altice labs

Cognitive landscape: artificial intelligence redefining the industry

Artificial intelligence; Cognitive; Digital transformation; Digital services provider; Data science

White paper

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Summary

The transition to data-driven digital businesses leveraged by a growing “data and algorithmic economy” is already a reality among many organisations across several industries, with businesses using algorithms daily to influence and support decisions and optimise operational efficiency. It is undeniable; we now live in an AI Spring, a moment where the information, infrastructure and toolset virtuously combine to boost the AI infusion in digital processes across industries.

Overview

In past decades the industry has been evolving with the aid of computers and information systems to manage information and automate tasks, aiming to increase productivity and business value. Computers and information systems have been evolving exponentially in capacity and complexity to process ever-increasing amounts of data and to handle ever-increasing complexity in tech industries. However, business productivity is not by far increasing proportionally; in fact, when comparing with the evolution of computation power, productivity increase can be considered marginal.

The gap above mentioned can be explained by the inability of information systems to overcome two major constraints that drain productivity: a) they are unable or struggle to implement some tasks in critical business and operational processes, so they need to be delegated to humans; b) they are not able to address exceptions to what has been explicitly coded in the system. These constraints express the intrinsic limitation of the paradigm which information systems have been relying on: they are rule-based systems, limited in its capacity to handle some real-life complexity and mutability of industrial processes. In this sense, the general availability of artificial intelligent (AI) technology and high-performance computational resources bring the opportunity to create information systems able to overcome the aforementioned productivity constraints.

By learning from data and human experience, by providing fully autonomous processes (capable of continuously learn to adapt to changing environments), and by having the extraordinary ability to create insights unattainable by traditional rule-based systems, able to express new business value, AI brings the toolset to complement the existing rule-based operations with new pattern-based capabilities, creating a new operational landscape. A cognitive one.

Introducing artificial intelligence

AI as a new toolset

In past decades humans used their intelligence to develop the means required to create, at scale, intelligent artificial systems able to mimic human cognitive capabilities, i.e., able to perceive, understand and use acquired knowledge to act according to a specific scenario. Those systems are new cognitive tools that, in one hand, promise to boost the evolution of two strongly related business dimensions: performance and productivity, and, in the other hand, when coupled with process automation will allow making more, faster and efficiently.

In the current landscape, near to all industries still rely on humans to perform some industrial process activities, due to: a) functional gap in existing systems; b) the activities performed by humans are too complex to be coded into a system. While the first case can be handled through incremental evolution of systems and processes using traditional technology, the second cannot, and that's where AI systems will step in and reveal its potential in short to medium term. A paradigmatic example of such case are the customer care processes at call centres. The handling of customer complaints involves an enormous contextual diversity and human sentiments that make this activity near to impossible to be handled by a pre-coded rule-driven algorithm. AI systems using natural language processing (NLP) capabilities can mimic human interaction when relating to customers and promote the implementation of fully automated processes.

Beyond productivity, business performance is also closely related to the creation of something new and relevant, i.e., something that will allow to sell more or to decrease operational expenses (OPEX). In this dimension, AI systems can have a bigger impact in the medium to long term, since their cognitive capabilities will allow to extract new insights from the huge amounts of data produced by industrial processes and to act accordingly, in a more powerful way. A paradigmatic use case on the sell uplift side is the use of AI systems to create personalised one-2-one product recommendations considering the whole universe of characteristic and behavioural data associated with it. A paradigmatic use case on the OPEX reduction side is the use of AI systems to support predictive maintenance of industrial equipment, i.e., able to predict future anomalies considering continuous time series of operational parameters obtained from that equipment.

Technology behind AI

The creation of an AI system can be made using a very broad set of technologies and approaches. In the Industrial arena, machine learning (ML) has been the approach to create AI systems.

ML consists of using mathematical algorithms created to solve specific types of tasks (e.g., classification, clustering and regression) and to train those algorithms using datasets. Before the training stage, one must define the data that must be feed into the algorithm so it can learn (the model features) and the data the model should be able to produce (the model targets). The training phase roughly corresponds to perform N iterations to optimise the model parameters until reaching acceptable error values when generating its targets. Depending on the size of input data and the number of iterations required to converge, the time and computing power to train a model may increase considerably. And of course, the quality of the input data will, for sure, limit the quality of the ML model or even the ability to create it.

In fact, as illustrated in **Figure 1**, in most ML projects there is a substantial amount of hard work to ingest, clean, explore, transform and structure raw data to make it suitable as inputs for training and run the models. Effort aside, those activities are critical for the quality and time to deliver ML models, as they provide the means to create high-quality data sources and to extract knowledge from them, the true fuel for ML.

