COLLABORATION

Networks for Artificial Intelligence and Artificial Intelligence for Networks: Implications for Telecommunications

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Abstract

The development and widespread growth of AI tools and solutions creates opportunities with significant positive effects for nearly all economic, social, and governmental sectors. For the telecommunications industry, the transition to AI is a challenge but also an opportunity. On the one hand, telecommunications enable AI; however, the increased use of online services based on AI will put additional pressure on connectivity networks, their costs, management, and the sustainability of investments required to maintain and expand them. On the other hand, successfully integrating AI into the optimization and management of the telecommunications value chain creates opportunities to increase business profitability and design value propositions for end users and industrial customers.

Keywords: AI, Telecommunications, Networks, Connectivity, Digital Ecosystem

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Introduction

The development of AI tools and solutions is generating a positive impact in all sectors, although it is important to address the risks associated with their use. The transformation is relevant for sectors related to connectivity, infrastructure and digital systems. Specifically for the telecommunications industry, the transition to AI is a challenge but also an opportunity.

On the one hand, telecommunications enable AI, but the increased use of online services based on it will put additional pressure on connectivity networks, their costs, their management and the sustainability of investments riquered to maintain and expand them. On the other hand, successfully integrating AI into the optimization and management of the telecommunications value chain creates opportunities to generate efficiencies that impact business profitability, as well as design value proposals for end-users and industrial customers. In addition, AI can be an enabler and catalyst for the transition of telecommunications companies into companies providing technological solutions leveraged on capabilities and resources related to connectivity network infrastructure and management.

The AI Revolution Begins

Advances in AI in recent years position it as one of the technologies with the greatest potential to transform the economy and society by automating tasks at the decision-making scale and (Basso *et al.*, 2025). The expected potential of AI use is based on its ability to process information and automate complex processes, and generate efficiencies and innovation in modern digital economies and societies. Eventhough there are obstacles to its deployment, widespread growth and escalation in the short term, its adoption is imminent. Technology is rapidly becoming a fundamental layer in the processes of public and economic value creation, as well as in the experiences of service users and productive sectors in the digital ecosystem that employ it.

It is not easy to define clearly what AI is. In general, the diversity of definitions focuses on its intention or ability to fulfill objectives and

perform functions related to, or at least imitating human skills and intelligence: perceiving, reasoning, decision-making, reacting and relating to the environment, as well as internalizing processes of understanding, learning and feedback (Sheikh *et al*., 2023). The European Commission's High Level Expert Group on AI defines it as systems that prove intelligent behaviour by analyzing their environment and taking actions, with a certain degree of autonomy, so as to achieve specific objectives (European Commission, 2018). It also categorizes technology into two basic types, those systems based purely on software, acting in the virtual world (voice assistants, image analysis software, search engines, speech and face recognition systems), and those that can be integrated into physical devices (such as advanced robots, autonomous vehicles, drones or Internet of Things applications).

Another useful typology to classify AI is according to its practical applications (Sheikh *et al*., 2023). There are at least five general types for everyday use: Machine Learning, Computer vision, Natural language processing, Speech recognition and Robotics. There are also applications that combine various functionalities of these types such as generative AI (Gen AI) for content creation or the Edge AI or IA at the edge, which performs AI processing locally on devices and not in the cloud (Annex 1). All of them with different characteristics and potential uses that together are begining to revolutionize the digital economy and society, and the operation of networks.

AI requires three layers of key enablers to its deployment and escalation: (1) access to large volumes of data to train and operate models, (2) data infrastructure such as data centers and cloud platforms for data storage and computer processing and (3) electronic communication networks for data exchange and distributed AI operations (Stryker, 2024).

Intelligent systems are embedded in infrastructure and processes related to the digital transformation of public and private services, as well as industrial uses in a wide range of sectors. In addition, generative AI is becoming a digital tool available to more people and workers. Its acceptance and mass use will redefine the way people

and businesses relate to digital and physical environments, which has significant implications for the digital ecosystem in general and telecommunications in particular.

Networks for AI - AI for networks: implications for the digital ecosystem and telecommunications

Telecommunications is positioned at a key intersection in the advancing AI era: networks as a key element for AI development and exploitation, and AI as a strategic resource to enhance network and business models in telecommunications (Jarich, 2025). On the one hand, networks support computing tasks, communications and data exchange required for the development, training and deployment of AI applications. As in previous booms of digitization, networks will primarily enable the development of digital technologies such as AI.

