



AI for Industry

by **startupinside** & **EMERTON**DATA

WHITE PAPER

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An ever-increasing digitalization of industrial activities, ever more voluminous data generated, a potential of business value still under the radar of most decision-makers, ... Nothing new about AI, you'd think.
Well, think again!

Upon closer look, major projects have been undertaken by many industrial groups, which were previously perceived as lagging behind other sectors, such as retail or financial services. Thanks to the hard work of many, the fundamentals of digitalization and data governance are now much better understood. Everyone is taking action and gradually transforming their business with data and AI. This has been confirmed by our recent study, based on a series of thirty interviews with data & AI experts in industry.

Unsurprisingly, manufacturers have started off taking the Data & AI topic from the side of operational excellence, making it a lever for competitiveness. Nevertheless, their recent investments are directed towards two new subjects. The first one is the environmental footprint: use cases are being developed for biodiversity and carbon neutrality purposes. The second is knowledge and adaptation to the market. This is certainly a no-brainer in other sectors, but it tends to be more difficult to implement in industrial groups, often stuck with a B2B mindset.

Emerton Data is a specialist in data and AI for the industry sector, with a mission to support its clients in the transformation of their business, by helping them define their data & AI strategy, equipping them with custom AI solutions and incubating AI SaaS software.

Startup Inside, a unique platform and engine for AI-driven initiatives, has the ambition to create and fuel sectoral ecosystems around finance, health, industry, environment, and retail.

Emerton Data and Startup Inside aim at bringing together the players in the AI for Industry ecosystem around concrete exchanges, away from the banalities and buzzwords.

This white paper is being published alongside the AI for Industry 2022 event. It will explore the major Data & AI use cases of the moment, before diving into the Data & AI Factory model.

These elements will then be illustrated in depth through a succession of interviews and opinion pieces from the current leaders in data and AI for industry.

We would like to thank everyone who contributed to the preparation of this white paper.



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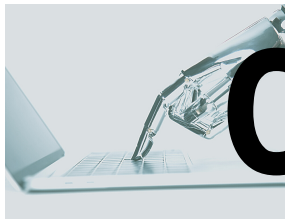
Damien Gromier

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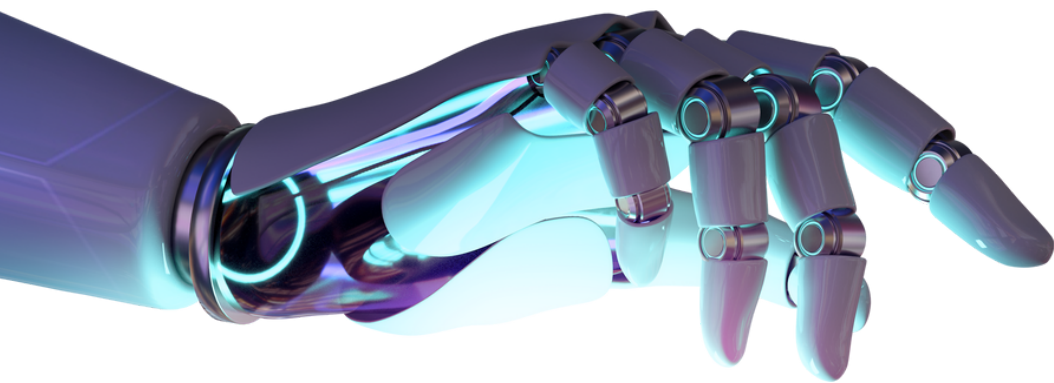
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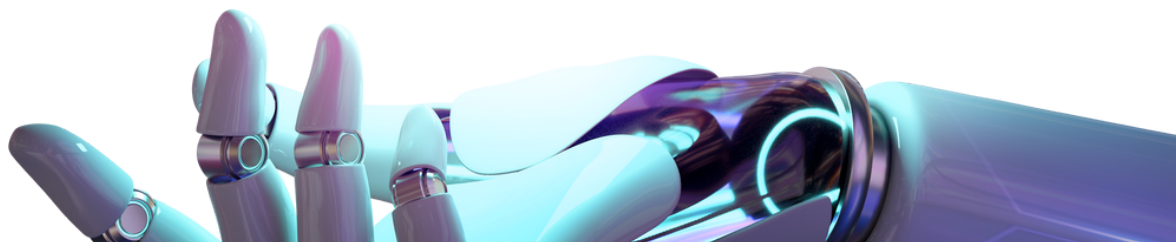
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WHAT'S NEW UNDER THE AI SUN?

Focus on emerging trends:
New use cases and development of the Data & AI Factory model



EVOLVING APPLICATION TOPICS

from operational excellence to market responsiveness and environmental issues

When it comes to AI, the sky often seems to be the limit; several new use cases have emerged in recent months. Industrial groups first embarked on their AI journey focusing on operational excellence, in order to be more competitive. 100% of respondents have identified use cases related to cost reduction or product improvement.

Synergistically, a quarter of our panel of experts indicate that they were very quickly led to consider the environmental impact. A mere positive externality at first, it has now become an objective in its own right and a core corporate value, guiding all projects and the prioritization of investments.

Lastly, manufacturers, despite their B2B cultural heritage, have recently accelerated and developed data and AI use cases to increase their knowledge of market dynamics (competition, trends, customers).

Competitiveness, environment, knowledge & adaptation to the market, are the three use cases that emerge from our study and that we will detail below, offering a synthetic vision and showcasing the experiences of some major players of data and AI in industry.

COMPETITIVENESS : STILL THE MAIN TOPIC FOR DATA USE

100% of the experts we interviewed told us that they use data and AI for **productivity and competitiveness**: improving processes, implementing operational excellence and ultimately producing better at lower cost. Industrial groups systematically start leveraging their data for these reasons, before potentially expanding to other issues. Data and AI are thus first put at the service of the business, with the aim of **making processes more fluid and efficient**.

AI comes into play at different stages of the industrial process. The Head of Data Science at a leading pharmaceutical company explains how sensors in factories can be used to **monitor** vaccine manufacturing **operations**: since this is a biological, living product, it is important to ensure that there are no discrepancies or variability in quality within and between sites. The data captured allows for almost instantaneous quality testing and better guarantees the productivity level of each site.

A data manager with a major aerospace company talks about how AI can be used to **yield a competitive advantage**: his company has recently shifted to a business model where they manufacture aircraft components, lease them out and provide technical service. Unlike their competitors, they manufacture the leased parts themselves and, therefore, own the design data. The data team developed digital twins: a digital replica of each part in use, enriched with design data, recorded operational data and external data (e.g. weather). This enables a better prediction of failures and offers an enhanced technical inspection service, better suited to their clients' needs.

THE ENVIRONMENT :

A TOPIC OFTEN SEEN AS INTERTWINED WITH PRODUCTIVITY

25% of experts interviewed have declared having developed data & AI use cases related to CSR, especially environmental impact (measuring, simulating, or positively impacting biodiversity and greenhouse gas emissions). However, it was often not the primary goal of these projects, but a positive externality **of the search for productivity**. The recurring example, cited by 23% of interviewees, is that of AI used to reduce energy consumption, which therefore reduces production costs but also carbon footprint.

