Deloitte.

2024 telecommunications industry outlook

What's inside

About Deloitte's Outlooks
Deloitte's annual TMT outlooks are designed to help leaders better understand and navigate the broad trends that are expected to shape their sectors. Our Global TMT Predictions offer deeper dives into the specific technologies, trends, and behaviors contributing to these outlooks. Together, they offer leaders pragmatic and actionable considerations for the year ahead.

Introduction

This year's telecommunications outlook reveals a shifting landscape that may challenge communications service providers (CSPs) but could also present opportunities. Their strategies and investments today could determine their success or failure tomorrow. Although our analysis is primarily US-centric, many elements may be equally applicable to global telecoms.

While 2023 launched generative artificial intelligence (Gen AI) into the world, 2024 is expected to see CSPs bringing the Gen AI proofs of concept they've been developing into the market. This will require them to better understand the costs and risks of data conditioning and governance, training foundational models, running inference at scale, and building guardrails to minimize errors and hallucinations. Many are already zeroing in on which kinds of data enable the best Gen AI use cases for their businesses. They will likely also look more closely at their data quality, security, and governance, and the implications of sharing it all with cloud providers. Like most enterprises, however, their biggest limitation in scaling Gen AI is expected to be access to talent.

Enterprises across industries have been reorganizing to become flatter and more distributed. This can help them break down silos, develop more cross-functional capabilities, and—critically—become more agile and nimble in a fast-moving and complex world. Arguably, CSPs have not often been at the forefront of this flattening of the business hierarchy. Generative AI can help CSPs reduce organizational complexity and cost through sophisticated automation that replaces certain tasks. But to get those capabilities, CSPs may need to compete for very expensive talent that may not see telecom as their first choice of employment.

There are more connectivity providers offering more options to consumers for wireline, wireless, fixed wireless, and even space-based networks.[1] At the same time, digital subscriber line (DSL) networks based on copper are being de-emphasized or phased out, with providers focusing on more modernized connectivity.[2] With vast geographies to serve—and relentless demand for connectivity—CSPs are expected to continue working to balance costs and revenues while establishing their role in a more diverse ecosystem of providers.

Traditional providers see increased competition for enterprise connectivity from nontraditional players. For much of the internet era, CSPs have built enterprise networks with managed lines connecting offices and data centers. But as more businesses moved onto the cloud and to hybrid and multi-cloud networks, they needed more flexible and scalable connectivity. Cloud providers began offering their own connectivity solutions optimized for their clouds, with scalability and consumption-based fees and a storefront that many customers already use for cloud.[3] If enterprise customers increasingly look to cloud providers and integrators for these solutions, CSPs could see more competition and may need to focus on defining their role in the new ecosystem of connectivity.

In 2024, makers of telecom equipment could also confront the current and ongoing 5G wireless connectivity spending trough. This pattern isn't new; it happened with 3G and 4G. Five years into the 5G upgrade cycle, smartphone sales are the lowest in a decade, and revenues from radio access networks (RAN) are declining, even as the market shifts to Open RAN.[4] The trough may also be eroding profits for equipment makers and setting up potential consolidation of vendors. Having spent billions to build out 5G networks—and many more billions spent by all the tech and services that enabled the migration from 4G—CSPs may still be looking for the payoff from 5G.

Like all times of great change, there are risks and opportunities. CSPs have large cost burdens and larger responsibilities to deliver reliable connectivity and quality of service. In 2024, their investments could be challenged to pay off, and the businesses they once held dominion over will likely face strong competition from multiple quarters, especially in home broadband. Yet they may also have an opportunity to redefine their place in the connectivity ecosystem and strengthen their future position.

In our *2024 telecommunications industry outlook*, we'll take a closer look at these major forces at play and five key trends expected to shape the industry in the year ahead—and beyond.

# Telecoms are operationalizing generative AI

Like many industries, telecom is already being impacted by generative AI.[5] CSPs are evaluating and experimenting to understand what it takes to implement generative AI: what the costs look like, what the return on investment is, where they can develop early use cases—and where they can't yet. As they work to operationalize their generative AI models, more opportunities are emerging, especially in customer care, customer service, and network performance.[6]

Generative AI offers CSPs pathways to make sense of the unstructured data they have across different parts of the business.[7] This can enable them to start breaking down data silos, for example, by bringing together customer care transcripts, network logs, and maintenance records. Providers may then better equip a customer service agent, field tech, or tower operator by delivering insights directly suggesting the best response or action. Such copilot relationships can potentially empower productivity across data-driven parts of the business.

