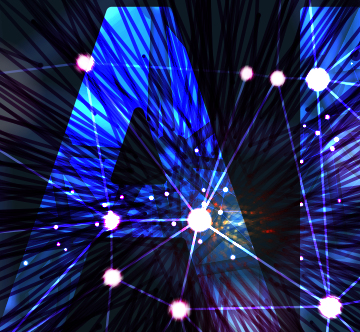


Monthly Briefing
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How the Telecoms Industry Can Get the Best Out of AI





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Introduction

How the Telecoms Industry can Get the Best Out of AI



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The increasing complexity of telecom networks and services and the exponential growth in the amount of data generated have gone beyond the capacity of manual calculation. Telecom operators therefore are increasingly compelled to embrace AI to help them properly manage their networks, services, and customers. This Telecoms.com Intelligence monthly briefing aims to separate noise from truth about AI and discuss how the communications industry can benefit from AI while avoiding potential pitfalls.

What is AI and what does it mean for telecoms?

About a year ago the Telecoms.com Intelligence team attended an industry event on the future of digital economy and the sectors closely interact with it. A panellist from the banking industry told the audience a story of his experience introducing AI to his team. One of his analysts commented after listening to the primer, “we have been doing this data analysis stuff for decades, and you suddenly started calling it artificial intelligence?”

In a way, the analyst was not wrong. The banking sector, as well as other industries, has been working with information since Day One. This includes acquiring, recording, organising, analysing, retrieving, presenting, and sharing of information. Earlier such tasks were primarily undertaken by human beings, like our analyst in the bank, assisted by specialised tools. But in recent years, the role that computers play in information processing has been expanding fast. Two main factors have contributed to the change.

First and foremost is the increasing availability of data. From medical diagnosis to instant trading in the financial markets, advancements in technology have made it possible for industry operators to access and extract data previously unattainable. This is further helped by the reducing cost of storing data. The exponential growth of available data is probably manifested most visibly in none other than the communications industry itself, which is powering many of the other sectors. This is a curse and a blessing. While the data available to us has vastly increased and has made advanced data analysis possible, it has also quickly made it impossible to manually process all of it.

The second main factor that has help enhance the role of machines in information processing is the growing computing power of the machines themselves. For over 50 years, the trajectory of the advancement of computing power has vindicated what Gordon Moore predicted in 1965 (which he updated a decade later). There is a broad recognition in academia and in industry that Moore’s Law is slowing down, while some even claim its end is in sight. Meanwhile, new approaches to keep computational advances going are being explored, including designing chips for specialised use cases, with Microsoft, Google, and China’s Baidu being the leading companies to do so. Unconventional technologies such as quantum computing, carbon nanotube transistors, and spintronics are being developed and invested in. In other words, computing power at our disposal, with reduced cost, has been growing, and is likely to continue to grow in the foreseeable future.



HOW THE TELECOMS INDUSTRY CAN GET THE BEST OUT OF AI... CONT'D

These two main factors, combined with other advances in technology, especially in software and algorithms, have driven computers to the forefront of information processing. In that sense, our bank analyst was right with the “intelligence” part but failed to appreciate the “artificial” bit.

AI for telecoms is artificial intelligence for a special purpose, or what the professionals call “applied AI”. To compare with the other two types of AI works, “strong AI”, which aims to develop a computer that thinks just like a human being, and “cognitive simulation”, which aims to understand and simulate how human brains work, applied AI has achieved the biggest successes. From medical diagnosis to credit line decisions, from climate models to camera designs, applied AI tools have equalled and often outperformed the best human experts. So is the case when it comes to telecoms.

The following sections of the report will examine how AI has helped deliver values for the telecoms ecosystem and where further improvements are to be made. It includes the following:

- What AI can do and is doing for telecoms
- New telecoms territories for AI to explore
- Key challenges AI for telecoms is facing
- An interview with Mark Beccue, Principal Analyst at Tractica, on topics related to AI for telecoms.