The environmental impact of a factory depends directly on its operational efficiency. If a factory produces more efficiently, it will use fewer resources for the same output. By serving productivity, AI allows a better allocation of resources and addresses environmental issues in the process.

Ensuring this environmental positive externality is not always straightforward. For example, the supply chain is starting to take on the responsibility of using AI with the primary aim of limiting carbon footprint.

More and more industrial groups are getting equipped to calculate and act on the carbon footprint of their operations - notably by adding constraints on carbon emissions in the algorithms that manage their logistics flows. This means, for example, potentially striking a different arbitration between local and cheap suppliers. Achieving such an objective often requires the implementation of product traceability, which hides complex issues of governance and data quality.

Finally, environmental and resource management considerations are also alive and well within the data and AI sector. About a third of respondents mentioned their desire - or that of their peers and management - to **use AI more sparingly**. This means questioning practices: how complex do we really need the models to be? On what data and how often do we train the models? At what scale do we need to produce them? And how often do we need to update them? Some even imagine the implementation of company-level charters and regulations in the same vein as what the General Data Protection Regulation (or GDPR) has done for consumer privacy.

For companies, this means controlling the allocation of computing power, as the Chief Data Officer of a French automotive company explains: *"We operate with limited constant resources. If a team needs more CPU power, we make it available, but for a limited time (forty-eight hours). We don't want machines that are running but not used. The same goes for data storage: we want to get the most value out of the resources we have and not store unnecessary [digital] waste. The results for the environment are visible: we have doubled the size of our team without increasing our infrastructure costs"*.

Some sectors, such as embedded systems, integrate a certain sobriety in their design. An example comes from a drone manufacturer that must optimize its algorithms to cope with both the constraints of real time and the power & memory limitations of on-board computing. The interviewed engineer told us about the research going on around automatic neural architecture search (NAS), a neural network search method based on constraints, where computation time and memory consumption are beginning to be included.

Data and AI are **likely to become strong players in the ecological transition** of the industry. On one hand, as we have just seen, it will be achieved thanks to the efficiency gains brought by the models and solutions; and, on the other, thanks to the sensitivity of the data professionals to these issues. As this field is rather new, it mainly employs young team members who are deeply aware of the challenges of climate change. **Leveraging AI for such goals can have a substantial impact** and is an opportunity that deserves to be seized by industrial groups wishing to achieve environmental objectives.

KNOWLEDGE & MARKET ADAPTATION : THE NEW FRONTIER

38% of the experts interviewed are now using advanced data processing to **understand their market better** and **anticipate changes with agility**. In the B2B space, this use of data is still emerging, but industrials are quickly catching up.

As intermediaries and distribution channels multiply, end clients are increasingly scattered and distant from manufacturers. Data can solve this challenge by enabling industrials to **be more in touch with their market and customer-focused**. Using consumer, competitor, and market data, industrials can now understand the dynamics and forecast demand in order to establish a relevant **Go-to-Market** strategy.

One game-changing way data can be leveraged is to tailor offers to different types of consumers. For example, predicting the impact of promotion on the consumption behavior of a group of similar customers ("*will it increase their loyalty, increase their average basket, reduce churn, or have no impact at all?*") allows you to **allocate resources on the most useful marketing actions**.

AI plays a particularly important role on the Internet, where companies interact directly with their consumers, without any third party involved. Algorithms ranking products for display on web pages are crucial, as a product owner for a global retail giant testifies: "*Out of 50,000 products we have on offer, a consumer will only look at the first page. Out of these 50,000 products, only ten or so will actually appeal to her. It is essential that these most desirable products always make it to the top of the first page.*" These ten products are constantly changing, depending on the consumer, the season, new products popping up, hence the interest in implementing an AI model that can dynamically and optimally rank the products for each visit. To convince the consumer - and convert a visit into a purchase - we should go even further than that, says the Chief Data Officer of a French manufacturer: "*beyond improving the ranking in which we present the items on the site, performing A/B testing by changing one element at a time. AI allows us to make continuous improvements to our online sales experience.*"

The industrials that have succeeded in generating the most value from data and AI have taken the transformation bull by the horns, having ventured far away from their core business and launched large-scale programs, with the aim of profoundly transforming their operations and expertise, without ignoring the massive change management it required.

DATA & AI FACTORY

What are the key success factors of this increasingly popular model?

Faced with the challenges of data transformation, many industrial groups have chosen to equip themselves with a **centralized or mutualized team, serving the group's various business lines and bringing together skills** related to the management of data projects. In this way, Data & AI Factories enable groups to **quickly gain data maturity**, regardless of their starting point.

These new "factories" are shapeshifting, sometimes positioned as a support function alongside IT, sometimes as an independent operational business partner, close to the business and operations. They often have the dual challenge of providing a top-down vision that will enable in-depth business transformation, and of being a bottom-up enabler of this transformation.

We interviewed about fifteen managers and employees of several Data & AI factories and **four success factors** have emerged to create an efficient Data & AI Factory, regardless of the data maturity of the industrial group. Among them, organization, positioning, and financing are the most important success factors.

SUCCESS FACTOR 1: DEFINING CLEAR POSITIONING AND FUNDING

Organization is the most frequently cited success criteria: **71%** of the experts we interviewed mentioned it. Several levels of action have been identified.

First of all, it is necessary to clarify **where the Data & AI Factory is positioned in the organization**, on whom it depends and with whom it interacts. Some industrial groups choose to place it alongside IT, *"with whom it shares common issues: data governance, security, integration into platforms"*. Others prefer to keep it clearly separate. For the Data Officer of a French car reconditioning company, placing the Factory under IT would lead to technological trade-offs against the Factory and, therefore, to an underestimation of the data challenge. The director of data projects at a multinational food company, however, believes that the positioning of the Factory has no impact on its success, as long as its operating model is well defined.

Success then depends on the **sponsorship of the executive committee**. The experts interviewed agree on the need to bring data into the executive committees. For some, this means **creating a dedicated seat** in order to *"place data at the heart of value creation: this allows us to quickly understand where value can be unlocked and where it cannot"*. While some do not go that far, all mention the fact that the Factory must be used to support the group's strategy and, as such, be in direct interaction with the management bodies.

This proximity must be accompanied by a **phase of acculturation and awareness of leaders** to the challenges of AI. In particular, the rapid and universal adoption of this technology has created **confusion about both what it is and what it can do**. A Machine Learning Researcher at a leading aerospace company testifies: "*Management has a misunderstanding of AI. We crave AI, but my project manager doesn't know the difference between a software project and an AI project*". This **distortion between what is imagined by management and the operational reality** results in frustration for operational staff and a waste of resources – for example, by trying to apply elegant Deep Learning techniques where classical algorithms would suffice. This lack of understanding can also lead to an **underestimation of AI capabilities**, resulting in "*under-ambitious projects or projects hampered by lack of resources*". Training management is a solution often favored by factories employees.