Still, enabling and operationalizing generative AI requires work to build the right foundations and ecosystem relationships.[8] For many, this starts with modernizing their data systems.[9] Diverse and unstructured data sets, like those for customer service and network operations, may need to be brought together into a more coherent repository that can be used to train foundational models. Investing in operational support systems (OSS) and business support systems (BSS) data to feed

models could enable better results.[10] CSPs should also consider their data security and compliance, especially for personally identifiable data and sets that may combine public and private data. Ultimately, data quality and governance can be key to developing robust models that mitigate risks.[11]

Once the data is conditioned, CSPs should consider whether they want to build, buy, or rent generative AI training and inference capacity, as well as the hardware needed. Hyperscale cloud providers offer training and inference, but CSPs should understand the costs of both, how much they think their use cases might scale and demand more inference, and how much of their data they're willing to share with third-party providers to keep models up to date.[12] CSPs should determine if a specific use case could be done with standard machine learning or if they require large language models. If they do need foundational models, how much data is needed to train one, and how much will it cost to do so? Once deployed, the amount of usage will determine operational fees: more requests to the model requires more inference, computation, and packets over the network.[13] Finally, relationships with hyperscalers may need to set guardrails on data usage. CSPs should negotiate the terms of data-sharing to ensure their data remains exclusive, or may need to "go it alone" and build their own infrastructure.
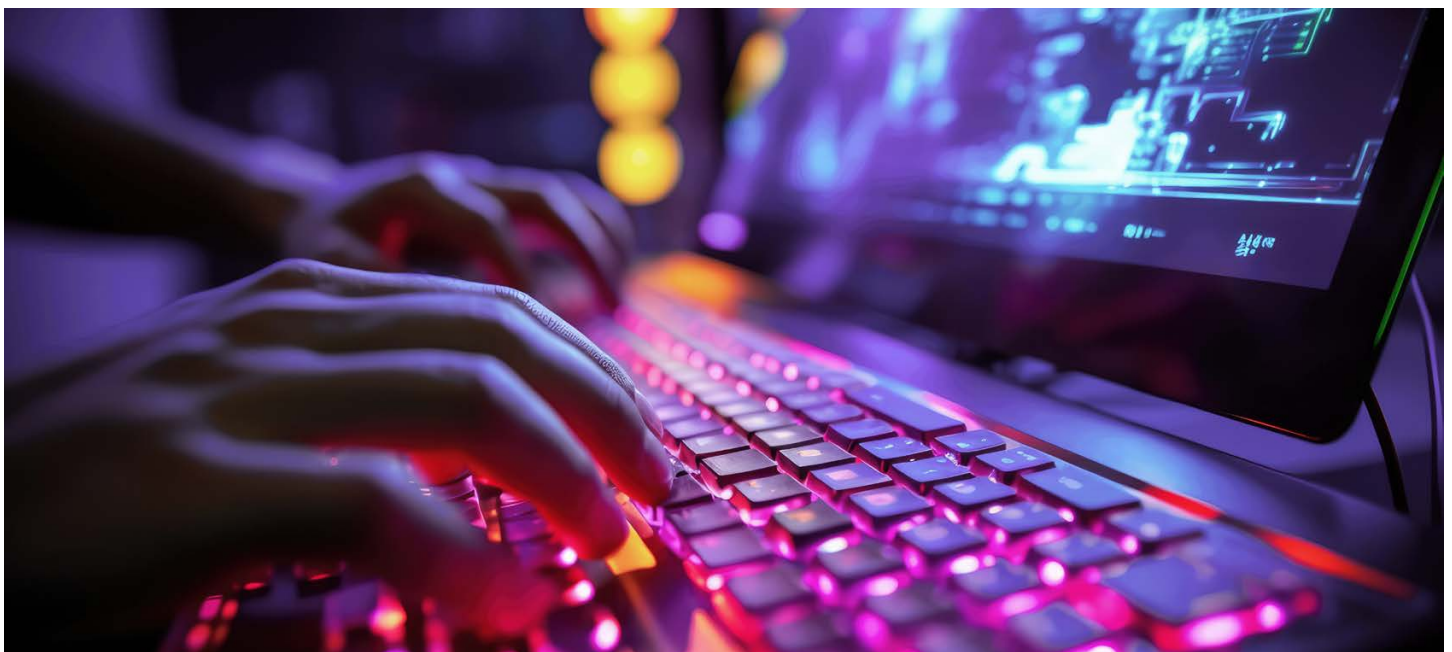
Over time, some providers may find that certain workflows and data sets are best in the cloud while others should live in their own data centers. The latter should consider the costs of building generative AI accelerator data centers and the challenges of securing the chips required. Smaller CSPs may get generative capabilities in their existing software-as-a-service (SaaS) subscriptions, but these will be native to SaaS providers, not to the CSP. As Deloitte has shown in our *2024 Global TMT Predictions*, some may also build generative models trained on their own private data.[14] A multi-cloud environment could lead to multiple models needing additional integration, security, and talent. Still, some CSPs may have a fundamental distrust of cloud and won't advance on generative AI until they can control all the infrastructure. Given the fast pace of adoption, however, they may be at a competitive disadvantage if they choose to take it slowly.

