe that workplace communication, advanced customer experience, and enhanced remote working capabilities are key for employee, customer, and machine centric-use cases



Source: Deloitte Analysis

After Japan and United Kingdom, India is least inclined towards private 5G and is most likely to go for a combination of both public and private 5G slice

To address the need for an advanced wireless network, global operators are targeting and allocating all types of spectrum, comprising licensed (shared or exclusive) and unlicensed. The aforesaid spectrum categories are expected to offer industries with options to proliferate through private and public 5G and Wi-Fi networks. Further, advanced 5G features such as public and private network slicing, along with a multi-access edge computing service is expected to support the needs of industry-vertical sectors. Network slicing shall bring precisely tailored services per the needs of an organization, in terms of required service quality, speed, security, latency, etc. Moreover, edge computing is expected to bring compute capabilities closer to enterprise end-users, which can enable low latencies and customized local services.

Globally, regulators have been making spectrum available for 5G in conventional ways (for instance, auctions with exclusive rights). However, some regulators have also set-aside a portion of spectrum in priority 5G bands (for example, a portion

of the 3.5 GHz range) for local enterprises so they can build their own private 5G networks. In this regard, after Japan and the United Kingdom, India is observed to have the least inclination towards private 5G and is most likely to go for a combination of both public and private 5G slice. Additionally, Indian executives expect to ride on telco-enabled 5G slices to cater to their use case scenarios on the belief that utilizing services through a wireless provider is preferable to acquiring spectrum directly from a government/regulatory body or gaining exclusive rights on a dedicated or shared spectrum.

However, a majority of executives feel existing cyber-security apparatus and concerns around service reliability and quality are inhibitors to be addressed in public 5G service adoption. With technological changes redefining business and operating models, it has now become imperative for enterprises to capture the upside of this disruption and mitigate bottlenecks to continuously focus on enhancing digital infrastructure. Adopting key lessons from global practices is imperative to propel Indian enterprises towards spearheading infrastructure for an adaptable, assured, and agnostic model of connectivity.

Two-third organizations in India believe that existing networking infrastructure is preventing them from innovation



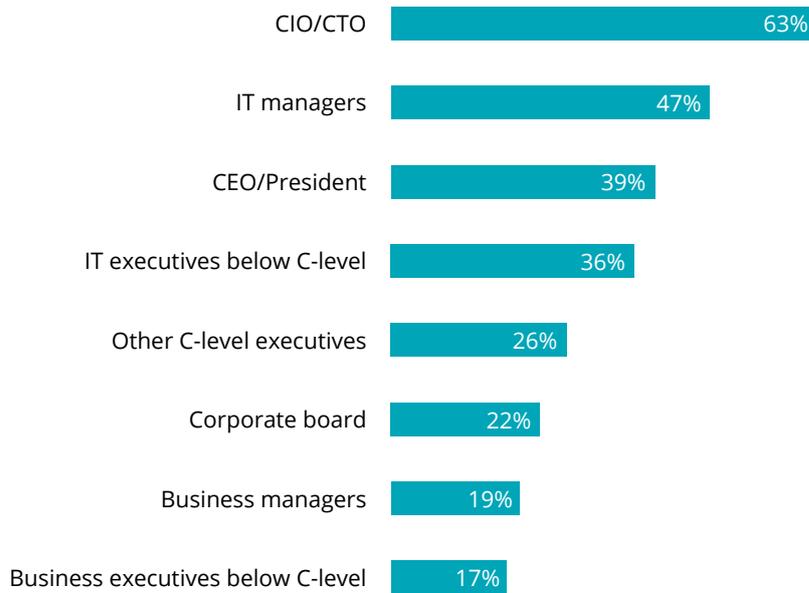
How adoption of advanced wireless is unfolding

Organizations are approaching advanced wireless adoption as a strategic technology initiative, led by technologists both inside and outside the enterprise. The IT function—both C-level executives and practitioners—leads the charge to adopt, followed by C-level business executives (figure 18).

When it comes to influencing an organization's decisions around advanced wireless, IT staff and technology vendors hold the most sway, followed by wireless carriers and the company's executives (figure 19).