However, AI will also be a disruptive technology and its impact will advance rapidly across productive sectors and social arenas (Ericsson, 2022; Jarich, 2025). AI applications intended to end-user are democratizing and attracting more and more users. Innovation soars in general and industrial use cases and applications, as well as in competitive strategies in economies, markets, businesses, and organizations to leverage AI. All in a high complexity context for digital environments and telecommunications. Telecommunications operations range from voice, text and data to smart networks solutions that need to be delivered simultaneously. The need for greater capacity to sustain the growing data traffic generated by new applications is prioritized and connected devices are multiplying especially in Internet of Things (IoT) environments. Security risks become more difficult to manage. Customers demand quality user experiences that match their expectations of digital environments use, and manufacturing industries are looking for new connectivity services to help them create business opportunities.

On the other hand, AI promises opportunities for economies and businesses, representing a window for its use in telecommunications networks and operations. Like other sectors and industries,

telecommunications is advancing the adoption of AI solutions in various value chain segments to improve its value offer, generate efficiencies, increase profitability and productivity, as well as remain competitive in a complex sectoral context.

The future of connectivity and telecommunications networks in the AI era

The massification of AI solutions among productive sectors, end users of the digital ecosystem and public platforms will impact data traffic on networks, the demand for infrastructure and connectivity services, and also in new requirements and capabilities in the management processes of the networks that support the entire digital ecosystem. This involves a challenge for infrastructure maintenance and expansion, as well as the sustainability of network investments. Firstly, it is very likely that in the coming years the networks will experience a significant growth of traffic and data exchange needs related to AI. According to Omdia analysis, in 2024, 8% of the traffic on networks was related to new AI traffic, either in software or native AI solutions (use cases that would not exist without AI) or programs with enhanced functionalities with IA (services that existed before AI but that now some functionalities are being improved with its incorporation) (Korolov, 2025). At the same time, 27% of the traffic was concentrated on software functionalities and applications that are not related to AI (even if the applications have such functionalities). Conventional traffic, that is applications without any AI functionality, accounted for 66% of the total. The 39 exabytes of AI-related traffic recorded in 2024 is expected to reach up to 79 exabytes in 2025. In addition, the growth rate of AI traffic is projected to be higher than that of conventional traffic (Holma, 2024). By 2030, it is possible that more than two-thirds of network traffic will involve AI, especially in video and image content (Shrivastava et al, 2025; Javaid & Zerbib, 2024).

The above is attributed to massive use cases such as generative AI, chatbots, immersive experiences of virtual/augmented reality, video games and streaming generated by IA, but also its use for optimization of solutions and digital platforms, communication links (uplink

and downlink), communication between devices, sensors and data processing (machine to machine), industrial platforms and systems in real time. AI-powered cloud services require data exchange: data and information upload for analysis, processing, delivery of results from AI applications and IoT sensors that deliver data to AI engines.

Secondly, there will be new network requirements and infrastructure provision to support AI-centric applications. In other words, not only will there be an increase in traffic on the networks, but the capacity of these networks will have to be higher to transport larger packets, and maintain continuity and quality in the connectivity service. This includes the need to have more spectrum available for mobile broadband, especially in mid-bands for 5G, sooner than expected to meet the demand for connectivity. Without more spectrum supply at affordable prices in the face of local market conditions, there is a risk of experiencing congestion, reduced quality of service, and lack of capabilities for the development of new AI use cases (Accenture, 2025). For carriers, it can also mean the need to implement efficiency measures for spectrum use and allocation, refarming or the reallocation of frequency bands from 2G/3G to 5G spectrum to boost capacity.

There will be an increase in demand for bandwidth and fiber optic backhaul for data packet-intensive applications (video, generative AI, real-time applications, etc.). Another necessary consideration will be linked to AI solutions that require low latency (manageable with 5G) due to their sensitivity to inconsistency and variability in data transmission (Houpis et al, 2024). Some of these AI applications are those used in industrial IoT solutions, virtual/augmented reality (AR/VR) and real-time services such as translations, video games, autonomous vehicles, or even telemedicine with remote robotic medical procedures.