To advance their generative AI strategies, CSPs will likely need to secure the right talent.[15] This could mean competing against other industries that can offer higher salaries and stock-based compensation—or reskilling their own talent. Having data scientists who understand this information can help organizations more effectively condition data and develop training sets and guardrails to help ensure reliable and valid results. Frontline talent may also need to evolve to be able to leverage generative AI effectively in their day-to-day work. This could require additional resources to support an employee-facing user experience.

Security experience should also be updated to include emerging attack vectors, such as prompt injection, and the unique surface area of vulnerability of a conversational interface that could potentially share data from its training set.[16] Executives should prioritize security and risk analysis that understands how these

systems can be compromised without proper development and oversight. CSPs should clearly articulate how their data governance and operating models come together to produce the most value while mitigating risk.

The strongest use cases for generative AI are likely still being discovered, but the fundamental capabilities are clear and are already driving strategic planning and investments across industries.[17] Smaller CSPs may wait or rely on generative AI capabilities from their SaaS providers, but larger CSPs may need to go all in to stay competitive. All CSPs should proceed with caution and continue experimenting.

Strategic questions to consider:

- How should CSPs prepare to implement generative AI? What is needed for data, training and inference, security, and talent?

- When and where should a CSP build, buy, or rent capabilities? What ecosystem relationships are necessary, what are their costs, and how do they need to be secured to protect proprietary data?

- Even if CSPs want to own their own generative AI hardware, prices are currently high and chips are hard to get. Does it make sense to wait until late 2024 or even 2025 before securing hardware?

- What are the risks of moving too early or too late?

New ways of working

As telecoms move toward flatter work structures, generative AI can make that transition both more urgent and more complicated. It's a bit of a chicken-and-egg situation: Generative AI may make it easier to flatten work structures in some mainly nontechnical areas, but telecoms need to attract the right kind of generative AI talent that may expect the workplace to already have become less hierarchical.

Across industries, workplaces have been shifting toward flatter organizational structures that give individual employees more power and autonomy.[18] Although global telecom organizations may have lagged in this shift until now, they likely need fewer silos and more cross-functional corporate structures. They also need more tools and technical processes, including Gen AI, to help accommodate the growing technological requirements of the industry.[19] Existing IT and tech workers within telecom organizations can help drive the internal shift toward collaborative models across functions to solve complex problems, but telecoms should also consider reorganizing to attract more and different IT and tech talent, especially around Gen AI. Some organizations may need to bring in talent from outside of the industry, especially from the technology sector, who can help reshape teams to be more agile.

Generative AI may require CSP organizations to evolve faster. Recent developments in generative AI and other automation technologies are beginning to reshape nearly every part of telecom organizations globally, from internal functions to customer relationships and even complex network maintenance tasks.[20] Like many other industries, these developments may change how some lower-level telecom roles work and drive adjustments in talent strategy. Given the ongoing, intense competition for talent, organizations should consider retraining and redirecting these employees to support the organization in other capacities where possible. Moreover, implementing AI technologies will likely also require telecoms to focus on hiring more technical talent, which is already in high demand from other industries that often offer more competitive salaries and have a reputation for being more cutting edge among employees.[21]

Overall, telecom organizations may struggle to compete for this talent more than other technology sectors due to high costs and competition against industries with a reputation for more operational flexibility. As a result, telecom organizations should focus on retaining and upskilling technical employees wherever possible. Opportunities also exist to recruit among often overlooked talent demographics that can be trained with technical skills, including individuals who don't have traditional degrees, those who are making career shifts, those returning to the workforce after a break, or young professionals who might be looking for early career opportunities to do technical work.

Telecom organizations globally have continued to reduce their workforces to cut costs throughout the past year. Some of these cuts may have been related to automation and AI, while others were due to lower-than-predicted profits caused by cost-cutting measures to meet profitability targets.[22] Continued reductions to telecom workforces may continue into 2024 as organizations could trim costs to match consumer demand and direct new resources toward growing technological opportunities. Balancing cost-cutting and short-term profitability with the potential for developing a competitive advantage through new automation technology will likely be a major challenge over the next year that organizations should navigate with caution.