Figure 18: Within organizations, IT executives and practitioners lead the charge to adopt advanced wireless

Percent ranking each a top-three role leading the charge for adopting advanced wireless at their organization

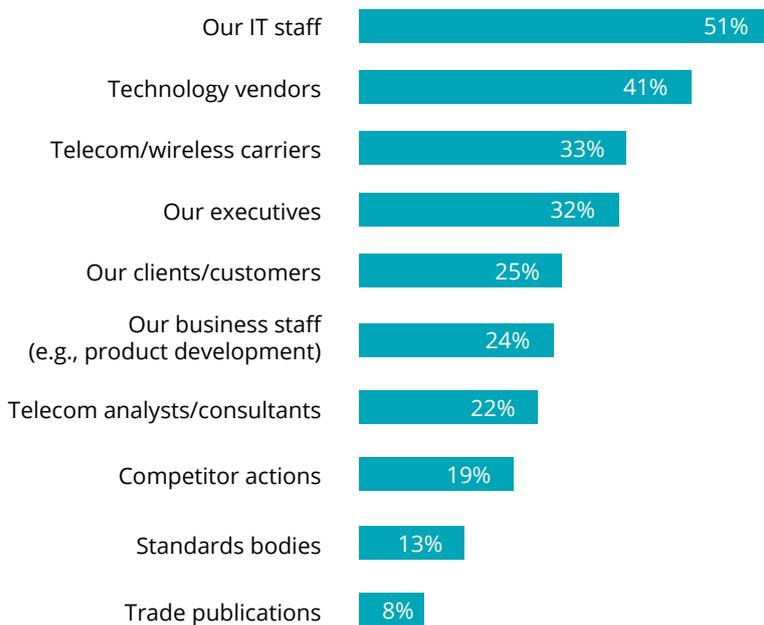


Note: N=437 global networking executives.

Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.

Figure 19: IT staff and technology vendors have the most influence on organizations' advanced wireless choices.

Percent ranking each a top-three influencer guiding their organization's advanced wireless choices



Note: N=437 global networking executives.

Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.

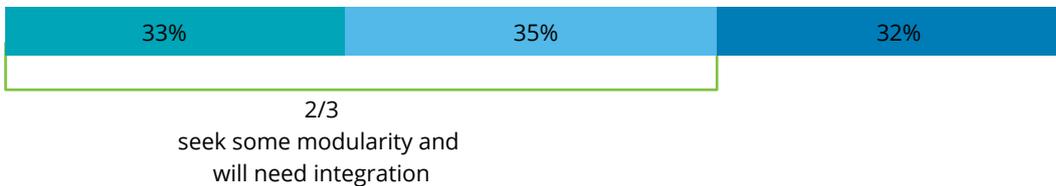
Complex and evolving ecosystem

Fulfilling the promise of advanced wireless initiatives, particularly those involving 5G, involves a complex ecosystem of players, including application and cloud providers, wireless carriers, consultants and integrators, equipment manufacturers, and infrastructure providers. About one-third of the networking executives we surveyed prefer to purchase full end-to-end advanced wireless solutions, but the other two-thirds prefer to acquire best-of-breed components or a blend of components and full solutions, offering more of an opportunity to customize and control (figure 20).

In order to assemble complete solutions, organizations generally bring together capabilities and technologies from a range of players (figure 21). On average, advanced wireless adopters engage with about eight of the nine listed types of vendors. Moreover, when it comes to cloud providers, application providers, component providers, consulting firms/integrators, and network equipment providers, about half of enterprises engage with two or more vendors of each type. The relationships are evolving: For each type of vendor in the ecosystem, at most three in 10 adopters prefer to keep engaging with their current vendors; the remainder are open to exploring new ones.

Figure 20: Two-thirds of advanced wireless adopters prefer to purchase best-of-breed components, or a blend of components and end-to-end solutions

