European
CD²O Study

Profiles, Challenges & Enablers of European Digital & Data Leaders

ARTEFACT
Kienbaum

About,

Artefact

We're a next-generation data services provider, specialised in data consulting and data-driven digital marketing, dedicated to transforming data into business impact and tangible results across the entire value chain of organisations. Artefact's skyrocketing growth is fuelled by our three visionary and entrepreneurial founders, who see the future of data as a catalyst for good, for both humankind and business.

Artefact offers a comprehensive range of data-driven solutions designed to meet today's specific client needs, delivered via a business-centric approach that is built upon deep AI expertise. We are a connected independent global network, with a footprint in 18 offices across 14 countries, and we partner with 1000+ ambitious clients around the globe.

Our 900 employees are focused on accelerating digital transformation thanks to a unique alliance of company assets: cutting-edge AI technologies, agile methodologies, and teams of market-leading experts in data science and digital marketing.

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Kienbaum

For over 70 years, we have been working in locations around the world to empower people and organisations for tomorrow's professional world. To meet the individual needs of our clients, we bring together leadership advisory services and management consulting in interdisciplinary consultant teams.

These teams provide advice on all aspects surrounding the recruitment and continued development of top-level candidates as well as employee evaluation, compensation and long-term commitment. Using individualised methods and models, we provide support for changes to organisations and develop specific learning approaches and training academies. Working jointly with our clients, we develop the capacity of individuals and organisations to grow through these opportunities.

We are convinced that a respectful, appreciative and results-oriented approach to leadership is the key to success for organisations in the future.

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Preamble,

Artefact and Kienbaum have joined forces to conduct a study on the two new roles of Chief Digital and Data Officers. Our goal is to define their profiles, the challenges they face, and their evolution within organisations.

This study is in continuity with the studies carried out by Matthieu Watremez in 2015 and 2017. It will therefore highlight the evolution of these positions.

Dear Friends, Dear Humans, Dear Robots,

With this study, we wanted to put the profiles of the people we work with every day into perspective: European Digital and Data leaders.

First of all, we would like to express our sincere gratitude to the hundreds of CDOs who gave us time out of their busy schedules. In addition to our daily exchanges, these interviews allowed us to take a step back from the rush generated by ongoing projects in order to enhance our understanding of your mid- and long-term challenges.

Although we are aware there is no unique recipe to lead your company's Data and AI transformation, we wanted to provide you with some of our convictions that may help you build strong enablers.

Vincent Luciani.
Co-founder and Global COO of Artefact

Dear digital and data curious,

This is the third time I've conducted a study on this topic, and the first question I wanted to ask was: is it strange to still conduct studies and speak about "Digital Transformation" in 2019? After all, the first one was carried out in 2005. The reply wasn't obvious at first, but after all the interviews were completed, the answer was clearly: "No. It isn't."

We spent a great amount of time on this study in order to deliver answers and insights in the most intelligible way possible. In fact, thanks to all the great feedback from the CDOs we interviewed, we raised a lot more points than we thought we would.

Thank you to all those who gave us time, honest feedback, and perceptions of the impact of their respective positions in their companies.

Matthieu Watremez.
Digital, Data, and IT Practice Director of Kienbaum

Intro,

First seen in Europe as a temporary role, **the Chief Digital Officer has now become a permanent position** which is moving up the hierarchy. **The role of Chief Data Officer is slightly more recent, but is growing even more quickly**, as data collection is now omnipresent, and its processing, enabled by AI algorithms, is more and more necessary.

The similarities of **CDiO (Chief Digital Officer)** and **CDaO (Chief Data Officer)** profiles led us to consider these two roles within the same study. **CD²O (Chief Digital Officers and Chief Data Officers)** share the same enablers which are both technical and organisational. On the tech side, they have to build a solid data infrastructure which requires selecting, deploying and connecting the right tools. As for organisation, their scope also includes setting up clear data governance that ensures data quality and usability. Beyond these streams, their ultimate goal is to deliver impactful use-cases; this generally involves carrying out major transformation projects.

However, contrasts between these positions were also clearly identified during the interviews. The CDiO is in charge of a wide range of missions that may significantly vary from one company to another and which, more importantly, may quickly evolve over time. The CDaO also plays a crucial role but has a more standard function that focuses on transformation, governance and data valorisation. Will they converge? This might happen, but many factors are in play.