Considering the techniques behind ML domain, currently, the most popular one used to implement AI systems is deep learning (DL). This technique is a very young field of ML (when compared with other traditional algorithms, decades-old), based on artificial neural networks. DL performs better with large amounts of raw data (as illustrated in **Figure 2**), i.e., tends to increase its accuracy with the increasing amount of training data, where traditional ML models stop improving after a saturation point. This is probably the distinctive aspect of DL responsible for its hype and massive adoption.

In the last years, thousands of AI and ML technical articles established a new slogan – "There is no AI without IA (information architecture) ", which states a very truthful dependency on data engineering and data science practices and technologies when implementing ML models. Considering this, if a company does not specify and operationalises an efficient data management infrastructure to support the required data engineering and data science activities, it will probably compromise the ability to deliver quality, in time and at scale.

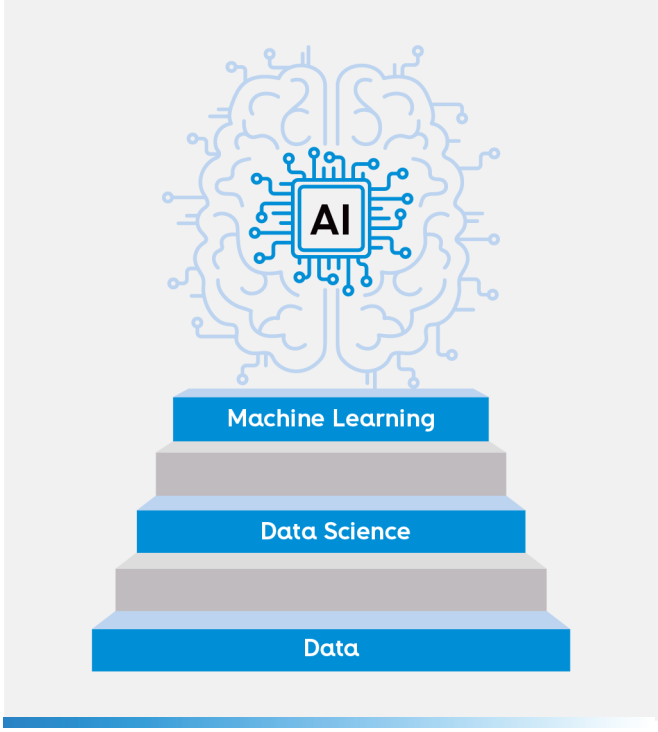


Figure 1 – The AI ladder

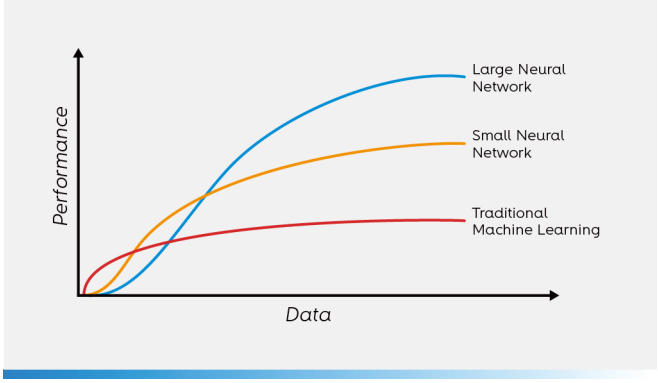


Figure 2 – Deep learning benefits

AI spring - the age of implementation

Algorithms are not new. Traditional ML algorithms exist for decades, and even the theory behind artificial neural networks exists since the forties of the XX century. So what changed or is changing to boost its adoption?

According to a report released by Gartner [1], as illustrated in **Figure 3**, four major factors stand out today, such that their confluence has enabled a significant tipping point in the potential for algorithms to be broadly deployed across industries and become instrumental in delivering business value and competitive differentiation:

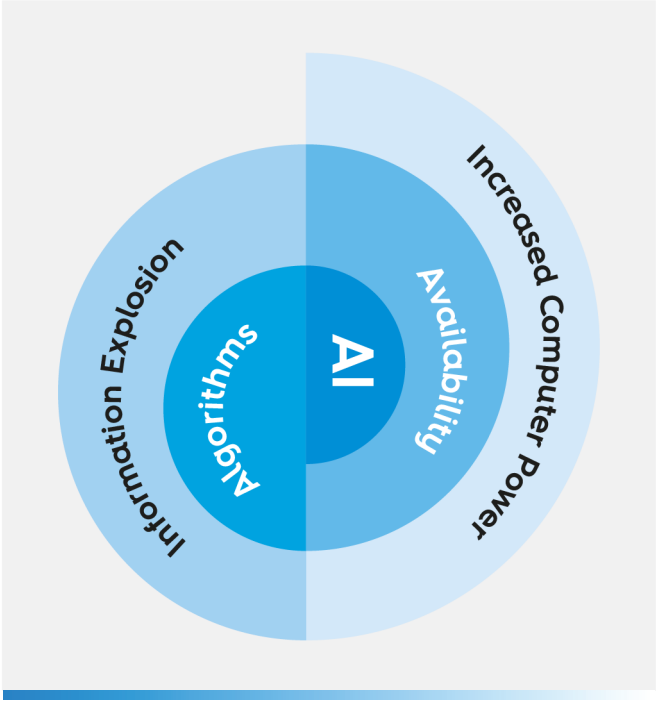


Figure 3 – Factors allowing AI to accelerate digital business

- **Information explosion:** The number of sources of information to which AI technology has access is growing all the time. These sources include sensors, user equipment and other devices, which means that AI technology can now access the essential data to fuel its algorithms;
- **Increases in compute power:** Advanced system architectures, in-memory storage, and more powerful chipsets, combined with highly scalable cloud-based architectures are now widely available. This obviates several infrastructure constraints founded in an enterprise, making the required infrastructure more powerful and affordable, thus accessible for enterprises of all dimensions;
- **Infrastructure and toolset availability:** Cloud-based services combined with cloud infrastructure (eventually powered by GPU and TSU) make available the toolset required to process all types of data sources and to apply ML algorithms. This scenario, along with the fact that most of this toolset is made available as open-source technology, truly democratises the access to data science and ML;
- **Advanced algorithms:** The most relevant ML algorithms (if not all) are today implemented and made available as libraries for widespread programming languages, like Python, R and Java. The inner complexity of those algorithms is highly abstracted with higher-level primitives that make possible to work in data science and ML without the mandatory need of a PhD or decades of research.

In this context, the transition to data-driven digital businesses leveraged by a growing “data and algorithmic economy” is already well-established in many organisations across many industries, with businesses using algorithms daily to influence and support decisions (fact-based decision making) and optimise operational efficiency. It is undeniable; we now live in an AI Spring, a moment where the information, infrastructure and toolset virtuously combine to boost the AI infusion in digital processes across industries. It’s the age of AI implementation!

Industry impact of AI

Business value

When introducing new technologies or new paradigms in any industry, one of the most relevant aspects that will dictate adoption is the business value it can add to the industry since that introducing novelties on existing processes usually requires a significant level of investments. AI is no exception.

However, there are not so many technologies that can be as disruptive to a business as AI. By integrating human innovation capabilities with AI, hence introducing cognition into any processes, the span of possibilities where this technology can be applied is huge and so are the results that can be achieved. Ranging from operational breakthroughs on existing processes to enhancements on the way the business is promoted and passing through the experience a customer can be presented, AI can disrupt almost every domain where it is applied while creating new opportunities along the way - see **Figure 4** as an example [2]. Resources can be freed to innovative tasks, time can be better allocated, and innovation intersections may be created.