How organizations prefer to develop/acquire advanced networking solutions



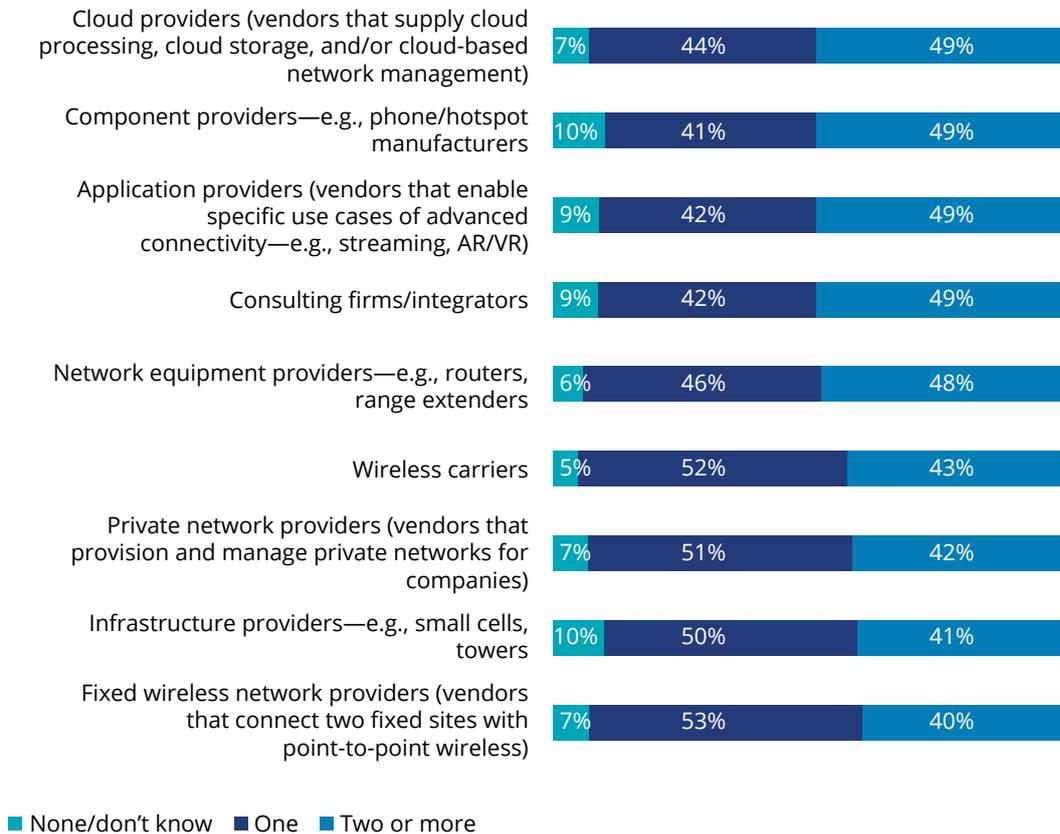
- Prefer to acquire best-of-breed components and integrate them
- Prefer blend of individual components and end-to-end solutions
- Prefer to buy end-to-end solutions

Note: N=437 global networking executives.

Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.

Figure 21: Organizations engage with myriad vendors to implement and manage their wireless initiatives, including technology companies, telecom firms, and consultants/integrators

Vendors with which organization engages for wireless implementation/management



Note: N=437 global networking executives.

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

Enterprises choosing best-of-breed solutions face a great deal of complexity and need to coordinate the efforts of multiple parties. Beside their own in-house teams, they’re looking to cloud providers (such as the hyperscalers), network technology vendors, consultants/system integrators, and wireless carriers to help them weave together and orchestrate the pieces. Even when adopters choose integrated solutions, the vendor handles a great deal of behind-the-scenes complexity. Today’s reality is that no single vendor can offer full-stack, end-to-end solutions on its own. While some may already have the

vast majority of the required components and capabilities, they still need to partner with others to acquire and integrate additional pieces to create complete solutions.

The architecture of 5G networks is expected to become more virtualized, open, and programmable, allowing best-of-breed components to proliferate.³⁸ The role of orchestrators that assemble all the pieces is likely to become increasingly important, whether that role is assumed by telecom providers, tech providers, or system integrators.