Finally, it is essential to **define the financing method** from the start. The director of a Factory we interviewed gave us examples of invoicing rules: for a data warehouse, invoicing depends on the volume of data stored, whereas in the Data Lab it depends on the machine power used. This makes it possible to differentiate the price to be paid according to the use of each branch and, ultimately, to **allow each one to equip itself at its own scale**. He also points out a strict rule that he applies: a feature is only developed if a use case has been clearly identified, to **avoid the accumulation of unnecessary costs**.

SUCCESS FACTOR 2:

CONVINCING AND ANCHORING OPERATIONALLY WITH THE BUSINESSES

Managing change with the business lines is a central challenge for the Factory. **Obtaining the support of the businesses and being able to work in collaboration with them** is the second success factor we identified, cited by **59%** of the experts surveyed.

The encounter between the historical professions (operators, supply chain managers, process engineers, etc.) and the technological tools linked to AI can create mistrust, even confrontation. The Factory is even more likely to create a blockage with the branches because it is an external entity bringing a different culture – short cycles, often younger population, different formalism.

You must **be constantly connected to the business**: from the identification of problems to the development of products. According to the Chief Data Officer of a world leader in the food industry, data transformation must start with the businesses. The first step of a Factory is, therefore, to **listen to them**, understand their needs and imagine how data and AI could help them. It is necessary to **start from the user and go to the data**, and not the other way around: arriving with data and wanting to incorporate it without considering the business reality will create a blockage and will not bring any value.

In the second phase, we need to "*obtain a clear definition of what the business wants*", says a Data Scientist from a Factory in the telecommunications sector, "*this is the most complicated phase: the business itself does not know and can change its mind several times during the project*". In reality, it is often the interaction between the business and the data experts that refines the need. The **presence of business experts**, such as product owners, guarantees that the project is aligned with the needs.

Finally, during the rendering process, you have to include the trades in the successful completion of the project. The Head of the Factory of a leader in the aeronautics industry tells us that one must *"remain humble: include the people and show them that the important results were achieved thanks to them. They have not been on our side, but in collaboration with us"*. According to him, fighting against the isolation of the Factory is done *"with patience, by playing over time over several years"* and by taking initiatives that are part of the long term – not only during projects: participating in the co-creation of roadmaps for data projects or setting up exchange days during which people from the business lines come to the Factory and vice versa.

SUCCESS FACTOR 3:

ARMING YOURSELF WITH TALENT AND MAKING THE MOST OF IT

A Factory defines its particularity by a **grouping of transversal skills within the same unit**. This is the third success criteria, noted by **41%** of the Data & AI Factory managers and employees we interviewed.

Many skills are present in the Factory: software engineer, data engineer, data scientist, etc. Bringing together the necessary skills within the teams allows them to be **agile and dynamic** in carrying out projects. A Data Scientist from the Factory of an energy production group even adds that *"it is this guarantee of speed and quality of skills that entities come to the Factory for"*.

While large groups are struggling to recruit young AI talent – as one Data Manager points out: *"it's easy for us to recruit resumes, but difficult to recruit the best ones, and then to keep them. This is a recurring problem in data and AI"* –, the Data & AI Factory model has **quickly gained in attractiveness to this same talent**.

Several reasons for this popularity among candidates came up during the study:

- While the entities of large groups are known to have a strong inertia and to be difficult to move, a Factory is a **young, agile, and dynamic** structure: it is easy to create something.
- The subjects covered are **varied and technically ambitious**, combining research and development with a business approach.
- Factories are **as competitive, if not more so, than the market** – both French and international – in terms of remuneration and rate of progression.

On the Factory side, the managers interviewed in this study agree that the recruitment performance of this talent is based on:

- Having a **clear vision** of the Factory's position within the group: knowing where it fits and how it relates to the business lines, the executive committee, and the IT department. This makes it possible to tell an easy and clear story to candidates.
- The **order of team building**: recruiting scientific and technical experts and placing them in key positions. Having these senior referents is a promise for candidates to continually learn within the company.

SUCCESS FACTOR 4: DEFINING DATA GOVERNANCE STANDARDS

Often perceived by data consumers as a key element in the success of data projects, data governance was, however, only identified by **24%** of experts surveyed as a factor in the success of the Factory.

Nevertheless, it is certain that the Factory often plays an important role in defining standards in terms of data governance. Depending on the maturity of the data transformation and its seniority, the Factory's responsibilities in terms of data governance vary:

- At low maturity, the entire challenge of the Factory is to **"give the business units the ability to undertake projects with data"**, which means setting up common standards for data-related tools, particularly their governance.

Imposing new standards can create friction within the business units, as the director of a French Factory testifies: *"We represent a loss of freedom for data scientists outside the Factory: we define stricter rules on data access. We force them to change their way of working"*.

- A more mature Factory already has an established legitimacy on these fundamental themes. However, it must **remain active in maintaining and improving standards**. In particular, the role of data engineers should not be underestimated, as illustrated by a lead data scientist from the Factory of an energy production group: *"data engineers are the bass players of the groups: they don't trigger euphoria, but we can't do anything without them"*.

"Today, many groups dream of a Factory. But few of them talk about collecting their data. But to have a Factory, you need products. And for that, you need data. Don't wait until you have a Factory to properly collect data", concludes this same lead data scientist.



INTERVIEWS AND CROSSED PERSPECTIVES

1. *Using AI to achieve environmental goals*

- a. Lesaffre - Mathieu Clément-Ziza
- b. Eramet - Ludovic Donati
- c. TotalEnergies - Michel Lutz

2. *AI for the agricultural and agro-industrial sector*

- a. Ynsect - Nicolas Desombre
- b. Agrisight - Pierre Boucher

3. *Know and adapt quickly to the market thanks to AI*

- a. L'Oréal - Lucas Fourès

4. *Keys to success in building a Data & AI Factory*

- a. Sodexo - Maxime Marembaud
- b. Danone - Axel Droin

USING AI TO ACHIEVE ENVIRONMENTAL GOALS



Mathieu Clément-Ziza

Head of Data Science and Computational Biology



Lesaffre facing the challenges of data transformation: How can research and production data be used for a greener industry?

Lesaffre is a world leader in fermentation. Where does the data come from in this sector? What are the main needs that can be met by Data and AI?

Data is generated at all stages of the business. Right from the product design stage in our innovation centers, we use machines that produce an exceptionally large amount of data. In addition, we have inaugurated a "bio foundry" that industrializes certain stages of research, with multiple sensors. All this represents a **phenomenal amount of complex data**. In addition to the development expectations of our customers, the **current challenges in biosciences require** us to move quickly in innovation, and it has become imperative for us to exploit this data. Integrating their various sources and making them intelligible requires advanced modeling, made possible by AI.