AI to Serve the Telecoms Ecosystems

The telecoms industry is no stranger to AI and machine learning (ML), a subset of AI. As a matter of fact, AI can be and has been adopted in many aspects of telecom operators’ business and operation, which can be seen in different shapes and different degrees of sophistication.

AI’s role will only get more important as the industry embraces more advanced technologies, for example cloud native, next phase 5G, and edge computing. In a recent Telecoms.com Intelligence survey, industry

professionals were asked to assess the impact of AI and ML on future mobile networks. Fifty-five percent of them believed that AI will enable full automation in multiple network activities, for example, network optimisation, power management, preventive maintenance. Another 35% believed that AI will be used to enable and develop new innovative services for network users.

The full survey report can be found [here](#).

Figure 1: Impact of AI and ML on Future Mobile Networks

What impact do you see Artificial Intelligence (AI) and Machine Learning (ML) have on the mobile networks of the future?

■ It will enable full automation in multiple network activities (optimization, power, preventive maintenance, etc)	55%
■ It will be utilized to develop new innovative services for network users	35%
■ I don't know	6%
■ No impact.....	4%



Source: Telecoms.com Intelligence, Next Steps for 5G industry survey, July 2020

The full automation the survey participants envisioned will bring total transformation for those companies that embrace AI. There are different ways of evaluating how AI can play its role in supporting such transformation in telecoms companies. To look at the business functions AI can serve, we see it in the IT systems (OSS and BSS), analytics, customer touch point management including CRM, internal operation like ERP, as well as various digital applications. Multiple internal operation

processes can also benefit from AI. Vodafone, one of the leaders in AI adoption, once told Telecoms.com Intelligence that one of the key areas in which it has deployed AI extensively is its human resource management functions for talent recruitment, retention, and development.



AI TO SERVE THE TELECOMS ECOSYSTEMS... CONT'D

When looking at the telecoms networks' operational process, AI's role can be seen in the whole network lifecycle from planning through deployment to operation and maintenance. For example, network infrastructure can become more self-healing with predictive and pre-emptive maintenance powered by machine learning. Or, the network management system can automatically execute on quality assurance, optimise storage, and detect anomalies by learning from historical vulnerabilities.

There are plenty of cases where telecom operators, partnering their technology vendors, have already adopted AI one way or another. Among the tier-1 operators, Telefónica has developed network planning models using AI to optimise network CAPEX, especially in its "Internet para todos" ("Internet for all") project to bring remote areas onto the grid. To roll out and maintain the networks in the most efficient and sustainable manner, the operator "built a trained neural network with historical failure analysis and fed with network metrics to provide a model capable of monitoring the status of the network in an automated way, with prediction of possible failures and an optimised maintenance route."

A recent mode of automation is the adoption of automated drones to carry out network tasks, especially site and tower inspection. The video analytics team at AT&T Labs have worked with the operator's contract drone operators to automate cell tower inspection. A deep learning-based algorithm can analyse drone footage and detect defects and anomalies. The operator hopes tower repairs can also be carried out by drones at some point. The greenfield operator Rakuten is another one that has embraced drone technology, relying heavily on the unmanned traffic management (UTM) platform from AirMap, with whom Rakuten has formed a joint venture. Such automation solutions are particularly meaningful now, not only to save man-hours and eliminate dangerous tower climbing, but when most of the staff work from home during COVID-19.

In consumer domains, AI has been broadly used to improve user experience while adding a bit "fun" element, a trend led primarily by the internet and consumer brands, including Google, Apple, Microsoft through their AI-powered "personal assistants", or virtual digital assistants (VDAs) as the AI sector calls them. But that does not mean CSPs do not have a chance to compete. As a matter of fact, the telecoms

industry is one of the pioneers across verticals to adopt VDAs, according to Mark Beccue, Principal Analyst, Tractica, an AI research firm. (A full interview with Mr. Beccue can be found at the end of this report.) One of such telecom operators using AI extensively for customer service is Vodafone, which has had a long-standing partnership with IBM to power its automatic customer service platform with Watson, IBM's AI solution for enterprises.