Strategic questions to consider:

- As talent structures shift to make way for less-hierarchical, cross-functional models, how can CSPs empower their employees to take accountability for their growing roles within the business?

- What resources can organizations adopt to upskill their employees to be ready for incoming technological developments?

- What roles within organizations can be supplemented with generative AI technology? Which staff members can generative AI free up to focus on other areas of the business?

The new home broadband reality: More options mean more competition

In 2024, US consumers will enjoy far more options for broadband connectivity. Some Americans could have nine or 10 possible services from a mix of terrestrial wireline, terrestrial wireless, and space-based wireless networks.[23] Not all those services are equally fast, but not all consumers need the highest speeds, and slower services such as fixed wireless access and satellite may be enough for some. Further, some of the newer options are significantly cheaper, which may have an impact on US broadband pricing, already among the world's highest.[24] The abundance of options reflects more competition among providers—and technologies— working to meet the evolving connectivity needs of consumers.

Households in the United States are adopting more wireless solutions. Deloitte's 2023 Connected Consumer Survey reported that 12% of home internet users said they have a fixed wireless connection, up from 6% in the 2022 survey.[25] The majority of these surveyed (52%) indicated that their fixed wireless connection is powered by 5G technology. This represents a considerable increase from 2022, when only 32% of the fixed wireless access (FWA) users in our survey reported 5G connections. Indeed, 5G FWA has been capturing broadband share rapidly, accounting for 90% of net additional broadband internet subscribers in 2022, and is expected to continue at 80% to 90% through 2024.[26]

Low-Earth orbit (LEO) satellite providers have also shown healthy US subscriber growth—and not just in hard-to-reach areas.[27] Both LEO and FWA are adding subscribers (millions of homes per year in the United States), but they may be gaining more share from additional markets than was originally thought.[28]

Initially, it seemed likely that most customers switching to FWA would be former DSL subscribers, specifically those who were miles away from telecom central offices and whose DSL speeds were slow. About 13% of US broadband subscribers are on DSL,[29] but the top five providers of DSL have been phasing out their DSL services over the past few years, focusing on replacing aging copper lines with optic fiber.[30]

However, in recent quarters it seems that the growth in FWA subs is also coming at the expense of cable subscribers, with the number of cable broadband net adds falling or even going negative.[31] Although cable broadband speeds tend to be higher than FWA, they also tend to cost more for consumers.

This can change the competitive pressures for consumer wireline products. Though cable companies may be seeing slowed broadband growth—or actual subscriber losses—they are gaining from the telecoms by offering more mobile virtual network operator (MVNO) wireless bundles, as we cited in our 2023 telecom outlook.[32] While FWA and satellite are adding subscribers, both telecoms and governments are pushing fiber to more areas. But not everybody needs (or will pay for) fiber speeds.

Most US consumers now have more choices for how to obtain internet service, and historically underserved areas are seeing more funding to extend broadband coverage. According to the Federal Communications Commission, as of June 2021, almost 61% of households had a choice of *three or more* wireline providers.[33] Adding to the options, satellite internet service now covers the entire United States (although with limited ability to support many users per square mile), and FWA is available to many consumers as well.[34] Further, CSPs are working with satellite companies to offer rural and remote coverage in areas where they don't have fast enough terrestrial networks.[35]

This is also a national imperative. Broadband connectivity is increasingly viewed as critical for equitable access to jobs and educational opportunities. In November 2021, US President Biden signed into law the Infrastructure Investment and Jobs Act, dedicating $65 billion to expand access to reliable high-speed internet.[36]

The majority of the funds are allocated to Broadband Equity, Access, and Deployment (BEAD), a $42.45 billion grant program for states, that is funding project planning, infrastructure installation, and broadband adoption to bring broadband internet (defined by the FCC as minimum download and upload speeds of 100 Mbps and 20 Mbps, respectively) to underserved and unserved communities.[37] Additional government funding includes $1 billion for building out 12,000 miles of "middle-mile" fiber optic infrastructure across 250 counties and $2 billion for providing high-speed internet in rural areas.[38]

For CSPs, more connectivity solutions, more providers, and larger government mandates may add some uncertainty to the year ahead. But it may already be lowering the cost of connectivity for US households, potentially encouraging more subscribers.[39]

Strategic questions to consider:

- What is the right strategy for attracting and retaining broadband customers in the face of increased competition? Can CSPs bundle additional services (such as mobile, home security, entertainment) to make their offerings more attractive, as is already done in Europe?