At a time when digital and data are changing the order of things by offering new growth levers, legacy actors are increasingly threatened by the emergence of new competitors. Being agile, they perfectly master the new Digital and Data rules to offer seamless experiences to a market that has very quickly taken them for granted.

Therefore, the purpose of this study is to give CDiOs and CDaOs the keys to enhance their company transformations. To do so, we outline the trends and recent evolution of both profiles. Then, based on CD²O testimonies, we elaborate on the main projects led and challenges faced by Digital and Data departments in each industry. Finally, we compile the best practices observed to give them the right enablers to build their data strategy.

Methodology,

To have a representative and relevant sample for this study, we chose **a list of 400 companies in Europe**. Within this list, we selected large listed groups from the main indexes (SBF 120, Dax, FTSE, AEX...), but also family groups, internationally recognised pure players and companies with an annual turnover of more than 500 million euros.

Once these lists had been consolidated, our first task was to identify the different digital and data leaders within these companies. In this study, the CDiO and CDaO are by definition leaders on their subjects, whose responsibility is to develop and implement the group's digital and/or data strategies. Regardless of the different job titles, very often specific to each company, the function of the CD²Os we have identified is to manage or coordinate all the digital or data topics entrusted to them.

In order to collect a maximum of both quantitative and qualitative data, we decided upon the following panel:

- **100 CD²Os** interviewed either face-to-face or by phone (including 70 in France).
- **500 identified profiles** from which we collected insights and data available online (LinkedIn, articles, corporates websites, network sourcing...).

To collect as much data as possible about these positions - their profiles, their missions, and also their feedback - partners from Artefact and Kienbaum conducted the live interviews with CD²Os across Europe, asking them about 4 main topics:

1. Organisation

- Role and position
- Team structure
- Size and profiles of the team

2. Context

- Digital & Data maturity
- Digital & Data culture

3. Roadmap

- Main projects for the next 3 years
- Enablers and inhibitors

4. Vision

- Upcoming challenges
- Major technological trends and their uses

The following analysis is the result of these exchanges and all the data available through previous studies, which we have analysed based on our respective experiences at Artefact and Kienbaum.

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CD^2O Evolution and Range

Historically similar, CD^2O roles are evolving differently

01

Introduction.

The first Chief Data Officer was appointed in 2002 by Capital One (10th largest bank in USA), 3 years before the first Chief Digital Officer in 2005 for NBC. And for nearly two decades, CDiOs kept rising, monopolizing the attention of organizations and media, paving the way for the return of CDaOs by transforming companies and showing the way for the use of their data.

No one today disputes the importance of Data. CD²Os are tightly intertwined through common interests, challenges, teams and problems, working hard to earn their seat at the Excom table. These two profiles, still considered hybrids are on the rise and depend on each other for mutual success.

This part of the report — based on previous studies — interviews across Europe and public data gives a global overview of these two positions and how they impact all the sectors.

CdiOs and CDaOs share several common streams

CdiO, a sustainable and promising position

CDaO: an equally crucial position that seems to be more "standardised"

CdiOs and CDaOs share several common streams

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CD²Os: Hybrid profiles that have deeply transformed their organisation

The ideal profile for both doesn't exist

Groups have different histories, cultures, challenges and internal organisation. This is why CD²Os are the only hybrid profiles among C-Levels, as they must develop and master different skill sets depending on the context.

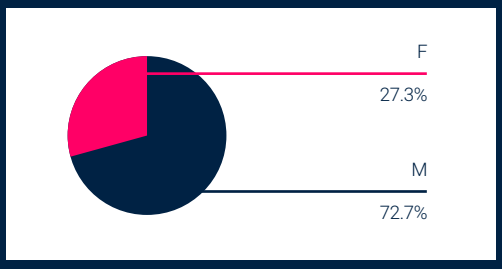
One key insight from the last studies and all the interviews we conducted is that changing or transforming a company's DNA can't be done easily, no matter how strongly you desire it. Companies still have to deal with certain major changes which are specific to their situation, and they need people to overcome them. This is one of the reasons why CD²Os are considered hybrids compared to other C-Levels.