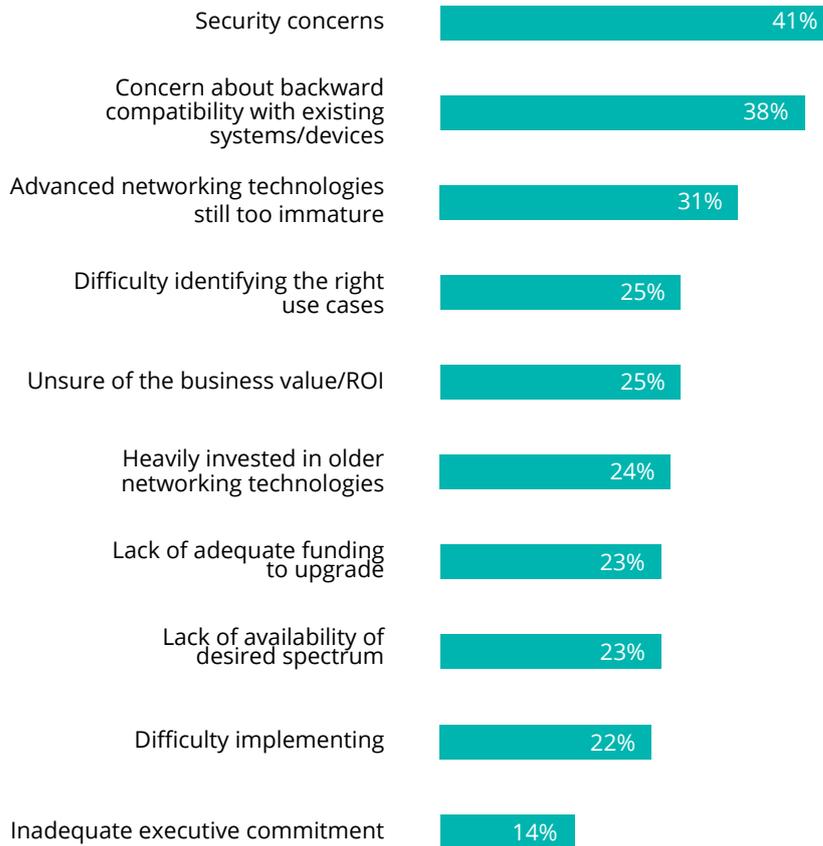
Challenges to adoption

One way vendors can up their game is by helping customers address their networking challenges. With advanced wireless enabling a hyperconnected world, leaders recognize that there are many more potential network entry points that need to be protected, and security tops their list of concerns (figure 22). At the same time, next-gen wireless

technologies promise better security. Wi-Fi 6 improves data protection by ensuring that all certified devices support the latest generation of security (WPA3), which offers more robust encryption and key management.³⁹ And 5G slicing supports unique security policies per slice—a boost to security as long as slices are configured and managed properly.⁴⁰

Figure 22: Security and backward compatibility with existing systems are the top concerns in adopting advanced wireless

Percent ranking each a top-three challenge for organization’s adoption of advanced wireless



Note: N=437 global networking executives.

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

Another top concern of adopters is backward compatibility with existing systems and devices. Vendors have an opportunity here to show how their components can work well with others, and to go above-and-beyond by offering integration services. When we look at the country level (figure 23), it's clear that some adopters are still struggling to get out of the starting gate, heavily invested in older technologies (a top-three challenge in Germany), unsure of the business value of advanced networking (a top-three challenge in China, Germany, Japan, the Netherlands, and Portugal), or having difficulty identifying the right use cases to target (a top-three challenge in Australia and Japan). Once again, these difficulties represent an opportunity for vendors to demonstrate the business value of their solutions and the usage scenarios they enable—perhaps by engaging customers in pilot programs.

Cloud and edge in the spotlight

Seven in 10 networking executives revealed that they expect to primarily deploy and manage their wireless networking applications and services on public or private clouds in the next two to three years (figure 24). Remarkably, those who expect to use mainly private clouds are twice as likely to trust traditional cloud technology firms the most to manage their data in the private clouds (56%) than to look first to their own IT department (28%).

Moreover, executives reported relying on technology companies—namely, application providers and cloud providers—the most to help design their advanced wireless network architectures. And enterprises are keenly aware that their networks can't merely connect their devices but must also connect to clouds, collecting data from machines and sensors, and meshing it with the company's cloud-based operational data. Another area that bears watching is the proportion of adopters (16%) that expect to chiefly deploy and manage their wireless networking applications and services on the edge in the near future. This represents a jump from 9% of executives in our US study and points to

a growing awareness of the significance and utility of edge computing.⁴¹ Consider that, with 5G, the time for device or sensor data to arrive at a cell tower may be just 2–3 milliseconds, but the time for it to travel to a distant data center for processing (for example, by cloud-based analytics services) could still take hundreds of milliseconds, presenting a problem for applications for which low latency is critical.⁴² Moving data processing, storage, and AI-driven analytics to the edge—closer to where the data is collected—can enable applications that require fast response times, such as drones that visually inspect rail lines or bridges to spot possible problems, telehealth systems that capture and analyze video to monitor patient health in real time, choreographed robots on a factory floor, or automated traffic management systems.⁴³