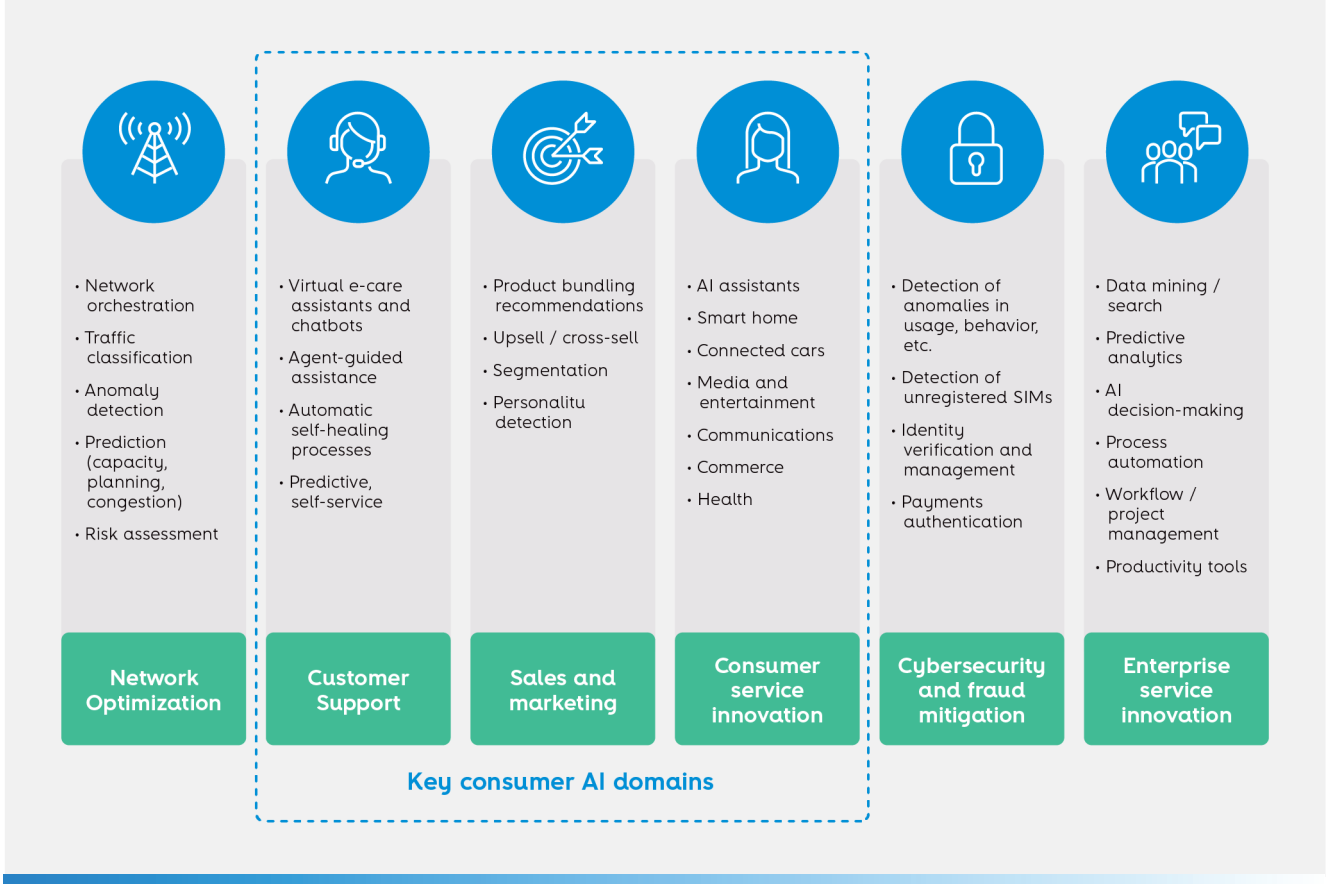


Figure 4 – AI reach considering CSP business [2]

Moreover, having been named by major research companies as one of the top strategic technologies of the decade, it is with no surprise that one can see major industry players making large investments to secure their positioning as technology enablers, driving others to apply AI on behalf of their businesses. A new industry is born (see **Figure 5**), promising a strong revenue growth in the forthcoming years.