Once designed, the product is transferred from R&D to industrialization. We seek to optimize these intermediate processes: modeling production, for example, via digital twins, requires the use of data. The production stage represents a real challenge for AI. On one hand, in a factory, there are sensors everywhere, i.e., a mass of exploitable data. On the other, we produce living things: it is not an exact science. Sensor data allows us to adapt to the non-uniqueness of life, stabilize our production, and ensure product quality. AI is a strength for our factories because it has **the capacity to integrate complex multifactorial analyses**, which the human brain does not have.

Finally, data and digitalization allow us to adopt a **consumer-centric approach**. We sell to resellers, so our end users are located far away from us. Collecting data allows us to put the consumer in the middle, to better understand the needs of the market, and to adapt our production.

How are Data and AI transforming Lesaffre's businesses? What progress have you made towards this process?

The transformation of businesses is not easy anywhere. To this is added the challenge of supporting change at Lesaffre: these technologies emerged first in industries with high added value and where the talents and skills were already present, which was not the case in the food industry. We began a data transformation of our businesses several years ago. But this is such a **massive** project that the **major effects will only be visible in the medium to long term**.

However, we are crossing thresholds, visible steps in our transformation. The same logical cycles are repeating themselves. In the beginning, there is a certain lack of understanding of the business users, which requires a **significant amount of time to acculturate and demystify**: to make people understand that AI is neither a threat to jobs and know-how nor a miracle solution to problems. Then come the first concrete projects. We then realize that there are significant differences in working methods, knowledge, and agile practices. This is followed by a phase of reframing and standardization of practices. The first results allow us to definitively break the fear of AI and data in the business. From being wary or even reluctant, **the business lines have become enthusiastic and understand that this is an opportunity, a place to be taken for them and for Lesaffre**. This is what we have just achieved in the context of a major project to optimize our industrial process.

Lesaffre's slogan is: "Working together to better feed and protect the planet". How do you use AI to achieve this ambition? What are the concrete applications of AI for sustainable development?

First of all, the expression "AI for a Green Industry" has a particular resonance at Lesaffre, since our first AI project ("understanding and reducing the sources of effluents in a factory") was a green topic before being a productivity topic. The two are obviously linked: if we produce more efficiently (by reducing production costs, or by increasing yield), we will use fewer resources than before, or produce more with the same amount. If this **quick win** seems to be true for the moment, **the group wants to make sure that there is no rebound effect** as we have seen in consumption: for example, gaining productivity could be at the cost of using a more polluting input.

More generally, data and AI are used **to serve the group's strategy**. If the group has environmental objectives - which is de facto Lesaffre's credo - these objectives will be shared by everyone, including the data and AI department. I would even add that **these environmental objectives will particularly resonate in the data and digital departments**, even more than in other departments. It's a generational aspect: these disciplines are young; we employ a lot of young people who are interested in these subjects. This can be felt in my teams: between two equivalent subjects, the sensitivity and personal affinities of each person often tip the balance in favor of the green subject.

Our carbon footprint challenges are significant. Firstly, because of the volume that Lesaffre represents today, approximately one bread out of three in the world is produced with Lesaffre yeast. To produce yeast, we use molasses, which can be produced anywhere in the world from sugar beet or sugar cane. Where molasses comes from and how it is transported has an obvious impact on our ecological footprint. Gradually, we need to include the carbon emissions of our raw materials in our sourcing plan: we need to be able to meet customer demand, at a low price and with a limited carbon footprint. **AI has the potential to bring a lot to these issues of optimization and transport**, which are very complex intellectually. Moreover, it is imperative to be reactive. Over the last three years, the coronavirus, the blocking of the Suez Canal, and the war in Ukraine (among others) have completely changed supply chains. Faced with these crises, we need to **be able to quickly propose sustainable solutions**. AI must allow us to consider these new logistics constraints.

Finally, it is imperative to think about "**how to deal with the issues**", not just "what AI can do for those issues". Making the right choices will limit the impact on the environment. **We must think frugality**: how often should we update the models? At what scale should we run them? Of course, the ecological impact of our applications using AI is limited compared to production. But, to change as a whole, all the actors must move in this direction.





Ludovic Donati

Chief Digital Transformation & Performance Officer
Digital representative for the National Strategic Committee
of the Mining and Metallurgy sector



Data governance, the cornerstone of data transformation and of the industrialization of use cases to achieve ambitious environmental goals

Eramet is one of the world's leading players in mining and metallurgy. How do you integrate data and AI into these activities?

We started to exploit our data to **gain efficiency in production**. We had a very large amount of data, covering all stages of the industrial process - from the extraction of ore to its transformation into metal. We extracted value from them through use cases (for example, connecting AI to several metallurgical furnaces or performing predictive maintenance), which we have made available to our businesses. Many professions are now much more involved in data: metallurgists, geologists, miners, and supply chain managers. **Our productivity issues are never divorced from our desire to reduce our environmental impact**. Anticipating yield shortfalls, managing to produce more with less, etc., contributes to our production having a better impact on the environment.

Data also allows us to **improve our knowledge of the market**. The world is changing: the energy transition and the economic development of certain areas will result in a growing need for metals. We need to understand these developments and position ourselves correctly. Anticipating the challenges is fundamental for the Mining and Metallurgy sector as a whole and for the challenges of French and European sovereignty.

You have a fervent desire to improve your environmental impact. How can AI and data help you achieve your goals in this area?

Eramet has a fundamental role to play in the years ahead: ensuring the supply of metals needed for the energy transition (especially electric vehicle batteries). To meet the objectives of this transition, it is estimated that the world will consume more metals in the next few years than since the beginning of mankind! The increase in metal requirements must be accompanied by a very ambitious CSR approach. We are, therefore, placing our CSR roadmap and responsible mining standards at the heart of our challenges. Data enables us to **measure the direct and indirect impacts of our activities** on the environment, biodiversity, and local communities so that we can then take concrete action. This is a deep conviction shared within the company.

Several use cases based on AI have emerged. In New Caledonia, we transform ore into nickel alloys using energy-intensive metallurgical furnaces. We sought to optimize the carbon impact resulting from this transformation by considering several factors, such as the different energy sources, their availability, and the weather. Optimizing our energy mix between carbon and non-carbon sources through AI results in significant energy savings.

AI also allows us to monitor the revegetation of mines. We've been using drones to map the area around the mines for some time, which gives us access to a lot of information, such as the state of the stockpiles and roads. We have recently coupled these images with an automatic plant species recognition algorithm, and we are now monitoring the progress of revegetation. It is important for us to return the plots to a better state than they were in before they were mined. Processing the images with AI makes this process automatic and less expensive. In addition, the resulting data is easily accessible to external stakeholders who follow how we revegetate.

Purely data use cases are also developed. In Senegal, by implementing **good governance of our various types of data**, we **ensure the traceability of our products**. Thanks to digital technology, it is possible to access the history of the metal: the place of extraction, the transformations undergone, the quantities of water and CO2 consumed. We are currently completing the industrialization of this traceability, and we have the ambition to deploy this certificate of traceability to all our other products.