As providers of next-generation networking products and services jockey for competitive position and race to deliver complete solutions, the enterprise networking space is seeing the formation of many innovative collaborations and alliances among technology firms and telecom vendors—even among parties once considered competitors. Edge computing is an especially dynamic area for emerging partnerships, and the large public cloud providers are all rolling out edge computing capabilities.⁴⁴ Amazon, for example, has been partnering with telcos (such as Telstra in Australia) to embed Amazon compute and storage services at the edge—in base stations or the network operators' data centers—and customers can continue to use the cloud APIs and functionality with which they're already familiar, without worrying about the complexity of establishing an edge presence themselves.⁴⁵ Google Cloud is partnering with AT&T in the United States to bring edge compute services (such as cloud-based artificial intelligence and machine learning) to the network edge.⁴⁶ In India, Bharti Airtel has teamed with IBM in an initiative to bring 5G, hybrid cloud, and edge capabilities to its customers.⁴⁷

Figure 23: Executives in some countries have other top concerns, such as uncertainty about business value, difficulty identifying the right use cases, and lack of spectrum

Percent ranking each a top-three challenge for organization’s adoption of advanced wireless

	All	Australia	Brazil	China	Germany	India	Japan	Netherlands	Portugal	United Kingdom
Security concerns	41%	39%	45%	44%	30%	45%	31%	28%	59%	57%
Concern about backward compatibility with existing systems/devices	38%	33%	43%	54%	26%	39%	29%	40%	28%	43%
Advanced networking technologies still too immature	31%	31%	31%	28%	28%	35%	20%	34%	38%	33%
Difficulty identifying the right use cases	25%	33%	24%	22%	26%	31%	31%	24%	7%	22%
Unsure of the business value/ROI	25%	20%	12%	30%	28%	16%	39%	34%	34%	20%
Heavily invested in older networking technologies	24%	25%	18%	28%	32%	24%	16%	24%	21%	26%
Lack of adequate funding to upgrade	23%	29%	29%	20%	16%	22%	27%	28%	21%	17%
Lack of availability of desired spectrum	23%	18%	16%	20%	30%	37%	31%	12%	21%	19%
Difficulty implementing	22%	27%	24%	8%	28%	14%	25%	24%	28%	22%
Inadequate executive commitment	14%	27%	12%	10%	16%	12%	8%	16%	14%	11%

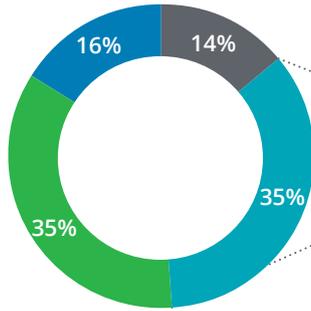
■ #1 challenge ■ #2 challenge ■ #3 challenge

Note: Networking executives based in Australia (N=51), Brazil (N=51), China (N=50), Germany (N=50), India (N=51), Japan (N=51), Netherlands (N=50), Portugal (N=29), and United Kingdom (N=54).

Source: Deloitte’s Study of Advanced Wireless Adoption, Global Edition, 2021.

Figure 24: Enterprises have very high levels of interest and trust in using cloud services to deploy and manage their wireless networking applications

Where organizations expect to primarily deploy and manage their wireless networking applications and services in two to three years



"Most trusted" entities to manage data in the private cloud



- On-premise ■ Private cloud ■ Public cloud ■ Traditional cloud providers
- Network edge ■ Our own company ■ Wireless carrier

Note: For the pie chart, N=437 global networking executives. For the bar chart, N=154 executives who reported their organization will primarily deploy on private cloud. Percentages may not total 100%, due to a small number who reported "Don't know".
 Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.