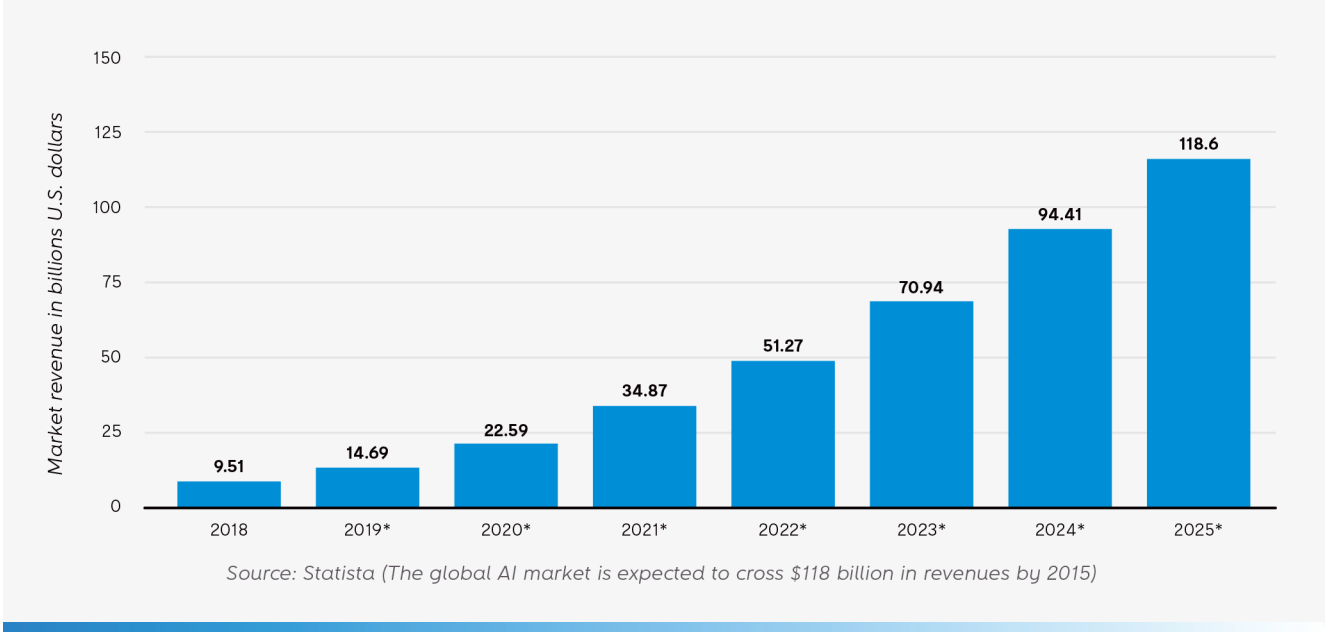


Figure 5 – Revenues from the AI software market worldwide from 2018 to 2025 (in billion U.S. dollars) [3]

On the era of the digital transformation at every single industry (logistics, transportation, automotive, healthcare, social care, retail, education, city management) there are clear shreds of evidence of the improvements AI introduction can create as well as of its endless potential, either by massively processing huge amounts of data to infer a result or a trend or by leveraging natural language interaction to create proximity and interaction. Having the capability to leverage valuable information sets, by introducing AI combined with other disruptive technologies (augmented reality, automation, high capacity computing and high throughput networks) is expected to lead us to digital innovations capable of solving some of the major challenges of the society.

Organisation impacts

Digitalisation and AI by themselves are already quite demanding on any industry when looking from the inside perspective, and it only becomes more demanding with the breadth of new technologies sustaining their main fuel: data. This means that additional knowledge will have to be introduced into organisations, new programming languages will have to coexist with traditional ones, and the type of infrastructure being required is just changing. Furthermore, the human resources and skills required to embrace these technologies are also different, requiring a change on the way resources are on-boarded and the approach required to keep them engaged.

This change means that industries, digital service providers (DSP) included, need to evolve their organisations into a more fluid, dynamic and daily interactive working model, where cooperation between teams is absolutely mandatory, and a Medici-like approach is advisable when creating teams. In fact, multidisciplinary, flexible, quick reaction and customer-focused teams will be differentiating on any industry willing to thrive through this new era and failing to adapt to this specific approach will not allow to fully benefit from the assets and innovations driving this technological transformation.

The case for the digital services providers

DSP nowadays play a fundamental role in the overall digital transformation of society. Being at the interception of the communication path of all major industries, consumer profiles and the enormous data hurricane being generated every second makes DSP a critical enabler. Of course, being a central piece on such a disruptive environment and moment means that there is a need to look inside DSP internal frameworks and make them agile and resilient enough to maximise the benefits. As seen in **Figure 6**, having AI assisting network assets decisions or predicting artefacts behaviour are some of the possibilities that are becoming a reality.

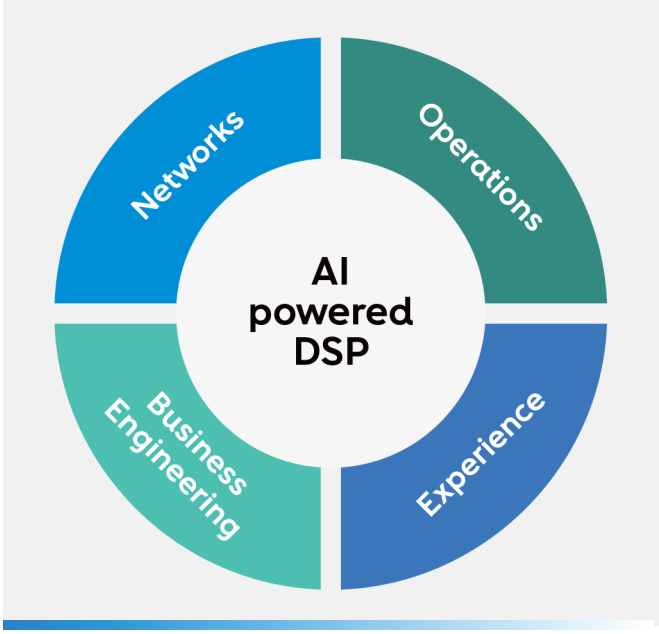


Figure 6 – Key enablement dimensions of AI on DSP

The network evolutions will provide the DSP with the capability to address a much bigger area in terms of a business domain. This means the network complexity will increase due to the need to handle new elements, additional proximity, multiple combined access technologies, exponential growth of connected elements and, above all, multiple demand needs that metamorphose through time and space. Coping with this new reality means that networks will need to adapt, scale and adjust in real-time or, even better, in advance of the needs. AI thus become a powerful asset in assisting engineering such capabilities.