You started your digital transformation in 2018. Five years later, where are you now? What are your major challenges?

We are still far from having covered all the ground. However, we **have proven the financial and extra-financial values** it brings to Eramet. Our number of employees aware of the importance of data has risen sharply, whether in positions that create data use cases (data engineers & scientists, IT team) or as data consumers (metallurgists and other Group businesses). We believe it is essential to **train our employees in AI**, to enable them to see AI as something other than a black box provided to them. For the moment, we have trained and certified about twenty people in Data Science, and we want to bring these skills to all our businesses.

A prerequisite for data transformation is **good data governance**, from how data is retrieved to how it is made available within the enterprise. Implementing best practices and building integrated information systems are costly programs, in which manufacturers may be reluctant to invest. However, **no group can afford to let technical debt and backlogs build up**. If this happens, they will have to compensate with a larger investment later. It is, therefore, preferable to be properly prepared and to smooth out the issues and expenses related to data governance over time.

Data governance is a critical topic. We have several success stories, and we can continue to run projects using AI. We are now moving towards an integrated and global management of our value chains and want to ensure product traceability, and this will only be possible if data is available to as many of our employees and stakeholders as possible. **Centralizing data and decentralizing the consumption of this information** can only be done with **solid governance**.



Michel Lutz

Head of Data de la TotalEnergies Digital Factory
and Chief Data Officer at TotalEnergies



The Total Digital Factory: a centralized Data and AI expertise center serving TotalEnergies' business and environmental ambitions

TotalEnergies opened its Digital Factory in early 2020. Can you tell us about it?

After the creation of our digital department in 2016, local data initiatives – within the Company's branches – were developed. This was an opportunity to test, to build convictions around Data. We quickly saw **the potential for value creation** that it represented for the company, and we decided to invest more broadly in our Data transformation. The creation of the Digital Factory enabled us to **pool our resources** and **create a significant digital strike force**: today, it brings together nearly three hundred people dedicated to the creation of digital applications. The pooling of their technical and business expertise, coupled with TotalEnergies' know-how in the field of energy, makes it possible to create high-impact applications for and with the Company's businesses.

In the Digital Factory, four out of five projects are based on the use of historical data, and about one out of two require complex algorithmic methods such as AI. We work primarily on data-intensive applications that need to be integrated with complex IT systems to go live.

Apart from the Digital Factory, there are other data science teams at TotalEnergies, with whom we work and who provide us with different insights – particularly on R&D or on specific business areas. The Digital Factory, on the other hand, is really specialized in the production and industrialization of data science (software development, MLOps). Data management is handled at branch level, by the Data Officers in charge of data quality, repository management, cataloguing, etc.

What are the uses of data and AI within TotalEnergies? Are there any specificities related to the energy sector?

Data and AI expertise must be used to serve the Company's strategy. The projects, at the Digital Factory or within the branches, are part of a **business vision**. TotalEnergies' current ambition, as a player in the energy transition, is to reinvent energy production and consumption to achieve carbon neutrality by 2050, together with society, and to solve the climate challenge. We are positioning ourselves in electricity, particularly from renewable sources, natural gas and green gas, and in the Company's more traditional businesses, such as oil and biofuels. Our data projects are designed to **help optimize energy-related operations** across the entire value chain, from production to distribution.

There is a direct link between optimizing production and reducing CO2 emissions, so many of **our projects are ultimately linked to environmental issues**. Data allows us to better monitor and reduce the carbon impact of our historical industrial sites. Thanks to data science, we are also able to make more accurate predictions of the energy consumption of hydrocarbon processing sites.

The Digital Factory also develops **products related to the new energy markets** in which TotalEnergies is expanding (electricity, renewable energy, etc.). With SAFT, a subsidiary of the company, we are developing a tool for predicting the quality of Li-Ion battery cells using AI, to reduce their production time. In the solar sector, we have worked on a centralized and automated tool to estimate the photovoltaic potential of a project, to identify its technical and environmental risks and its economic viability.

We select incoming projects to the Data Factory according to several factors: the adequacy of their objectives to the Company's strategy, their added value from an economic point of view as well as from a CSR point of view (possible reduction of CO2 emissions, improvement of safety on our sites, etc.), or their scalability and the desirability of users.

Within our OneTech branch, use cases are also multiplying: for example, with the prediction of renewable energy production, particularly from satellite images. OneTech is also leading a major program around CCUS (Carbon Capture, Utilization, and Storage), a new field whose deployment will help decarbonize industries. In concrete terms, we are participating with other operators in a pioneering project in the North Sea that integrates capture, transport, and storage of industrial CO2 emissions in geological layers. This type of project requires complex numerical models to understand the behavior of CO2 once it is captured and injected underground.

Data is also useful for **anticipating the evolution of energy markets**. It is used as a decision-making tool to guide energy market experts. In a world where everything moves very fast, this help is precious.

The Digital Factory is a centralized center of expertise. What are the success factors of this type of structure? What are your next challenges?

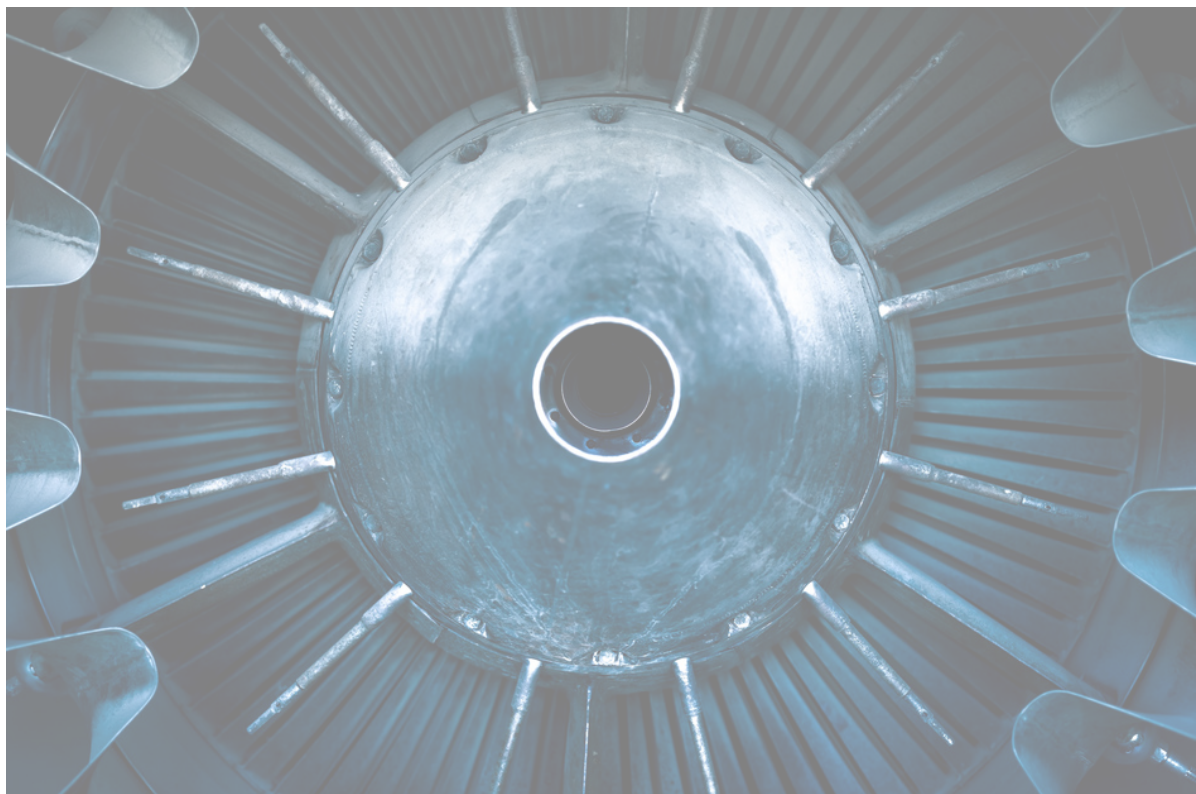
First, **we are connected to the business users**: in the management team of the Factory, there is a representative from each of the operational branches. This allows us to maintain a business vision consistent with the group's strategy. Within the projects, we work according to the principles of the Agile method in collaboration with Product Owners, who represent the business users and define the operational uses of the applications developed. The voices of the users and the business are thus present throughout the design process.