India perspective

A complex and evolving ecosystem

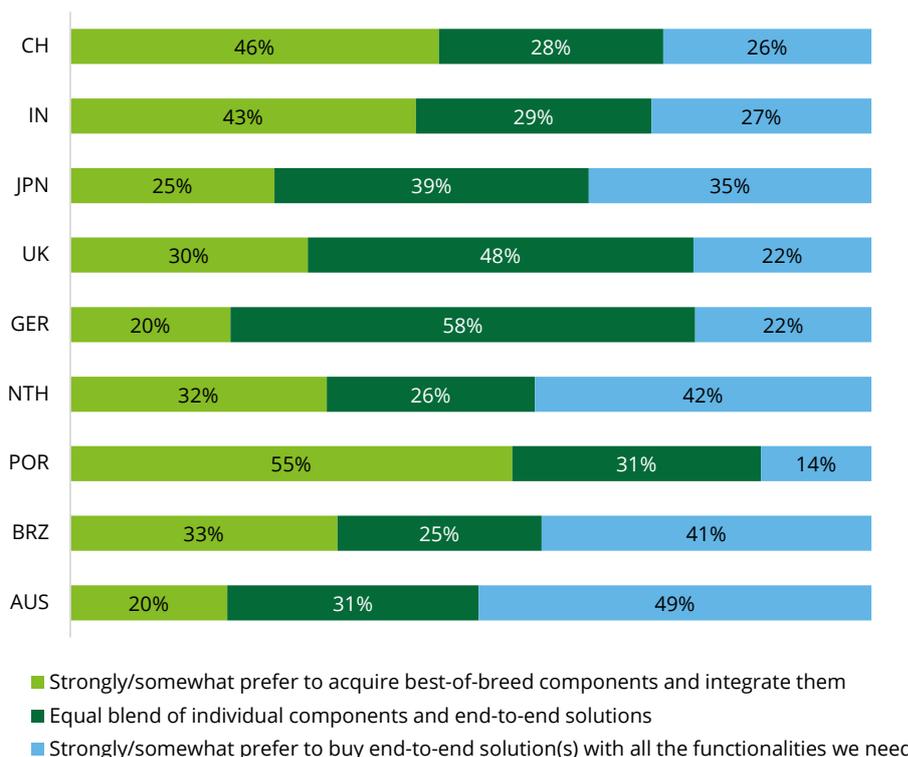
Indian enterprises are also approaching advanced wireless adoption through various strategic levers led by both C-level executives and practitioners. Although top leadership across CIOs and CEOs hold the charge and decide the way forward, their decisions are complemented by practitioners across IT, technology vendors, and telecom service providers, who act as influencers, making in-roads for newer technologies.

Networking executives expect advanced wireless solutions to be delivered through a complex ecosystem with a mix of component manufacturers, network equipment providers, and cloud providers, with the capabilities

of network service and infrastructure providers.

To deliver a complete solution, 72% Indian respondents are looking to carry out a combination of both end-to-end solutions and best-of-breed solutions—higher than the global average (67%). Based on the survey, two-third Indian enterprises want to entrust cloud providers and companies' in-house teams with integrating the best-of-breed components into a solution and utilizing the capabilities of network technology vendors. This is also providing significant opportunities to both solution integrators and consulting firms in delivering a cohesive solution.

Figure 25: Two-third advance wireless adopters in India prefer to purchase best-of-breed components, or a blend of a component and end-to-end solution



Source: Deloitte's Study of Advanced Wireless Adoption, Global Edition, 2021.

As heterogeneous technology ecosystems are typically complex, a collaborative effort seems critical. Large-scale deployments and need for customized services across enterprises are expected to reduce the dependence on one-stop-shops for network solutions. This may provide significant opportunities for new service providers across cloud, application, infrastructure, wireless carriers, network equipment, component, etc., to present a varied or alternative option across advanced connectivity ecosystems. Moreover, convergence and integration of best-of-breed solutions shall drive cohesiveness among service providers, vendors, and regulators, who are expected to ideate, plan, build, and operate business models to accommodate customized connectivity and deliver innovative service propositions.

With technological changes redefining business and operating models, India is well-positioned to capture the upside of this disruption. Realizing the upside would require continued focus on enhancing the digital infrastructure

More than 8 in 10 networking executives are willing to explore new providers across the advanced connectivity ecosystem – India and the United Kingdom most inclined to do so

and connectivity across enterprises to improve upon employee and customer networking capabilities. Indian enterprises would thus, require a multi-pronged strategy to enhance wireless connectivity—utilizing both fixed and mobility backhaul solutions. In the times to come, those who are bold, embrace change, and can transform the way they operate, are likely to emerge as winners.