Network segmentation (network slicing) can help meet AI-driven demands (Jarich, 2025), by partitioning networks to adapt each segment to specific and differentiated needs for latency, bandwidth, technical parameters and network prioritization. This

would help manage, ensure service and prioritize the complexity of traffic generated in an AI-powered digital ecosystem. However, the investment needs for its implementation, the operational complexity and the immaturity of some business models for its application hinder the scenery for its development. AI functionalities that require low latency could lead to decentralization of data center distribution for information processing, network redesign and component integration with new hardware specifications (for example with processing chips) (Body of European Regulators for Electronic Communications [BEREC], 2023). This will bring difficulties for equipment investment, integration with legacy hardware and software systems and implementation of OpenRAN schemes in the context of technical equipment changes (Uitto, 2024).

Finally, thirdly, there is the need to transform the design and operation of infrastructure (Javaid & Zerbib, 2024; Pearson, 2024). In this sense, Edge Computing in networks to shorten the data exchange distances by bringing processing closer to devices, would be useful to complement efforts to meet the requirements of an AI-influenced network and reduce dependence on network backhaul segments (BEREC, 2023). Similarly, carriers should prioritize investments to increase the capacity of the Radio Access Network (RAN) (Jarich, 2025; Holma, 2024). This part of the network is critical to provide both speed and last mile capacity to users.

It is worth mentioning the relevance of access to energy and data centers in adjacent arenas of the telecommunications value chain for the efficient operation of AI solutions.

The challenges of AI in the telecommunications market

Telecommunications networks are the backbone of digital transformation. They provide the necessary data traffic for the online service provision and have enabled the development of a global digital ecosystem. In previous waves of digitalization, connectivity infrastructure has supported and enabled traffic generated by digital service platforms and used up by end users and industrialists for use. Networks have enabled the transition from telephony and messaging

services to the Internet provider and network infrastructure, as well as the emergence of the digital revolution driven by the massification of smart mobile devices and smartphones.

However, telecommunications companies have failed to capture revenue in proportion to the growth in global traffic associated with the emergence of disruptive technologies such as the introduction of smartphones, digital platforms and services, as well as video streaming traffic and mass consumption of social media. Between 2010 and 2023, global mobile data traffic grew by more than 60%, while total telcos revenues remained almost constant with growth of just 1% (Shrivastava et al, 2025). In Latin America, from 2015 to 2023, the average revenue per user (ARPU, for its acronym in Spanish) in real terms has fallen by up to 40% for some carriers in the region, and the profitability of the investments also remains low (cet.la & NERA, 2025).

In addition, the investment requirements needed to meet traffic challenges and pressure on networks pose challenges for infrastructure sustainability. The Center for Telecommunications Studies and NERA estimate that it will be necessary to invest 49,100 million dollars until 2030, in addition to those planned for network operations: 17,000 million dollars to close digital gaps and modernize networks, and another 32,000 million dollars to expand the network capacity to be able to support the increase in traffic (et.al and NERA, 2025). The abovementioned amounts may underestimate the impact and growth of AI functionalities: some estimates indicate that Artificial Intelligence will add between 20% and 80% of traffic to mobile networks, in addition to what was previously projected (Powell & Hatt, 2025).

The deployment and massification of AI in digital environments poses challenges for carries: the increase in demand for connectivity and data traffic, as well as greater complexity in network operation. The exponential growth of traffic in the networks, stagnant revenues, intense regulation and competition in the digital ecosystem, difficulties in increasing profitability and high infrastructure investment requirements represent trends in the telecommunications industry that threaten its development.

The essential question for the telecom business is whether the AI adoption in industry and the broader economy will translate into an opportunity to generate value and increase the income needed to make network investment sustainable, or whether, on the contrary, the disruption of AI will only generate costs for the network infrastructure. The answer may lie in AI itself, which has the potential to be used as a resource and a technological capability that offers opportunities for the telecommunications sector to enable its competitiveness.

Integration of AI into the telecommunications proposal and value chain

AI also represents an opportunity to optimize the internal operations in the telecommunications industry, both for carriers and other sectors related to the connectivity value chain. In other words, not only networks for AI, but AI for networks. In fact, in 2024 globally, the telecom industry is the one in which spending on AI platforms has grown the most and also the sector that invests the most as a percentage of revenues (Basso et al, 2025). Ericsson's research reveals that, already in 2022, 66% of the surveyed carriers had some kind of AI deployment implemented or under development (Ericsson, 2022).