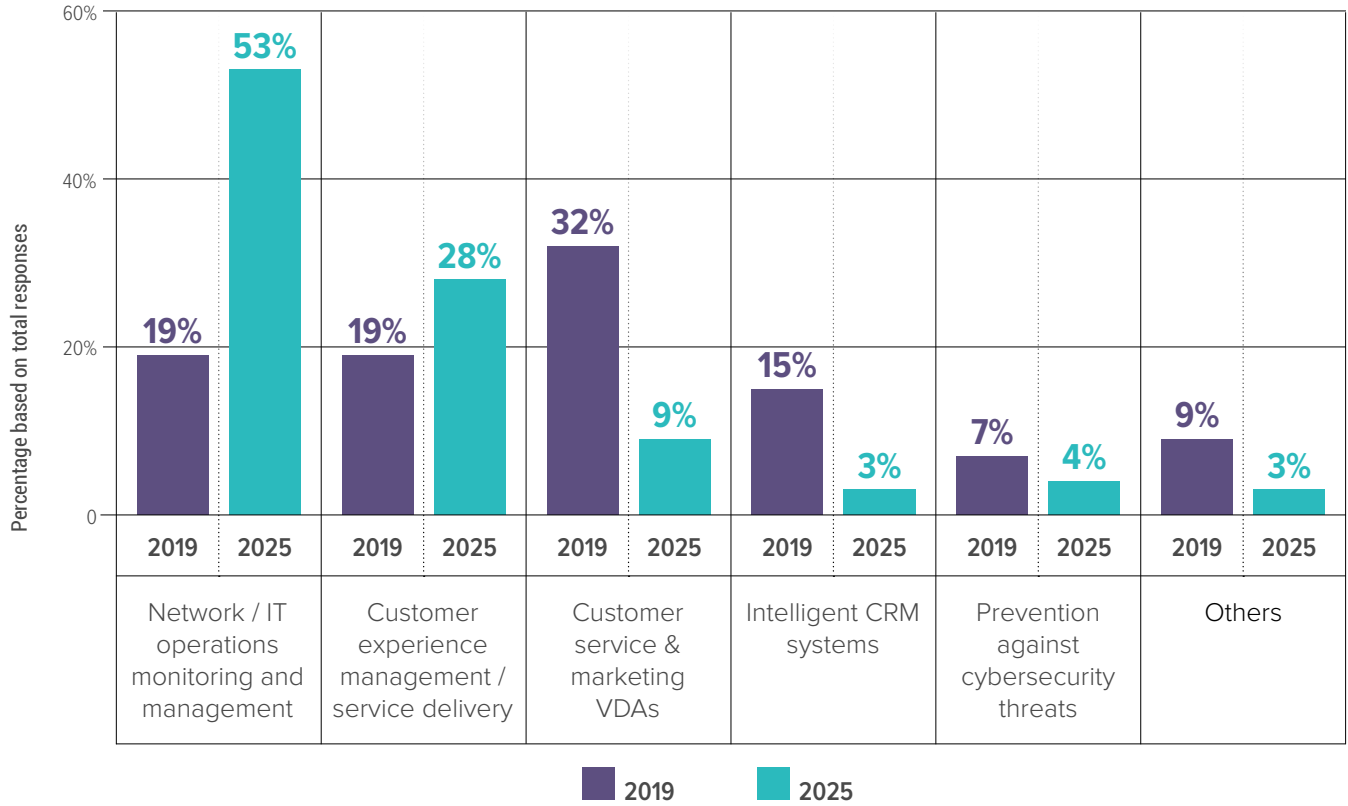
Some operators are also using AI for personalised marketing or service innovation, capitalising on their overall visibility to customer data, including their service consumption patterns. Malaysian mobile operator Axiata previously told Telecoms.com Intelligence that the company's smart billing platform, especially the credit rating and scoring engine would be able to provide instant cash lending, based on real-time analysis of their consumer data, to enable uninterrupted user experience, for example during a gaming session.