As a consequence, managing these AI-powered networks and operations is a challenge by itself. Multiply by several orders of magnitude the number of managed elements, the changes in self-configuration and the self-healing capabilities and one can understand the level of complexity involved! Doing it the traditional way won't work, and this is where AI will introduce new levels of productivity into the operations: creating algorithms that will assist humans by predicting when and where an issue will occur, by combining multiple sources from multiple domains, is now becoming at reach; working on huge data sets to identify the root cause of a problem can now be significantly reduced, and the optimisation opportunities keep showing up.

Moreover, when considering the business engineering and the users experience, introducing AI to improve it (not only when using DSP services, but also by applying cognition algorithms to the way services are used to create improved and personalised offer or campaigns) is considered the low-hanging fruit for DSP willing to quickly secure their positioning on the market. See, for example, the astonishing progress that has been achieved on AI-enabled natural language interactions, especially if one takes into account the cost-benefit relation. It is with no surprise that industry is seeing the spread of digital assistants for the most diverse aspects of customer interaction and with increasing levels of success and adoption. Also, profiting from the vast amount of information about service usage patterns existing within DSP to provide the customer with its dedicated experience is not a novelty. However, AI introduces a new stage on the agility that can be imposed on adapting to the needs of the customer, and on the flexibility that can be sought, since the depth of use of the existing information is much superior now.

Therefore, is covering experience or business opportunity depleting the opportunity space for AI? Absolutely not.

Altice Labs AI strategy

Altice Labs is a long term provider of solutions for communications and digital services industries, either for Altice Group operations and the external market. In this context, Altice Labs has a portfolio of solutions that addresses several activity domains, including network solutions, service platforms, operations support solutions and business support solutions, exactly the domains where service providers are investing more in data science and AI, going beyond experience and business.

More than an opportunity, this context drives a necessity. On the opportunity side, Altice Labs is in a privileged position to leverage its experience and expertise in the areas addressed by its solutions, thus to extract additional value from managed data and to create new use cases on top of its solutions using AI technology. On the necessity side, not making this investment will create a significant gap in existing solutions in the years to come.

As illustrated in **Figure 7**, betting in AI infusion into the existing portfolio is one of the more relevant dimensions of Altice Labs current strategy, which by itself drove Altice Labs to increasingly invest in data science and AI internal knowledge to define work methodologies and to establish the required infrastructure and toolset. This bet not only unleashes the infusion of AI into existing portfolio but also enables Altice Labs to address AI use cases in functional and data domains previously unexplored and not only on the ones being addressed by existing portfolio, empowering Altice Labs to start positioning itself as an AI competence centre for the Altice Group.

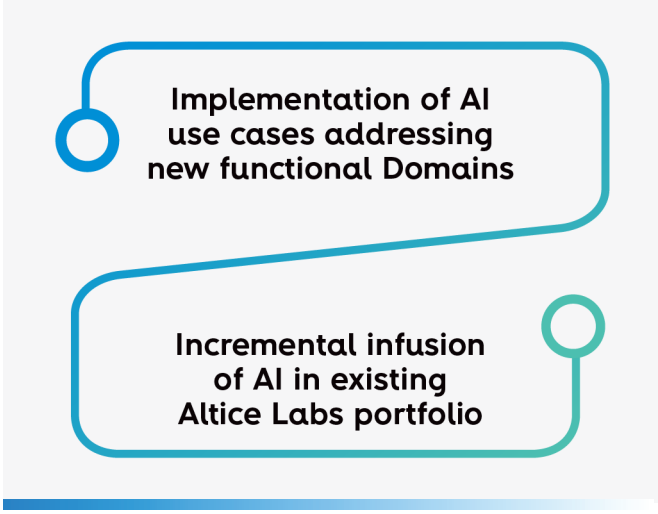


Figure 7 – Strategy for AI-infused portfolio

Altice Labs cognitive team

To support the operationalisation of its AI strategy, Altice Labs created the cognitive team (see **Figure 8**). This team is an instrument to catalyst the implementation of AI use cases in Altice Labs portfolio in cooperation with all Altice Labs business units, and also to address use cases that flow from within the operations and that can be addressed by the type of knowledge hereby created.

As illustrated in **Figure 8**, the cognitive team encapsulates key-work dimensions:

- **Use cases:** prospect and implement, in strict cooperation with business units and customers, business-relevant AI use cases;
- **Methodology:** specification of a work methodology to implement AI use cases;
- **Human resources:** Define roles and competencies that a team should have to tackle previous defined AI use cases;
- **Infrastructure:** specify and manage the physical infrastructure and toolset required to support the implementation of those AI use cases.