Some market studies indicate that during 2024 about 90% of carriers had integrated AI solutions into their operations, with 48% in pilot phases and 41% with active deployments (Market Growth Reports, 2025). According to a BEREC survey, telecommunications companies consider that its adoption in operational processes will be the criterion by 2030 (2023).

The implementation of AI solutions includes use cases and applications in virtually all segments and organizational processes of the telcos value chain (Wall, 2024). For example, in the area of administrative and corporate management its applications are related to efficiency, cost reduction and automation of processes and systems that support internal corporate operations. These areas include human resources, finance, monitoring systems, marketing and sales processes as well as administrative and legal management. This may also include the development and management of applications for

IT operations, software and technological capabilities related to code writing, system optimization and internal information systems performance (purchase orders and service delivery, collections, billing, etc.). However, AI support for administrative functions is a capacity that will be enabled transversely between economic sectors.

Outside the administrative sphere, the integration objectives of this technology into strategic telecommunications operations are focused on exploiting operator expertise with predictive AI, as well as the use of generative AI to drive efficiencies, improve customer experience and automate complex processes, network management (Market Growth Reports, 2025). This would make it possible to take advantage of technological solutions so as to optimize and generate efficiencies in processes and develop value propositions for its users, customers and service recipients.

Carriers will have to prioritize four strategic objectives to address critical aspects such as operational complexity, revenue weakness and the transformation of telcos in a volatile environment: cost reduction, service differentiation and user experience, safe and reliable operations and revenue growth (World Economic Forum and Accenture, 2025).

Cost reduction

The operating costs of telcos remain globally between 65% and 70% of revenues (Gabriel & Venturelli, 2022 as quoted in World Economic Forum and Accenture, 2025). The annual NVIDIA survey shows that in 37% of carriers, AI may be reducing costs by more than 5%, and 40% of them comment positive reductions but less than 5% (NVIDIA, 2025). In 2022, 63% of surveyed carriers mentioned network operations optimization as one of the main benefits of incorporating AI into their businesses, especially in aspects such as optimization and improvement of network performance and efficiency and anomaly detection (Ericsson, 2022). AI can help in creating cost-effective network designs, automating the components integration from multi-vendor, as well as monitoring performance, and carring out predictive maintenance. In addition, the transition of network infrastructures with monolithic architectures to disaggregated hardware and

software layer architectures required for automation of the networks is promoted (World Economic Forum and Accenture, 2025).

Investing in AI solutions for network operations optimization brings multiple benefits to continuity, stability and quality of service, as well as speed, efficiency and scalability of operations. Given the pressures on network operation, AI becomes a tool to keep low management costs and better return on investment. In the area of intelligent network management, which involves planning, designing, evolving, deploying infrastructure, operating and managing networks, the potential is significant. Some relevant use cases are the development of network architectures and infrastructure, antenna and fiber deployment patterns, traffic and demand projections and optimization, solution deployment automation, maintenance, monitoring, optimization and reconfiguration of real-time parameters and resources, network virtualization functionalities, as well as quality of service, power use, cybersecurity and dynamic spectrum access (GSMA, 2019; Pearson, 2024).

In addition, AI allows performance monitoring, fault detection, as well as predictive maintenance, preventive and real-time adjustments of networks, equipment and functionalities. It also includes traffic/demand management, upgrade, integration and automation of equipment operations and *Network Operations Centers*. AI can be essential for managing complex fiber-optic networks, 5G and 6G, while also accelerating the path to greater management autonomy of these. Similarly, this technology increases the value of *Edge Computing* offerings and solutions for industrial robotics, video surveillance, autonomous vehicles, AR/VR services, network maintenance and monitoring (Hatt & Jarich, 2025).

Differentiation in service and customer experience

More than 70% of survey respondents by Ericsson mentioned this as one of the most important benefits of AI for their business, including customer care and management solutions (Ericsson, 2022). This would allow a differentiation in their services compared to competitors and reverse the drop in revenues. Carriers implementing

AI solutions report significant increases in customer satisfaction (Market Growth Reports, 2025).