We also work hand in hand with the IT department: we are fully integrated with the company's information systems. This allows us to create robust products that can be deployed on a large scale. Our technology decisions are made in collaboration with IT, which plays a central role as architect, and another team in charge of platform management. Building this technology roadmap together keeps us aligned and ensures smooth processes.

Another dimension of success is the **human factor**. We have high level and motivated experts in digital technologies and practices. Our Product Owners are also of a very high technical and business level. The **meeting of business expertise and technological expertise** of the Factory allows us to build **products that are both very useful and very well done technologically**. We work on our projects in squads, bringing together all the skills. Each squad is autonomous, which allows us to move quickly and be agile.

One of our next challenges will be to industrialize the control of our models. With over three hundred models in production, we are good at putting data science into production, but we are still managing models on an application-by-application basis. We would like to move to the next level and achieve global governance.

Our second challenge will be to find the optimal way to make digital and data science serve an exceptional user experience. In the Factory, we talk a lot about technology, Artificial Intelligence, etc., but **our core business is not to make models, but above all to transform the daily lives of employees and customers by improving their experience and their decision-making process.** We work with UX designers on how to best include data science in the decision-making processes, while remaining as fluid as possible: to make the technical dimension disappear in favor of the user experience. It's a subject we're currently looking at a lot and we're very passionate about it.



AI FOR THE AGRICULTURAL AND AGRO-INDUSTRIAL SECTOR



Nicolas Desombre
Chief Digital & Data Officer



Data and AI: key dimensions in the invention of tomorrow's insect factory farms

Ynsect is a pioneer and agro-industrial leader in insect-based protein production. You are about to open a "4.0" factory farm. What is it all about?

We are the first to build a large scale industrial insect breeding plant. As such, data is a major challenge for us. The massive use of data should allow us to **accelerate our knowledge of this new industry**. A better understanding of our insect and of our process will enable us to **improve our productivity and better guide our investment choices**. The more factories we have, the more data we have, and the better we know our industry. This will be a real additional entry **barrier** for potential competitors.

Extracting data from a factory requires **the implementation and structuring of capture systems**, which are difficult to integrate into an existing factory. We chose to build a **native factory 4.0**, highly automated and in which the entire network is integrated. We integrated the CIM (computer-integrated manufacturing) pyramid: starting with the ERP and going down to the automata, we developed an **original methodology for integrating all these systems** to clarify the functional perimeters of each and to connect the one hundred and seventy interfaces between them. Once this is in place, we will collect the data from the production plant and use it according to the different use cases we have imagined.

You will collect nearly a billion historical data points per day. What will you do with them?

The data collected will be used at several levels: to ensure total traceability of products, to perform predictive maintenance of critical industrial equipment, etc.

In the medium term, we have many **use cases for industrial production and for research and development**. On the industrial side, we will be able to determine, for example, whether we are developing conditions that are favorable to the development of diseases or pests (such as mites).

To cite another example, the data will also address major genetic issues, such as selecting the most productive strains of insects and re-injecting genetic diversity.

We have already launched use cases on the research and development side. We are currently working on **models of the evolution of the farm and the insect** (how fast it grows, develops, etc.). The idea is to **confront our theoretical models with the reality of the new plant** and to make them self-learning. The systems for capturing data in the tanks and imaging the insects will provide us with the necessary physiological information.

Our challenge is to understand the interactions, the possible correlations that make our insect colonies evolve well. We would like to **build what-if scenarios**, in order to predict the impact of a decision on the colony. Since the effects of a decision taken today can only be seen in a few weeks (the time it takes for the larva to become an adult), these projection models will be central to decision making.

What are the data and AI challenges ahead for Ynsect?

The use and modeling of data is only the tip of the iceberg. They are **only possible if the data is properly captured** inside the plant. The real challenge today lies in the tip of the iceberg: Factory 4.0 must work; systems must be integrated and data must be collected.

This factory is a goldmine of data, but we don't yet know what are the veins to exploit. We will have to discern which data will be useful for which purposes – and stop collecting it if it is not useful. We will have to avoid fat data: with over a billion data points collected every day, we don't have the capacity to store everything. Typically, we will take photographs of all the insect bins, but we will only archive the results of the image analysis rather than the images themselves. That's a choice we must make.



Pierre Boucher
Co-fondateur



Supporting agricultural cooperatives in the digitalization of their activities: the example of supply chain optimization

What issues in the agricultural industry are you working on? How do data and AI help you?

We are developing a SaaS (Software-as-a-Service) solution for agricultural cooperatives to manage, forecast, and optimize their supply chain. We are positioned on processes related to the use of logistics data: flow and storage planning, sales forecasting, pricing of purchases and sales, calculation of routes, etc. For this interview, we can talk about 2 use cases in particular: **flow optimization** and **sales forecasting**.

The optimization of flows has a double interest for cooperatives: firstly, to **reduce costs** linked to the supply chain in order to be able to better redistribute the benefits to farmers, and, secondly, to **reduce the carbon footprint** of their activities. Indeed, reducing the number of kilometers traveled has a direct impact on the CO2 emissions emitted.

On the environmental side, our solution also helps cooperatives to **control and reduce the logistical costs related to new product references** ("chains"), which allows the sustainability of these varieties produced in compliance with strict environmental specifications.

We incorporate data and complex mathematical modeling to optimize logistics flows and make forecasts. For flow optimization, we configure a digital twin for each cooperative including all the infrastructure characterization and management parameters. From collection to sale, there is an infinite number of possible routes: these optimization problems require advanced algorithmic intelligence.