At first glance, the roles of Chief Digital Officer and Chief Data Officer share many common characteristics. These are relatively experienced profiles which still have several years of career ahead (half of CD²Os are between 40 and 49 years old), and they combine both technical and managerial skills.

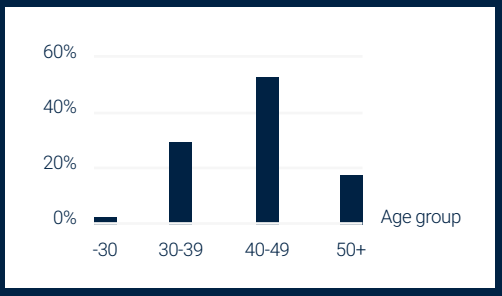
Standard profile

Chief Digital Officer (CDiO)

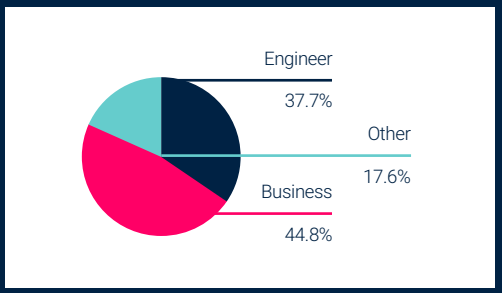
Parity



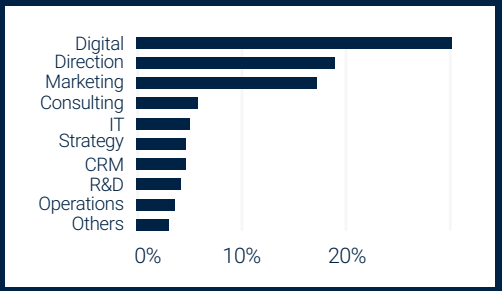
Age



Educational Background

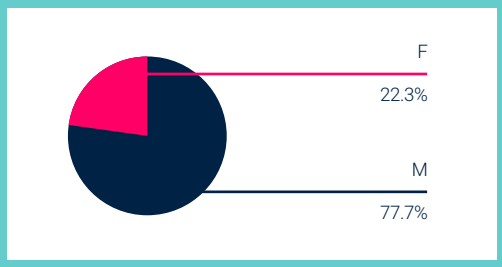


Former Job

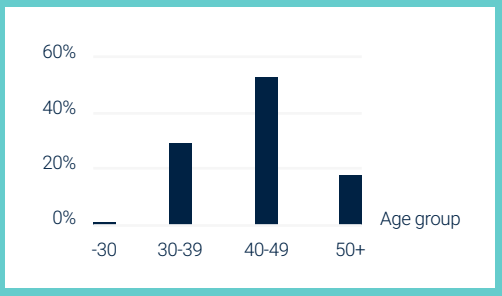


Chief Data Officer (CDaO)