Considerations for networking decision-makers

Although it's still early days of rolling out advanced connectivity, leaders already recognize the potential benefits. Adopters strongly believe in next-gen wireless networking technologies' ability to deliver competitive advantage, unlock the power of other emerging technologies, and rapidly transform both their organization and industry. The strategic decisions that wireless adopters make today may affect their future positions, and organizations

may want to take the following considerations into account:

- *End goal in mind.* Adopters should consider the usage scenarios they want to achieve and determine which wireless technology (or technologies) would be the best choice in different situations. The most successful adopters are likely to be those with the skills to deploy multiple technologies

and make diverse networks interoperate as needed.

- *Data strategies.* When massive volumes of data flow from connected machines and sensors, organizations need thoughtful strategies and policies on how to store, secure, and analyze it. Depending on the requirements of various usage scenarios, some data may need to be stored and analyzed in clouds, with other data processed at the intelligent edge.
- *Innovation infrastructure.* Given that leaders see next-gen wireless technologies as a significant enabler of other pivotal technologies such as AI, IoT, and edge, wireless will likely become intrinsic to every innovation initiative. Enterprises should regard next-gen wireless as a core part of their innovation infrastructure and strategy, not as a discrete consideration or afterthought. Imagine how advanced wireless may enable new products, services, and business models—and enhanced interaction with customers and employees.
- *Integration and network management.* Adopters are interacting with a complex ecosystem and a multitude of vendors. With the propensity to acquire best-of-breed components, organizations should decide whether to tackle the complexity of integration themselves or seek out partners. They should assess their organization's ability to manage, authenticate, and secure networks with thousands of devices. Given that security is the number-one adoption concern, leaders would be wise not to underestimate the level of risk, cost, and effort in shouldering these responsibilities, and may want to engage partners for help.

The advanced wireless ecosystem is complex and competitive, with the overwhelming majority of adopters willing to reconsider their vendors for wireless implementation and management. Suppliers of next-gen networking products and services may wish to consider the following:

- *Challenges as opportunities.* Adopters cited security and backward compatibility as top challenges to adoption. And, depending on country, there are difficulties around understanding business value or identifying the right use cases. All of these are areas of opportunity for savvy vendors to demonstrate their expertise and value.
- *Ecosystem positioning.* Evaluate where you can add the most value and carve out your position. Consider whether you can offer expertise in architecting solutions and integrating components—areas where adopters of advanced wireless are likely to seek help. Think about teaming up with other vendors to offer more complete solutions and a more attractive value proposition to adopters.
- *Innovation partnerships.* Vendors that see next-gen connectivity as adding merely incremental value may miss out on opportunities. Savvy vendors should go beyond offering connectivity products and services and seek to become trusted partners for innovation and transformation.

Both adopters and providers may be able to unlock enormous opportunities as advanced wireless networks become widespread over the next few years.

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06. In our prepandemic survey of US networking executives in January 2020, 75% ranked 4G as one of their business's top-three critical wireless technologies and 65% ranked Wi-Fi 5 (and below) in the top three. Those percentages were expected to drop to 33% and 26%, respectively, within three years. Twenty-nine percent and 31% ranked 5G and Wi-Fi 6 in their top three, respectively. By 2023, 76% expected 5G to be a top-three most critical wireless technology for their business, and 70% expected the same for Wi-Fi 6. During the same time frame, 4G and older Wi-Fi technologies were expected to diminish in importance.
07. The near-term future views of US and non-US networking executives are closely aligned. By 2023, 76% of both non-US and US networking executives expect 5G to be a top-three most critical wireless technology for their business; 65% of non-US executives and 70% of US executives expect Wi-Fi 6 to be in the top three.
08. This observation holds for all countries except Germany, where the networking executives surveyed still rank "Wi-Fi 5 and older" as the most critical wireless technologies for their efforts right now—followed by 5G and Wi-Fi 6. Within three years, these executives expect to place the greatest emphasis on 5G, followed by Wi-Fi 6. Note that for at least the new few years, infrastructure and device limitations mean 4G and 5G networks are expected to coexist; in fact, some early 5G deployments make use of existing 4G infrastructure. See Connor Craven, "What is 5G network infrastructure?," sdxcentral, January 5, 2020; OmniSci, "5G Infrastructure," accessed February 24, 2021; Mori Eliav, "How 4G and 5G can coexist while you prepare for the future," Oracle Communications Blog, October 2, 2020.
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