- What are the implications for CSP strategy and business plans if downward pressure on prices intensifies?

- As the broadband landscape continues to reshape, what kinds of new partnerships should CSPs consider?

- How can CSPs optimally utilize government infrastructure funding?

CSPs work to define their role in enterprise connectivity

The shape of enterprise connectivity has evolved, calling for more integration across provider ecosystems and yielding more connectivity offerings from cloud providers. Cloud providers have taken a stronger role in providing connectivity solutions that reinforce performance for their cloud offerings, drawing them into closer competition with CSPs. As some buyers of connectivity services could see cloud companies as possible alternatives to CSPs, 2024 may add more pressure on CSPs to further differentiate their offerings while reinforcing their strengths in the modern enterprise.

A bit of history helps. To support distributed businesses and functionality, many companies shifted their workloads to the cloud. High cloud rents—combined with the recent rise of hybrid workers, remote access, and an array of endpoints—have led more companies to develop hybrid networks across multiple cloud regions and on-premise data centers. This may change their connectivity profile considerably, with implications for how CSPs can integrate with a more diverse ecosystem.

With cloud becoming more of a centerpiece of enterprise data and communications architectures, it's driving more connectivity solutions that don't necessarily require CSPs. When enterprise connectivity was mostly between data centers and office buildings, providers sold dedicated lines between them—typically multiprotocol label switching (MPLS). Providers offered MPLS as a managed and dependable service, but they could be costly to build, had mostly fixed bandwidth, and were difficult to modify to address changing needs.

As enterprise networks grew to have more operations in the cloud and across multi-clouds, supporting mobile users and remote access, networks have looked to become more nimble and easily scalable. With so much traffic potentially moving away from their networks to competing solutions providers going over the top, CSPs responded by offering and managing software-defined wide area networks (SD-WANs) that run over the internet and can easily scale without any bandwidth limitations.[40] But in doing so, they may have facilitated the shift of enterprise connectivity away from their own lines. At the same time, cloud providers have been playing a stronger role in managing network connectivity to control more of the performance and scalability of their services. In a return to dedicated lines, cloud providers now offer connectivity capabilities over their own fiber networks.[41]

Many modern enterprises have these components across their networks. This can change the makeup of communications infrastructure and may be shifting the ecosystem toward cloud providers offering their own connectivity solutions optimized for multi-cloud and hybrid architectures. This means that enterprise customers could increasingly look to cloud providers and integrators, as well as incumbent providers such as CSPs, for support and guidance in how they design and implement connectivity—something they used to rely solely on CSPs for.

For the enterprise CIO, determining which parts of their infrastructure go to the cloud and which they want to keep on premises can lead to these kinds of connectivity questions: What should they buy, and from whom, to enable a modernized architecture that weds connectivity, computing capacity, and software services? Additionally, many enterprises have existing networks that were defined for older architectures that still should be maintained while they implement and scale their new solutions. This can add further cost burdens and risks in deciding how best to modernize their network and compute infrastructure.

For CSPs used to defining networks for their enterprise customers without other players being involved, the shift to multi-cloud and hybrid may require them to adapt as well. They face evolving enterprise architectures that not only change the shape of connectivity requirements but also demand more collaboration or partnering with cloud providers and ecosystem partners. Telecoms can leverage their strengths in 5G and edge computing, as well as their real estate footprints, to collaborate with cloud providers on edge-to-cloud solutions. This can further enable enterprise customers to act quickly on data where it is captured, then integrate it back to their cloud. As enterprise networks become more complex and distributed, more integration and orchestration may be required. Further, as companies increasingly are disclosing their scope 3 emissions, CSPs may want to consider their CO_2e footprint as it compares with hyperscalers providing comparable enterprise services.

CSPs can help provide better and more connective tissue across these ecosystems and offer hyperscale cloud providers the opportunity to better integrate with CSP infrastructure. This may be an imperative for CSPs to help them replace legacy product revenues and margins with next-generation solutions of advice, integration, and management.

Strategic questions to consider:

- How can CSPs drive growth as enterprise customers indicate demand for new cloud architectures? How can CSPs work with cloud providers and avoid being cut out of the process?

- Is there a way to differentiate products with innovative ecosystem monetization models, rather than end-to-end ownership?

- Are there new business models for how enterprise companies want to purchase connectivity?

- What do they buy, and from whom, to enable this new network/compute architecture?