For sales forecasting, we calculate from transaction histories and numerous agriculture-specific rules what the forecasted sales volumes for the upcoming harvest will be. This requires a direct integration of AI and supervised learning.

You are addressing agricultural cooperatives. How does digital transformation work in this sector? How do you get the necessary data?

Our customers are not big users of AI. That's why we have to **listen to them and convince them of the usefulness of our solution**. There is only one way to prove ourselves: **by example**. We run our algorithms on their real data and then compare our results with theirs. They gradually gain confidence in the reliability and value of our solution.

We have also decided not to parameterize everything, so that the configuration is at the "right level" of complexity and the result of the calculation is understandable. The user, therefore, always has the power to adjust the proposed result, whether it is a logistics plan or a sales forecast.

Retrieving the data is not a constraint. We start our simulations with few parameters and enrich

The quality of the infrastructure description data is also improved at each calculation iteration,

We work hand in hand with the business units to build our models, and from one iteration

Our tool benefits from this great flexibility: it does not require many parameters to work, but the

KNOW AND ADAPT QUICKLY TO THE MARKET THANKS TO AI



Lucas Fourès
Head of Data France

L'ORÉAL

Making the most of internal and external data for operational performance and market understanding

What are the uses of data and AI within L'Oréal?

Our first challenges regarding Data are related to **efficiency** and **market/consumer knowledge**: data and AI enable better management of sales volumes, prices, sales promotion, and product assortments. They allow us to **be in tune with the issues of our customers**, both consumers (B2C) and businesses (B2B). Our business customers, specifically, are becoming very diverse – between offline and online – and each channel raises different issues. Data and AI allow us to be polymorphic and to adapt efficiently to the particularities of each one.

Our data comes from our sales channels, our consumers, the market, and our vendors. Our data-centric approach allows us to become more intelligent about what consumers want and to do advanced detection of their needs. This is crucial: we are becoming more and more proactive in defining the right positioning and go-to-market steps for our products.

The data has **provided** us with a **lot of value in terms of market knowledge**, which in turn has improved our competitiveness. For example, we have become more sophisticated in our approaches to allocating our media budgets (Marketing Mix Modeling), particularly in the trade-off between offline and online investments. Media are key levers in our understanding of consumer behavior. They are multiplying and are increasingly complex to manage. Incorporating AI into our investment decisions facilitates these processes.

AI is also present in the services we offer: L'Oréal bought ModiFace in 2018, a Canadian company that allows Internet users to try our cosmetic products virtually. Integrating this service into our data ecosystem has given us a real technological brick, providing access to a new, much deeper, granular source of data about our consumers.

You work in both B2C and B2B. How is the access to data in both cases?

B2C data is very rich – especially due to its volume – but direct contact with our consumers is sometimes more difficult to implement than with retailer customers data. Strengthening the digital business, notably through e-commerce, allows us to **create a direct link with the consumer** and to recover value from this data. The term "digital challenge" takes on its full meaning in our industry, which has not been very advanced so far.

In addition to our online sales, we work on data partnerships with our retail customers.

We have several real-world cases of **collaboration** and while **data monetization** is a new topic for everyone - requiring the right stack, architecture, and skills - we are both pleased and confident of the value we are getting and will continue to get.

We have built our first successes with retail clients (Carrefour and Veepee). For example, we have co-created a L'Oréal x Veepee Brandsplace and proposed a unique and new way of selling on the market. These partnerships are very interesting for both parties: we find ourselves in a totally different equation where we learn together to better manage and value our data. We feel very comfortable in this scheme, and we want to push it to become an indispensable partner in our vertical.

You work in a cross-functional data unit, how are you integrated with the rest of the ecosystem?
What are the key success factors of your organization?

Our team is positioned within the Digital and Marketing Department, and federates a community of about thirty people, with various profiles (from BI Analysts or Scientists to Data Engineers or Scientists). We oversee the data expertise present within the four divisions of L'Oréal France (Consumer Products, Professional Products, Luxury and Active Cosmetics) and support them in the implementation of their data roadmaps.

We report to the CDMO France and work in **close collaboration with the IT department**. A good division of our fields of action has allowed us to avoid overlapping our skills: we are responsible for the activation part of the projects, and IT for the system-interface and security part.

There was a **turning point in our data transformation** three years ago when we developed a partnership with Google and equipped our teams with the GCP (Google Cloud Platform) environment. As a result, we are now **mature in data management**. This focus on capabilities allows us to move towards increasingly impactful use cases and value creation. This data transformation has been culturally very well received by the businesses. L'Oréal's culture of innovation has made it easy to understand the marketing challenges. We also benefit from a strong data community within L'Oréal France. We have hybrid expertise, which is well distributed in the organization.

What are your next challenges?

The challenges are many, and so much the better!

Our focus - while obviously on the roadmap and delivery of quality Data Science products with strong business impact - is primarily on:

- **Managing the life of data products**, from their scoping to their run and scale within our organizations,
- The **organizations**: they must be ready to live with these products on a daily basis, in their operating models as well as in their business models! And this is a huge task!
- The challenges of **ethical and responsible use of Data**, which tomorrow can become even more of an essential lever of the responsible company.

These issues of managing the life of a data product and integrating it into models are major challenges, as they are instrumental in activating data, while, at the same time, having to coexist with the imperatives of an extremely dynamic market that is, therefore, in perpetual motion!



KEYS TO SUCCESS IN BUILDING A DATA & AI FACTORY



Maxime Marembaud
Group Head of AI and Analytics



Sodexo: a Data & AI Factory model built and proven in the field

What are Sodexo's needs in terms of Data and AI?

Sodexo's operations architecture is centered on consumer demand. Building accurate predictions, both at the global and granular level, allows us to **gain efficiencies across our entire supply chain**.

We are now expanding into new areas, starting with **consumer insight**. By providing personalized offers and services, we work to improve consumer satisfaction, and, subsequently, that of our corporate clients. Thanks to data, we can monitor these needs over time. We also use data on "constrained optimization" topics. This allows us to identify alternative products or suppliers, and to integrate constraints on the carbon impact of our activity.

Our business generates large databases through digitalization. We collect retail data from checkouts and from our mobile shopping application. We link this data to our customer base, which allows us to **better understand consumer habits**: frequency of purchase, preferences, etc. On a more operational level, we **optimize the logistics of purchases** thanks to supply data (what is bought and from whom). We also have a facility management business, where data is used to monitor the performance level of buildings (energy and air conditioning consumption). Because of the differences in systems and deployment, AI is also used to reconcile these databases.

Four years ago, Sodexo set up a Data & AI Factory. What are its missions? How does it fit into its environment, particularly with IT?

Our Factory has grown rapidly. We are fully integrated into Sodexo's business organizations and are organized into three divisions: Products, Data Science & Analysis, and Software & Data Engineering. We have three missions:

- We define and prioritize use cases
- We design, develop, and deploy at scale the data products identified as being in line with strategic projects,
- We are customers of the group's major projects, for example, the implementation of data platforms and the cloud, or data management issues.