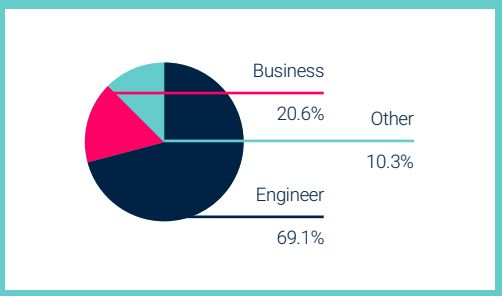
Parity



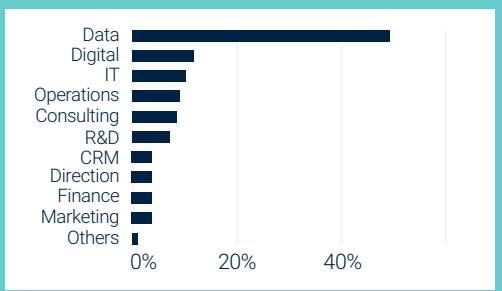
Age



Educational Background



Former Job



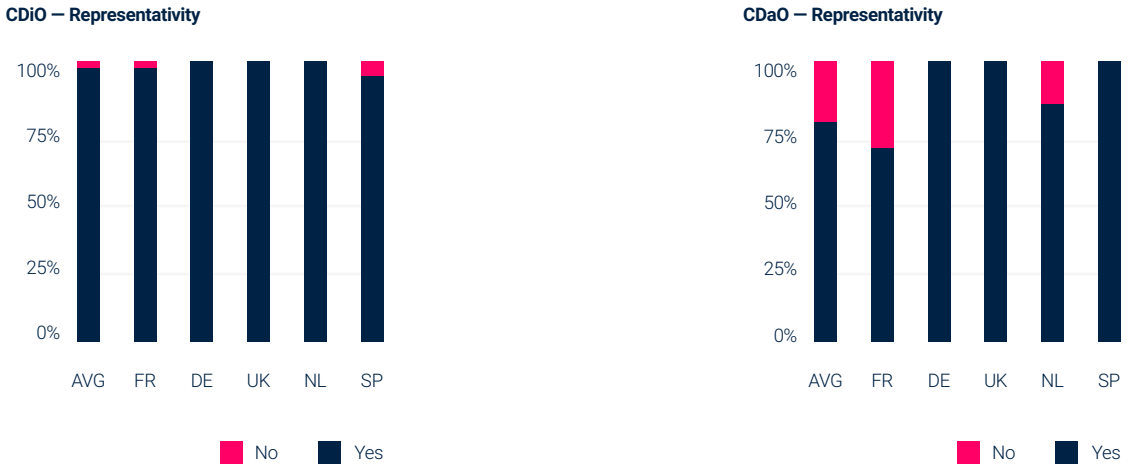
Source: profiles of 500 European Digital and Data leaders sourced on LinkedIn

Across Europe, CD²Os share many common characteristics...

European countries share common challenges across industries. It is therefore unsurprising that **CD²O profiles are very similar when it comes to skills and experience**. Although cultural differences can highly impact position or evolution within the organisation, these are not significant enough to be considered as relevant when leading the comparison in the European landscape.

European companies have thoroughly understood the importance of appointing a specialised resource to lead their Digital and Data transformation. These diagrams sharply underline this trend on the Digital side, showing an almost systematic presence of a leader for this practice (95%). It is less clear-cut for Data, where a Chief has only been identified on four-fifths of scanned companies (81%). France's lower rate could be explained by the higher volume of enterprises observed.

Representation of CD²Os across Europe



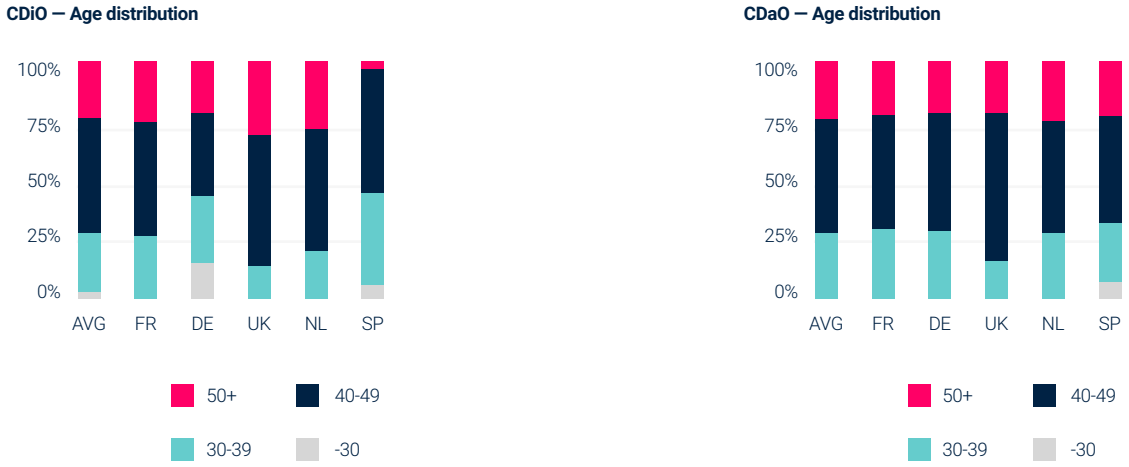
Comparing our data with the study mentioned above, there is a significant difference in the percentages. The main difference is due to our methodology, where we chose to call every person in charge for the group Chief Digital or Chief Data, even if she/he is not considered to be C-Level or an Excom member.