Post-peak 5G spending trough and vendor consolidation

Although 5G networks are still being launched in some new geographies, and networks are being made denser with more towers and antennas, the bulk of CSP spending on 5G equipment and spectrum seems to be behind us, and there are few signs that the trend will reverse. This has positive implications for CSPs that may have higher free cash flow as 5G build-out settles but has negative implications for the companies that make 5G wireless equipment. If annual revenues fall too far, the industry may see fewer vendors.

Since 1990, roughly once per decade, the global wireless industry has upgraded the entire ecosystem: 2G in 1992, 3G in 2001, 4G in 2010, and 5G in 2019.[42] Each generational upgrade required mobile network operators (MNOs) to spend billions of dollars globally on RAN and spectrum; it also requires the distribution of new phones to consumers to take advantage of the new technology and networks. The companies that make RAN gear (the original equipment manufacturers, or OEMs) and the companies that make phones saw their revenues and profits grow rapidly during the adoption phase of each upgrade cycle—and then flatten or decline until the next generational upgrade occurred.

In 2024, the industry will likely be in such an intergenerational trough. Smartphone sales fell 5% in 2023 to 1.16 billion units, the lowest in a decade.[43] As we showed in our *2024 Global TMT Predictions*, vendors of leading online applications are not expected to require more bandwidth from users for at least the next two years.[44] Meanwhile, RAN revenues peaked in 2021, were relatively flat in 2022, and, by the first half of 2023 were "declining at the fastest pace in seven years."[45]

But what is a headwind for OEMs is often a tailwind for telecoms. Over the past decade, their capital intensity (capital expenditures as a percentage of revenues) has been in a range between 16.3% and 17.8%—at the high end, that's about $330 billion globally per year.[46] At a high level, lower capital intensity and higher margins is a good thing for telecoms, as higher free cash flows can be used to pay down debt, return to shareholders via dividends, invest more in building out fiber optic access networks, invest in OSS/BSS transformation (a projected $80 billion market by 2028),[47] and invest in generative AI infrastructure.

In the big picture, how much do intergenerational wireless spending troughs matter? In the 1990s, there were more than a dozen large companies globally that made RAN gear. There are now about five to six that have more than 90% of the market.[48] Each trough has seen vendor consolidation, and it seems likely that the 5G trough could lead to a similar outcome. However, with recent technology sanctions, many telecoms may have fewer choices for vendors offering wireless equipment.[49] If there is further consolidation, there could be what amounts to a single vendor in some markets. In contrast, wireline markets (fiber, cable, etc.) have greater supply chain diversity and choice between vendors.

As a further complication, up until recently almost all RANs were closed ecosystems. As we predicted in 2021, there is a slow but gradual shift to an increasing percentage of Open RAN architectures.[50] Although it's still early days, and Open RAN was still not widespread in 2023, forecasts are for it to be 15% of global RAN sales by 2027.[51] It is also possible that growth in Open RAN will see a proliferation and deepening of supply chain alternatives in the RAN market. Further, telecoms could use Open RAN as a means of creating a more flexible and cost-efficient network infrastructure.

All of this assumes there's not a 6G upgrade cycle in the near term. At this time, 6G has not even been defined (likely 2025–2028), and most analysts are not expecting a commercial launch until 2030— with the full revenue ramp likely occurring in the following years.[52] A complicating factor is the development and release of 5G Advanced in 2024–2025, based on the 3GPP Release 18 and 19 updates.[53] It offers a number of improvements over 5G (releases 15, 16, and 17), supporting much improved network energy efficiency, AI/ML RAN automation, XR (VR, AR, MR, etc.), and more advanced MIMO antenna technology— and may delay or even obviate a move to 6G in the next decade.[54]

Strategic questions to consider:

- Will we see further OEM consolidation? What implications would reduced vendor choice have for buyers of RAN gear? Will Open RAN technology help expand vendor choice? Will buyers of network gear increasingly select vendors based in part on their willingness to support Open RAN?

- Given the lack of 5G monetization from MNOs, and few or no imminent "killer apps" for either consumers or enterprises that require higher speeds and lower latencies, is it possible that 5G Advanced gets pushed back, which could have a knock-on effect and push 6G back? What would that do in terms of lengthening the intergenerational spending trough?

- Although we've focused on telecoms and OEMs, there is an entire ecosystem of companies that rely on a decadelong cadence of generational upgrades—smartphone makers, smartphone vendors, semiconductor companies, tower and construction players, and more. What impact does the current trough have on these, and what could an extended trough do?

Signposts for the future

With so much change driven by the evolution of technologies and behaviors, what are some of the signposts to look for as this 2024 outlook unfolds?