The Factory and IT are closely linked. The **division of roles between IT and Data is never static** and is constantly evolving to reflect the needs of the business users. The way we have built it, our data transformation is driven by both the Factory and IT. The two teams work together, with the same objectives. It is essential to ensure that the right skills are grouped around the products to meet the challenges of each stage from design to deployment at scale, while being fully integrated into the Sodexo operational teams.

The roadmaps are fully **aligned with the Group's strategy**. Projects are prioritized according to their value, considering three dimensions: the project's consistency with the Group's strategic priorities, its short-, medium- and long-term value, and its feasibility. If the project is feasible - particularly in terms of access and data quality - we must enter the value cycle as soon as possible.

We have also become strongly **rooted in operational reality**, with decision makers who have a real grip on practical change and the use of AI in operational systems. This double hook - both with the executive committee and the operational reality - allows the Factory to **be well positioned between the strategic vision and its execution**. The second success factor for the Factory is **good collaboration with IT teams**. It is important to understand that the products built at the Factory must be integrated with existing systems and workflows. Finally, you need to have a **good mix of skills** within the team: profiles that understand business issues very well, others with strong data science and data analysis skills, and others in building Tech products. Recruiting talent remains an important challenge, but one that we are becoming more comfortable with. Our clear vision of the positioning of data in the Group's ecosystem allows us to tell an easy and impactful story to candidates.

The AI and Data transformation of businesses has become a central issue. What is the role of the Factory in this transformation? What is your main challenge in the next 2 years?

It is essential for the Factory to support the business users in their data transformation. We can deploy projects at scale, and we now want to **create impact**. Achieving this impact involves **managing change** within the business. We are working on this via two levers.

First, we have brought data acculturation to all employees through an internal training program. As part of the projects in which we are involved, we appoint and train "data ambassadors" within the operational entities. They have a better understanding of the issues and help with the proper implementation and deployment of data projects.

Secondly, we support the businesses in the adoption of data products. Businesses must be able to benefit directly from the value created by our products. We are making sure that they have the right skills and resources to be able to manage this change with our support. To do this, they are starting to acquire data and business analyst profiles.

Our challenge today lies in our ability to anchor ourselves firmly in this phase of change management in order to be able to transform our practices in depth.



Axel Droin
Group Director of Data Platforms and Data Projects



The Data Factory: a tool that enables businesses to transform themselves

What should be the place of Data in the company strategy? To what extent should a Data Factory be integrated into it?

First, it is important to understand **that there is no data strategy as such**. Data is at the service of the company's business strategy and must make it possible to base operational and strategic decisions on facts, not on feelings or intuitions. Data is then only a support function, just like IT, the finance department, or human resources. If the company is to become data-driven, this **must be the mission of everyone, not just IT or the Data Factory**. Consequently, since data transformation cuts across all functions, its vision and ambition must be driven by the CEO. It is important to realize that the people responsible for the success of a data transformation are the businesses themselves. **The Data Factory is not a savior or a superhero, but an enabler**: it will provide the keys, and help to bring data out of the business. But it remains only a tool, not a solution.

Secondly, there is no magic technology that solves all problems. **A data transformation is long, painful, and thankless**. At the beginning and for a long time, it is better not to expect to lead new projects, but rather to do better what we were already doing. IT has already been managing data for years, the work of the Data Factory must be in continuity with its activities and not in competition or opposition. It's a long-term commitment; there will be no revolution, only evolution.

The Data Factory, therefore, works to serve the business lines. From an organizational point of view, how should it be integrated with the various entities of the group, particularly IT? On what themes?

There are specific data issues, such as RGPD compliance, security, and data protection. **The legitimacy of the Data Factory on these fundamental data topics cannot be questioned**, unlike innovation or business transformation projects. These fundamental subjects can become a pretext for imposing good practices on the business lines and then helping them to implement the projects. From a governance point of view, we have to make sure that the business lines have no choice, that they cannot do AI, Data or IT without going through governance that ensures the legality and compliance of these projects.

As soon as it has legitimacy on the fundamental side, the Data Factory becomes able to take the lead on decisional subjects (reporting, monitoring, alignment of KPIs, etc.) and to accompany the transactional subjects led by the IT department at the service of the business. Indeed, on the latter subjects, what is essential to ensure the success of the project is the integration into the business gestures carried by the existing transactional systems. If the system falls, the company no longer functions.

The responsibility is, thus, to maintain the transactional part, by correctly distributing the tasks, i.e., by positioning the Data Factory in support of IT and integration.

It makes sense to bring data profiles together – in a Data Factory – because data is a specific subject for the company. However, if the ambition, strategy and operational model are clearly defined and accepted by all, the place where it sits makes little difference. For example, you can imagine it working very well within the IT department, strategy, a transformation team or within a business function, again there isn't an answer.

Once legitimate with the different businesses, how does the Data Factory help them in their data transformation?

The purpose of a Data Factory is to help business units to work on their data subjects and to transform themselves while being legal and compliant. To do this, the data factory must adopt the right posture: above all, it must not come and explain to the business what they should do, but rather **listen to them, understand their needs**, problems, and challenges, and see how the Data Factory and what it puts in place can help them. The mistake would be to come looking exclusively for AI, Data Science, or disruptive innovation projects and relegate operational issues to the background. There is not a single problem on which the Data Factory could say that it is not its subject. You have to analyze each one and understand where and how the Data Factory can act.

The first challenge of data transformation is to create a Tech culture, especially to make people understand that AI is not supposed to replace humans, that it must be trained, that the question must be well defined, and that, in any case, it will never work with 100% performance.

This acculturation takes time, must be done in small groups, must be based on concrete examples that speak to the company, and must be addressed to all employees. It is preferable to start with the members of the executive committee and their teams, and then extend their support to the whole company. Five main themes can be addressed :

- **Putting the evolution of data and technologies into context:** where it comes from, the difference between decision support and transactional, etc.
- **The reality of data today in the company:** the start-up, the constitution of teams, the different types of use cases.
- **Fundamental issues and data management:** what it is, why it is important, how to evaluate the quality of the data.
- **The technical solutions available:** those used within the company, what are their differences, and how to choose.
- **Use cases of data science and artificial intelligence:** the three types of learning (supervised learning, unsupervised learning, reinforcement learning), illustrations with use cases from the company.

The success of such training comes from easily actionable and concrete content, illustrated by internal use cases. Illustrating with external companies, especially with Tech giants, is useless: participants must be able to understand and appropriate each of the pillars. The Data Factory teams must be able to explain what they do and put it into perspective with the way the company works.

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Emerton Data is a digital, data & AI specialist for the industrial sector. We help companies define their data & AI strategy, we provide custom tool development services and incubate AI SaaS solutions for industry players, at the service of business improvement goals.

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Startup Inside is an innovation strategy consulting firm, a pioneer in intrapreneurship and business hackathons, and a leader in creating international conferences and think tanks on Artificial Intelligence and Data.

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