France 66%	Netherlands 45%	Switzerland 38%	Spain 32%	Italy 22%
Germany 48%	Great Britain 44%	Denmark 35%	Sweden 28%	Russia 11%

Source: profiles of 500 European Digital and Data leaders sourced on LinkedIn

Comparing ages at European scale shows the similarity between both profiles. We observe that the distribution is common between Digital and Data leaders: none are less than 30 years old, 30% are between 30 and 39 years old, half are 40 to 49 years old, and finally 20% are over 50 years old. Going beyond this analysis, it is important to stress that age is not an obstacle as some countries tend to have more confidence in young people. For instance, around 15% of CDiOs in Germany and 10% of CDaOs in Spain are less than 30 years old.

Age Distribution of CD²Os across Europe



... but also a few differences

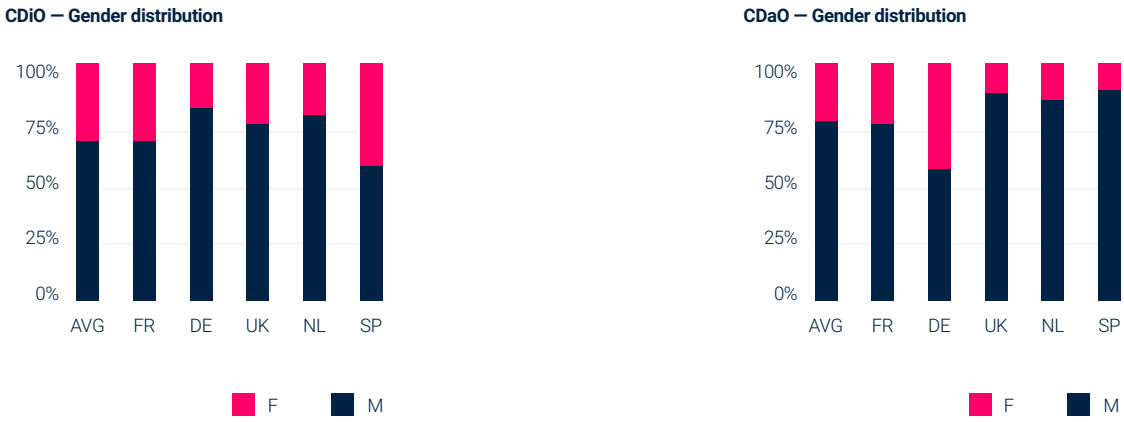
By crunching data, we also observe a certain form of heterogeneity regarding gender distribution, educational background and recruitment process.

When it comes to gender distribution, some differences can be observed from one country to another. Indeed, we noted an average of 25% women across Europe, but Spain (41%) and Germany (41%) are closer to parity, while the UK and the Netherlands are black sheep with only 19% of women in CD²O positions (Data and Digital combined).

While there is a slight increase in women as CDiOs, parity is unfortunately still far off. 68% of these women were appointed in the last 3 years with 60% via external recruitment.

For CDaOs, the engineering background - still predominantly male - explains lower parity.

Gender distribution of CD²Os across Europe



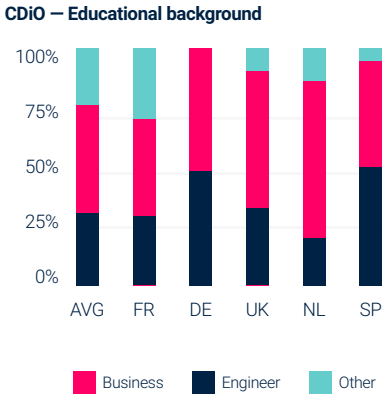
Kienbaum Insight: We often recruit CD²Os (17 over the last two years) in Europe, and we have never been solicited by a client to recruit according to gender. When we talk about external recruitment through firms such as ours, we present candidates without discrimination, based on skills and not on personal criteria. Although it is difficult to justify this disparity, it does not correspond to a specific demand by the companies, but rather to a gap in the market or even, unfortunately, a gap in career progression. Nevertheless, Digital and Data are among the most open professions because they are much more demanding on hard skills.