We will be looking for signposts around the use of generative AI. How much will CSPs (along with companies in other industries) adopt, deploy, and implement generative AI capabilities? Other potential indicators could be CSPs purchasing their own Gen AI hardware, building their own foundational Gen AI models, or offering private Gen AI services in competition with other players. Intimately linked with that, how will salaries and headcount in the Gen AI space evolve in 2024? CSPs may need to hire the talent to both offer new services to customers and also help address their own evolving talent needs.

We will be observing the rate of FWA subscriber additions in 2024: They are expected to be about the same as in 2023, and any increase or decrease in subscribers could be meaningful, especially if we see decreases in other kinds of broadband connections. Equally, the number of satellite broadband subscribers is going to be watched closely as additional satellites and even entire constellations are launched. At the same time, US companies continue to deploy fiber, and those subscribers are likely to grow … but how quickly?

Although capital expenditures on 5G may have peaked, there are other forms of capex required, and many CSPs must manage their debt, so a decline in interest rates could be a significant tailwind for many, as would a decline in inflation and energy costs.[55] We expect spending on 5G network gear to slow, though it is unclear how much. Equally, a faster-than-expected shift to Open RAN could disrupt that market, lowering prices and admitting new entrants, as well as possibly shifting incumbent market shares. Finally, shifting geopolitical issues could make buying various kinds of telecom gear or components easier or harder than in 2023. Still, as we've shown here, we expect the trends in our outlook to play a strong role in shaping the connectivity landscape.

Contacts

Jana Arbanas
Vice Chair
US Telecom, Media & Entertainment
Sector Leader
+1 415 987 0436
jarabnas@deloitte.com

Jack Fritz
Principal
Deloitte Consulting LLP
+1 312 218 6097
jacfritz@deloitte.com

Dan Littmann
Principal
Deloitte Consulting LLP
+1 312 486 2224
dlittmann@deloitte.com

About the TMT Center
Deloitte's Center for Technology, Media & Telecommunications (TMT Center) conducts research and develops insights to help business leaders see their options more clearly. Beneath the surface of new technologies and trends, the TMT Center's research can help executives simplify complex business issues and frame smart questions. The TMT Center can help executives better discern risk and reward, capture opportunities, and solve tough challenges amid the rapidly evolving TMT landscape.

Endnotes

1. Based on Deloitte's internal analysis.

2. Tyler Cooper, "The end of an era: Is DSL internet still available?," *BroadbandNow*, December 7, 2023.

3. Armita Satari, "Telcos and the public cloud: Drivers and challenges," Telecoms.com, February 24, 2023.

4. Counterpoint, "2023 global smartphone shipments to hit lowest level in almost a decade," press release, November 30, 2023.

5. Altman Solon, "Telecommunications' next frontier: Navigating the generative AI imperative," September 2023.

6. Ben Abbott, "Australia's telecommunications industry following global peers on generative AI," *TechRepublic*, October 6, 2023.

7. *The Economist*, "AI is setting off a great scramble for data," August 13, 2023.

8. Mohamad Said and Baris Sarer, "Operationalizing generative Ai in the enterprise," *Deloitte CIO Journal* for *Wall Street Journal*, November 10, 2023.

9. Tom Davenport and Maryam Alavi, "How to train generative AI using your company's data," *Harvard Business Review*, July 6, 2023.

10. Ari Banerjee, "How generative AI will change the game for telcos," *Telecom Review*, October 16, 2023.

11. Ray Pulapaka, Elliot Stamp, and Mo El-Jarad, "Data governance perspectives on generative AI," Deloitte, August 2023.

12. Mike Walsh and Nitin Mittal, "To scale GenAI, companies need to focus on 3 factors," *Harvard Business Review*, December 1, 2023.

13. Edouard d'Archimbaud, "The challenges, costs, and considerations of building or fine-tuning an LLM," *HackerNoon*, September 1, 2023.

14. Chris Arkenberg et al., "Taking control: Generative AI trains on private, enterprise data," Deloitte Insights, November 29, 2023.

15. Stephanie Palazzolo, "The AI talent wars heat up; the bankers banking on AI deals," *The Information*, November 13, 2023.

16. Scott Crawford, "Generative AI's novel security challenges," S&P Global Market Intelligence, November 22, 2023.

17. Anielle Guedes, "How generative AI is impacting industries," International Data Corporation (IDC), July 6, 2023.

18. Christina Brodzik et al., *New fundamentals for a boundaryless world*, Deloitte Insights, January 2023.

19. Tammy Whitehouse, "'A strong sense of purpose': AT&T tech, HR tag-team on transformation," *Deloitte CIO Journal* for *Wall Street Journal*, October 13, 2023.