Across all these domains, from network management to customer touchpoints, AI can carry out different types of tasks, or "use cases" as the trade calls them, another angle to evaluate the importance of AI for telecoms. These would include network operations monitoring and management, customer experience management and service delivery, customer service and marketing, intelligent CRM systems, cybersecurity threat prevention, etc. According to the latest forecast by Tractica, while a third of all AI software revenues in the telecoms industry was generated by customer service and marketing VDAs in 2019, by 2025, over half of all the revenues will be generated by network and IT operations monitoring and management, and over a quarter will be on customer experience management and service delivery. The shift is more dramatic if we consider that the total telecoms AI software market is forecast to grow 11 times during this period.



AI TO SERVE THE TELECOMS ECOSYSTEMS... CONT'D

Figure 2: AI Software Revenue Use Case Forecasts: Telecommunications



Source: Artificial Intelligence Software Market Forecasts, 2020, Tractica



Obstacles Standing in AI's Way

The ultimate objectives for the telecoms industry to embrace AI are to grow top line, optimise bottom line, and improve customer experience, not too dissimilar from the objectives of other industries.

With their data analytics capability, AI tools can help telecom operators discover otherwise invisible therefore untapped upsell opportunities. For example, operators can outreach to potential customers with customised plans or promote new packages to existing customers that better fit their service consumption habits. Such analytics can also help the operators' pricing strategies, as they will be able to see individual customers' impact on costs and profit margin.

AI tools and analytics can help operators reduce their network costs. One of the most expensive decisions related to networks is expansion. However, an AI model can provide operators with tools to optimise their networks in more economical ways, for example adding new connectivity, instead of investing in expanding the capacity of existing links, in areas where traffic is not routed optimally, as a means to reduce the transport cost.

Unsatisfactory customer experience can directly contribute to customer loss. According to a 2019 survey of the telecoms industry conducted by TechSee, an AI technology company, 39% of Americans who cancelled their telecom contracts in the past 24 months cited bad customer service as their number one reason for the churn. Improvements in the capability of VDAs can address some of the worst complains including the long waiting time, multiple calls, and rude customer service agents.

On the network side, operators equipped with solid AI solutions can vastly reduce the mean time to identify (MTTI) and mean time to resolve (MTTR) when network failures do occur. Moreover, the strong machine learning capability also helps the network operators get better at predicting and preventing known failures from recurring.

However, a couple of major obstacles need to be overcome to elevate current AI tools for telecoms, and AI tools in general, to the level that they can achieve these goals.

The first is challenge to data quality, including data availability, data integrity, data relevance, etc. AI feeds on data, therefore the popular saying "garbage in, garbage out" probably resonates in AI as much as in any technology. The particular challenge for the telecoms industry comes from the reality that most telecom operators especially those incumbents have generations of legacy networks coexisting with the most advanced and latest additions.

Such hybrid network structures make it very hard for the operators to have full visibility of data going through their networks. Conventionally, operators have used corporate IT analytics tools like deep packet inspection (DPI) technologies to extract network data for monitoring, analytics, and security purposes. The drawbacks of DPI and other monolithic solutions include high costs, weak scalability, and rigid policy regimes, which cannot fully satisfy CSPs' much more dynamic needs. The problems would be exacerbated if different parts of the operations deploy different tools that cannot talk to each other.

This leads us to the second challenge, the lack of standards. The telecoms industry, especially the mobile sector has benefited from common standards in a big way, from GSM to 5G, thanks to the standardisation bodies from the ITU to the 3GPP. There have not been comparable, widely accepted standards when it comes to AI, and AI for telecoms is no exception. This means telecoms companies, including the telecom operators, are at the mercy of the AI technology vendors and cannot demand them to comply with codified specifications.

The good news is that organisations like TM Forum have made substantial progress to support CSPs including telecom operators to gain transparency in their AI deployments. For example, TM Forum's Service Management Standards for AI aims to "develop standard interfaces for both the operational AI models to enable them to be understood, discovered and monitored in life, and also to develop standard component structures that define the architectural components used to develop and manage AI models such as feature databases, model databases, deployment servers and registration databases."