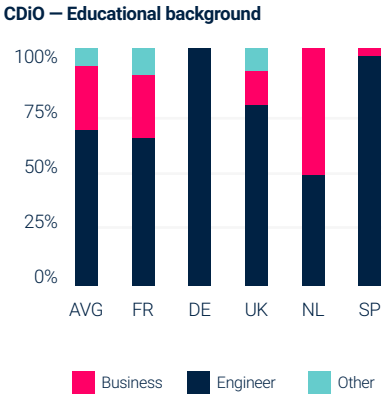
Source: profiles of 500 European Digital and Data leaders sourced on LinkedIn

Some disparities could also be found in the educational background that led to these positions. Zooming in on CDaOs, engineer training profiles are logically favoured in Germany (100%) and Spain (93%) but the percentage drops in the United Kingdom (77%) and France (60%).

In 2018, worldwide, 42% of CDiOs had a technological/engineering background versus 37% in 2019 in Europe.

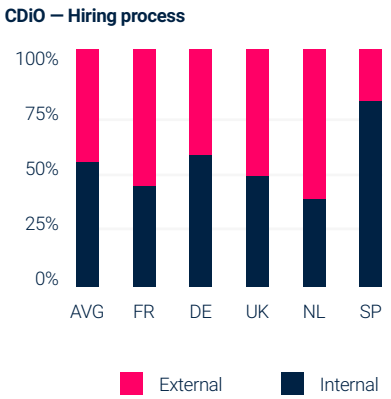
Educational background of CD²Os across Europe

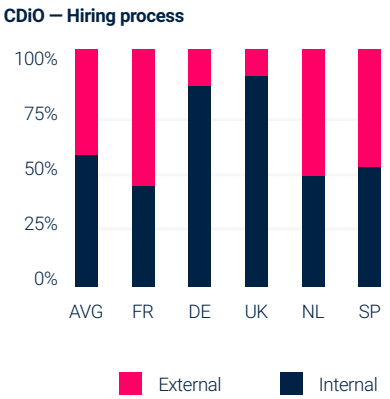




Finally, **internal promotion is better considered in Spain and the United Kingdom** with almost 70% of CD²Os recruited inside the organisations. It should also be pointed out that while CDiOs tend to be increasingly recruited externally (46% internal, 54% external), CDaOs are more frequently the result of internal promotions (57% internal, 43% external). This could change for them as it did for CDiOs in the last four years with more and more external recruitments.

Distribution of CD²Os' hiring process across Europe





CDaOs walk in the footsteps of CDiOs

Recruited to make a difference

The last 10 years showed something very clear: there is no efficient transformation if you keep recruiting the same people, the same organisation and the same strategy. While everybody speaks about Uberisation or even the Kodak business case, the truth is that companies are facing different challenges depending on their sector, and that there is no one correct strategy but hundreds, all linked to what you are aiming for and how you will execute it. And this is where CD²Os are playing a major role.

There are two kinds of evolution. The one you undergo involuntarily, and the one you choose. CD²Os have been acting as this "hybrid" factor within organisations. "Hybrid" can be defined in several ways as there is not only one type. This is what makes CD²Os interesting for major companies: the possibility of recruiting people able to fit their different needs and objectives. The fact that this hybridisation is voluntary or sustained not only determines a company's ability to succeed, but also the speed with which they will achieve success.

CDaOs share common "DNA" with the CDiOs, meaning their place in the organisation is not yet clearly determined but they are pushing boundaries and removing additional silos (IT, Product Data Management, Supply Chain...). Because they are still relatively young as C-Levels, every job creation or opening will force the board to think about their organisation and to make it attractive if they want to hire the best talents.

Comparing CD²O profiles with other C-Levels highlights the idea that it creates a necessary shift, by introducing different backgrounds, methodologies and mindsets. And while Digital can claim to have been successfully transplanted into the vast majority of companies, Data is again bringing about changes by introducing new profiles and new challenges with no other option but to embrace them - sooner rather than later.

Similar profiles and a common history

Whatever the company or its sector, Data and Digital are closely linked by their nature and the interviews conducted confirmed the challenges CDaO are facing are very similar to the ones CDiOs faced before:

Legitimacy

When setting up global positions, CdaOs and CDiOs all mentioned the importance of building up their own legitimacy and evangelising within the organisation. Relating to the experience of their digital peers, CDaOs quickly recognised the importance of their position in the organigram, the need for very strong sponsorship from an influential member of the Excom, and the establishment of lasting relationships with other departments. Some CD²Os pointed out that they had to spend most of their first months trying to convince and onboard other managers.