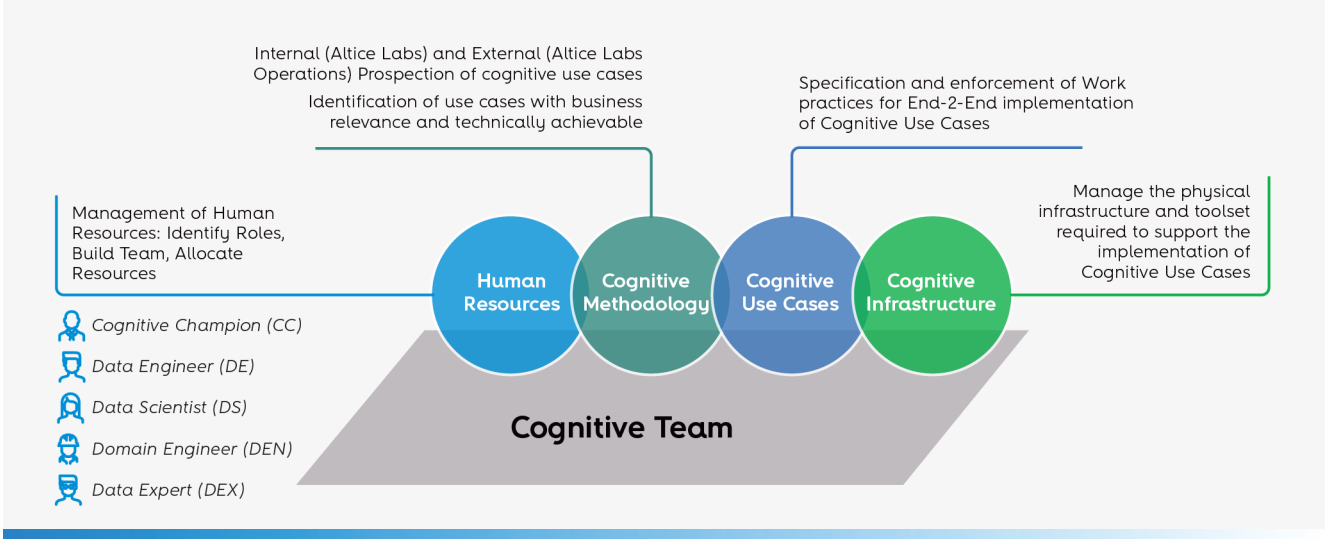


Figure 8 – Key work dimensions of Altice Labs cognitive team

For this team, the cognitive methodology is its cornerstone. As illustrated in **Figure 9**, the cognitive methodology specifies the workflow of stages and activities that must be conducted for a successful use case implementation, as well as the competences required to lead and execute each work stage.

Using agile principles as its workstyle, closely interacting with domain experts and Customer teams allows for a quick-try-fail-fast mentality that keeps the team moving forward into consistent progress that can quickly move into production and produce fast results.