OBSTACLES STANDING IN AI'S WAY...CONT'D

Like other cutting-edge technologies, AI, and data analytics in general, also faces talent shortage. According to LinkedIn's "2020 Emerging Jobs Report", artificial intelligence and machine learning has seen a hiring growth of 74% annually in the past four years. Another estimate in 2018, quoted by Forbes, claimed that 80% of all machine learning engineers with Ph.D. degrees are hired by Google and Facebook. The accuracy of the percentage may be debatable, but it is probably safe to say that most telecom companies are not in an advantaged position when competing for talents against the Silicon Valley heavyweights.

There are different initiatives to address AI talent scarcity and the tight grip by the technology giants. OpenAI, founded and bankrolled by Elon Musk and other entrepreneurs, aims "to ensure AI's benefits are as widely and evenly distributed as possible". The public-private partnership to educate one percent of the whole population of AI in Finland is also widely lauded. However, these programmes and many others are not likely to directly benefit the telecoms industry any time soon.

The telecoms industry is increasingly relying on artificial intelligence both to cope with and make sense of the amount of data that has grown exponentially, as well as to automate operations to increase efficiency and lower costs. Much has been done by the telecom operators and their technology partners to integrate AI into the decision-making processes across their networks and their organisations. However, there remain challenges to be faced before AI's high promises can be delivered on for the telecoms industry, with data quality, standards, and talents the most acute ones.



An interview with Mark Beccue

Principal Analyst, Tractica

Q: Please tell us a bit more about Tractica and your role.

A: Tractica was launched in 2015 with a focus on AI market development and became one of the foremost thought leaders on AI. We have built market forecasts in a bottoms-up approach, looking at market development by unique use case. At this point we track more than 300 unique use cases across various verticals and horizontals. Tractica was acquired by Informa in July 2018. Informa combined all of its tech research this year (Ovum, IHS Markit, Heavy Reading) to create Omdia.

I am a principal analyst focused on natural language AI and other AI themes. I joined the company in the summer of 2016.

Q: Compared with other sectors Tractica covers, what level of maturity do you see in the adoption of AI by the telecoms industry?

A: There are multiple AI use cases being commercialized in telecoms and consequently they are running at different levels of maturity. The telecoms industry is one of the pioneers across verticals for the virtual digital assistants (VDAs) for customer service. However, in relative terms, VDAs are a difficult AI use case to master and the overall level of maturity for that use case remains in early adopters stage. Telecoms have leveraged AI in fraud detection and cybersecurity, that use case is relatively mature, though I would say the overall use case is and telecoms' use of it tracks with the use case's overall maturity. Telecoms is a pioneer in the use of AI for network monitoring and operations, the idea of automating various tasks and workloads within networks. However, that is a very immature market overall.



INTERVIEW WITH MARK BECCUE...CONT'D

Q: What are the major challenges the telecoms industry is facing when embracing AI in their business and operation processes?

A: They face the challenges which are common to most industries in embracing AI:

- Cross departmental leadership and cooperation.
- Access to clean, usable, annotated data.
- Limited/unclear guidance in terms of AI data privacy and AI accountability regulation
- Limited or no standards

Q: “Open standards” have gained some strong traction in the telecoms industry, from network components to service offerings. Do you see open standards in some shape emerging in AI for telecoms, or it will continue to be vendor proprietary?

A: So let's make a delineation between standards and open source. Clearly, operators are pushing for open source-based networks offerings as they do not want to be tied in to single vendor proprietary systems. Standards-based approaches to interworking between operators has been a hallmark of their business since the earliest of days (GSM Association), and is widely credited with the massive success of mobile (interworking). Telecom operators understand and prefer standards, even though there are pros and cons to them. The biggest con is standards typically level playing fields so players must look for other ways to gain competitive advantages. In terms of AI for network use cases, there is clearly a movement to push for standards, and it seems that TM Forum may be the standards group to moderate those standards.