This group of solutions includes customer relationships, quality and personalization in care, contact channels, and in general, AI-enabled interactions for user attraction and retention. Chatbots, virtual assistants and digital self-service platforms are key applications in AI adoption. The functionalities also extend to the monitoring and analysis of customer experience data, service quality, churn prediction and proactive retention. And for users in the business segment and industrial applications allows to offer better business-to-business (B2B) services as portals for corporate users designed to manage their telecommunications resources dynamically, with self-service capability, for the provision of IoT devices on the network or troubleshooting connectivity issues on site.

Safe and reliable operations

These administrative functions include high-priority specialized areas such as network security and technology systems that could be leveraged in the IA to detect and address threats to critical infrastructure and operating and customer service platforms. The new risk scenario in digital environments requires telcos to adapt to new threats, but also opportunities, which brings the introduction of AI into cybersecurity issues. This technology works to identify and remedy vulnerabilities, and analyze real-time security incidents or prevent fraud.

Revenue growth

Approximately 25% of telecommunications companies report that implementing AI solutions in their operations increases revenues by more than 5% (NVIDIA, 2025). Some specific initiatives for revenue growth relate to marketing, sales, and product development. In these areas, processes such as product lifecycle management, customer acquisition and retention strategy redesign, market segmentation, user-anticipating customer journeys, marketing targeting and advertising, pricing strategies, offers, and loyalty programs can be transformed. For B2B services, improved infrastructure with AI capabilities can be leveraged and data center services can be offered

alongside cloud, Edge, and connectivity solutions (World Economic Forum and Accenture, 2025; Shrivastava et al., 2025).

In the future, the use of AI could not only generate efficiencies in telecommunications operators' current processes, but could also accelerate and make more profitable the transition to new business models that will lead companies in the industry to cease being solely telcos and transform themselves into techcos, or connectivity and technological solution providers in verticals adjacent to their core business, but leveraged on the capabilities and resources obtained in the delivery of their services. This transition requires a rethinking of operating and business models, as well as the necessary technological layers. Diversification and transitioning to tech companies have the potential to increase revenue and move to other links in the value chain. These links are leveraged by AI to dynamically respond to user needs (World Economic Forum and Accenture, 2025).

Conclusions

In the AI era, telecommunications are at a strategic intersection. On the one hand, connectivity networks enable the development of AI within the digital economy, industry, and society ecosystems. However, the increased demand for connectivity infrastructure, triggered by the use of AI-based solutions, poses significant challenges to the sustainability of infrastructure investments. On the other hand, integrating AI into telecommunications operations creates opportunities for greater efficiency and new service and business models beyond traditional connectivity schemes. This could usher in a new era of AI-powered telecommunications.

With the emergence of AI and its widespread use by consumers and productive sectors, it is necessary to address the risk that we will follow the same trend as in previous waves. This trend includes the intensification of network usage requirements, an inability to balance the sharing of costs and benefits in the ecosystem, and greater financial fragility to sustain infrastructure expansion and maintenance.

All players in the ecosystem must address the implications of this trend in digital environments. Operators must have a strategic

vision to capitalize on the AI revolution. Authorities must modernize the regulatory and public policy environment in the sector. Given the support they provide to the digital ecosystem as a whole, other stakeholders must recognize the importance of the sustainability of connectivity networks and services. In this context, the sector must evolve to provide smart and sustainable connectivity services for people, devices, services, and platforms. Similarly, public and regulatory policies must advance to ensure the adoption, management, and development of AI solutions in the telecommunications value chain.

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Annex

Artificial Intelligence: This technology is based on the fundamental principles of algorithms as problem-solving instructions, yet it encompasses a broad spectrum of tasks and functions that surpass traditional complex algorithms and calculation methods. In fact, it could be argued that it is not just a technology, but rather a set of approaches, techniques, and capabilities for developing advanced technological solutions.

Machine learning: (along with other machine learning techniques), whose main objective is to generate predictions based on data analysis, algorithms, and pattern learning. These techniques are used in forecasting and optimization models.

Computer vision: is used for the observation and analysis of visual information and images. Natural language processing is used to understand, interpret, and process human language. It is widely used in chatbots, text analysis, and transcriptions, for example.

Speech recognition: is a form of AI used for processing spoken language in voice-controlled assistants. Robotics combines AI capabilities with physical functionalities in hardware and robots. There are also applications that combine the functionalities of these types. For example, generative AI (Gen AI) is used for content creation, and Edge AI performs artificial intelligence processing locally on devices rather than in the cloud.