20. Ibid.

21. Taryn Plumb, "Telecom industry must address its talent shortage—here's how," SDxCentral, August 29, 2023.

22. Ray LeMaistre, "BT will not be alone in making massive job cuts—analysts," *TelecomTV*, May 18, 2023.

23. Based on Deloitte's internal analysis.

24. Lyndon Seitz, "How do U.S. internet costs compare to the rest of the world?," BroadbandSearch.net, October 8, 2023.

25. Jana Arbanas et al., *Connected Consumer Survey 2023*, Deloitte Insights, 2023.

26. Alan Weissberger, "Leichtman Research Group: Fixed wireless services accounted for 90% of the broadband net adds in 2022!," *Technology Blog*, IEEE Communications Society, March 6, 2023.

27. Michael Kan, "SpaceX: Starlink now has 1.3 million customers in the US," *PCMag*, December 13, 2023.

28. Ibid.

29. According to a 2022 study of internet at primary residences, cable leads with 49% of the U.S. internet service market share, followed by FTTH at 21% and DSL at 13%. The remaining market share is composed of mobile at nearly 12% and fixed wireless access at roughly 3%. *See* Diana Goovaerts, "FBA: Fiber a factor in move decisions as more head for rural areas," Fierce Telecom, August 23, 2022.

30. Cooper, "The end of an era: Is DSL internet still available?"

31. Jeff Baumgartner, "Charter warns of possible broadband sub losses in Q4," *Light Reading*, December 5, 2023.

32. Jana Arbanas and Dan Littmann, *2023 telecom industry outlook*, Deloitte, 2023.

33. Jessica Dine and Joe Kane, "The state of US broadband in 2022: Reassessing the whole picture ," Information Technology and Innovation Foundation (ITIF), December 5, 2022.

34. *BroadbandNow*, "Satellite internet providers," accessed November 27, 2023.

35. Pew, "How do Americans connect to the internet?," July 7, 2022.

36. National Telecommunications and Information Administration, "Investment meets impact: Celebrating the 2nd anniversary of the Bipartisan Infrastructure Law," Office of Public Affairs, accessed November 27, 2023.

37. Congressional Research Service, "Broadband Equity, Access, and Deployment (BEAD) Program: Issues and congressional considerations," June 15, 2023.

38. The White House, "Fact Sheet: Biden-Harris administration celebrates historic progress in rebuilding America ahead of two-year anniversary of Bipartisan Infrastructure Law," November 9, 2023.

39. Joy Wiltermuth, "High-speed internet is getting cheaper in America, according to a new study," MarketWatch, February 8, 2022.

40. Cloudflare, "SD-WAN vs. MPLS: SD-WAN benefits and drawbacks," accessed December 10, 2023.

41. Volico, "What's the difference between interconnect, direct connect, and cross connect in data center?," February 28, 2023.

42. Ritesh Bendre, "The current state of 5G deployment, challenges and more," 21:19, *The Counterpoint Podcast*, March 5, 2020.

43. Ibid.

44. Paul Lee, Dieter Trimmel, and Eytan Hallside, "No bump to bitrates for digital apps in the near term: Is a period of enough fixed broadband connectivity approaching?," Deloitte Insights, November 29, 2023.

45. Dell'Oro Group, "RAN declines at the fastest pace in seven years, according to Dell'Oro Group," press release, August 22, 2023.

46. Joanne Taaffe, "Telco capex rises sharply amid 5G and fiber investment," TM Forum, October 7, 2022.

47. Alex Bilyi, "CSPs' spending on telecoms-related OSS/BSS software and services will reach USD80 billion by 2028," Analysys Mason, November 13, 2023.

48. Naima Hoque Essing et al., "The next-generation radio access network: Open and virtualized RANs are the future of mobile networks," *TMT Predictions,* Deloitte Insights, December 7, 2020.

49. Federal Communications Commission (FCC), "FCC bans authorizations for devices that pose national security threat," press release, November 25, 2022.

50. Essing et al., "The next-generation radio access network: Open and virtualized RANs are the future of mobile networks."

51. Dell'Oro Group, "5-Year Open RAN forecast revised downward, according to Dell'Oro Group," press release, July 19, 2023.

52. Harald Remmert, "When is 6G coming, and what does it mean for 5G and 4G LTE?," Digi, August 24, 2023.

53. 3GPP, "Release 18," accessed December 10, 2023.

54. Imadur Rahman et al., *5G Advanced: Evolution towards 6G*, Ericsson, June 2023.

55. Jan Frederik Slijkerman, "How telecom companies are weathering the impact of rising energy prices," ING, February 7, 2023.

Deloitte.