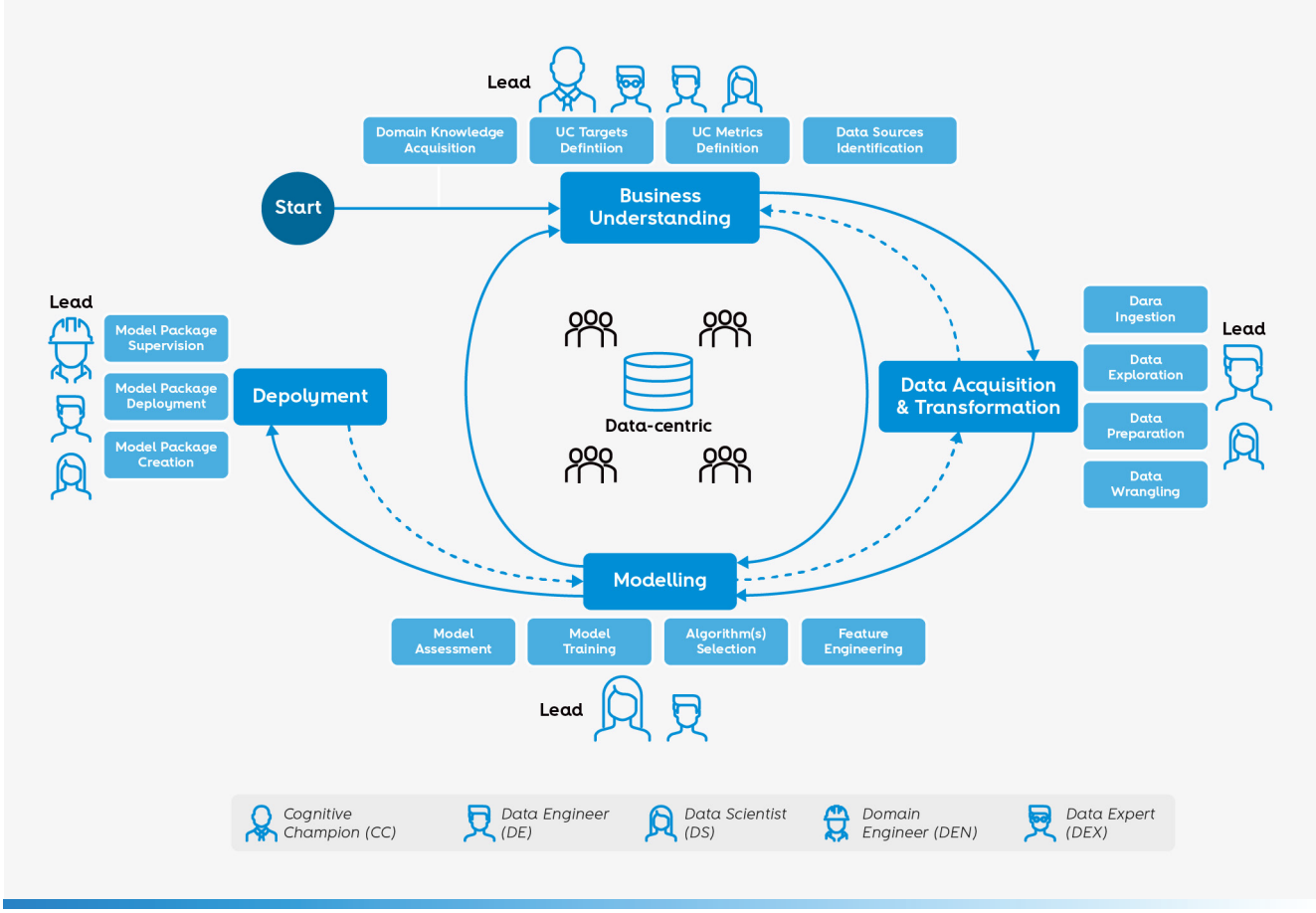


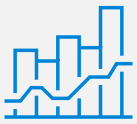
Figure 9 – Cognitive methodology of Altice Labs cognitive team

Altice Labs AI initiatives

Altice Labs has been researching on AI arena for the past years, and beyond the creation of the cognitive team, several use cases were and still are subject of investigation in collaborative projects with universities and other research institutes. Nevertheless, since its inception in the first half of 2019, and together with Altice Labs business units, the Altice Labs cognitive team start to prospect candidate use cases having two main characteristics in mind:

- **Business value:** what is the expected business value of the use case to Altice Labs Customers? Will its outcome express it?
- **Feasibility:** Do we have the (best) data? Is it addressable using available technology? Do we have the required proficiency to go for it?

As a result, new projects were created to support the implementation of, among others, the following use cases:



Cognitive network operation centre (NOC)

- Prediction of mobile network critical faults;
- Prediction and root cause analysis of low mobile networks accessibility.

Cognitive call centre

- Pattern-based diagnostics of customer services issues and automated corrective actions recommendations.

Cognitive infrastructure maintenance

- Prediction of customer premises equipment's anomalies (set-top-boxes & home gateways) and optimisation of repair processes.

Also, from the results of previous R&D initiatives, a new product line was created bringing digital assistants to Altice Labs portfolio. Its value proposition is entitling non-expert users in NLP to create by themselves digital assistants for their businesses.

Conclusion

AI is profoundly impacting every industry: automotive, media, finance, insurance, travel, healthcare, online gaming, communications, digital services and communication providers; you name it. We live in the age of implementation, where knowledge, tools and infrastructure combine virtuously to make possible the implementation of AI-enabled systems at scale, by large and small companies. This democratisation of AI is what is making possible the wave of transformation seen every day.

Industrial processes will improve significantly in future due to the adoption of data science and ML technologies, becoming fully automated and eventually autonomous. New processes for problems not attainable today will emerge. All these transformations will have business drivers. Enterprises ignoring this will stay aside from this industrial revolution and fall.

To take advantage of the wonders around data science and AI technologies a company must transform itself and evolve from an organisation to an ecosystem where human resources, infrastructure and work methodologies leverage the company growth by creating solid results at speed demanded by the market. Altice Labs defined and operationalised a strategy to make it happen and is now starting to deliver the results of it.

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Contacts

Address

Rua Eng. José Ferreira Pinto Basto
3810 - 106 Aveiro (PORTUGAL)

Phone

+351 234 403 200

Media

contact@alticelabs.com
www.alticelabs.com