Delivery and ROI

Consolidating their internal position passes very quickly by showing an ROI for the projects they carry. They must deliver and their budgets, even if they have been steadily rising in recent years, are strongly impacted by recruitment costs (rising wages) and technological costs. Thus the solicitation of external partners (Data consulting, Tech companies) is very widely used to quickly achieve results at lower costs.

Recruiting talents

Data experts are not only as rare and difficult to recruit as developers or CRM/Acquisition experts were, but the huge competition from startups and tech companies for these talents makes it very difficult for CDaOs to build up their own teams and to secure budget to do so. Recruitment has become one of their strategic challenges and CD²Os have a strong need for HR teams to be involved in business lines to help them better understand these new positions.

Overlap with IT

One major issue is how they deal with legacy IT. The need to transform IT in areas like infrastructure, architecture, cloud, data protection and big data platforms to carry out their own projects makes it impossible to work without the CIO and IT department. CD²Os can't carry out their missions without strong and efficient IT to support eCommerce, Data Science. What could have been seen as a hindrance some years ago is now used as an opportunity to make the different teams work together using agile frameworks.

Key Insight:

In a major insurance group, the CDaO has one HR resource reporting directly to him, working every day with the data teams, focusing on hiring data talents and on the employer's brand.

An efficient organisation optimises expertises

The proximity of the two profiles and their missions can create overlaps regarding responsibilities and projects. The question of their position in the organisation arises quickly, especially when it comes to job creation and external recruitment. Fully aware of the difficulties they may have to meet, CDaOs are increasingly vigilant with regard to their direct reports, their roadmaps and the means at their disposal.

Below are the main organisations we observed during this study and throughout our experience for both Chief Digital and Chief Data Officers.

CDiOs in organizations: the 3 main scenarios

Member of the Excom and reporting to the CEO:

- Desired by most of the CDiOs, they believe that this attachment to the highest authority within the group is proof of maturity and the wish to place digital at the heart of the company's strategy.
- On the sample of companies selected, in France, +8% of CDiOs have integrated an executive committee compared to 2017.
- The people we interviewed are all pushing to also have Data and IT in their scope in order to have a real impact on the business and deliver their roadmap.
- Collaboration with the CIO is viewed as the most critical point for this configuration to work efficiently. Agile methodologies between IT, Data and Digital are also seen as absolutely necessary, but need to include other departments.
- The largest listed groups didn't take this step and are still struggling to find their ideal organisation, changing - or losing - their Chief Digital.

Sectors: Retail, Financial Services (BtoC), Travel and Tourism.

Mostly industries where pure players and actors like Amazon disrupted their business and forced them to transform faster.

Key Insight:

This model is rated by Digital Leaders as the most effective if they are supported by the CEO and the board.

On the other hand, without any clear support to deliver, this role can not only create frustrations, but might also lead to lower efficiency.

Example: a world-leading French international B2B retail group chose to recruit a CDiO directly attached to the CEO to help the group accelerate its digital transformation. In addition to Digital, Omnichannel and Customer experience, they also attached the CIO and the Supply Chain Director. They are aiming for a +20% increase of eCommerce results worldwide.

Club Med is one of the best examples of this scenario, with Anne Browaeys acting as the Deputy GM and were able to completely transform their business.

Reporting to a SVP Excom Member:

- Probably the most classic organisation worldwide in major listed groups.
- The Senior Vice President role will depend on the industry and the core business. It can go from SVP Marketing to Sales, Innovation or Operations.
- The organisation will be considered as digitally mature if the SVP scope is related to the core business (ex: marketing and sales for BtoC products, client knowledge and experience for financial services).
- Digital and IT are separated, which makes collaboration through agile methodologies even more important. After the CEO, SVP and CIO play major parts in the success of this organisation.
- Digital and Data are considered as very strong and strategic assets by Senior VP to support their position within the Excom.

Sectors: Luxury, Apparel & Cosmetics, Telecom, FMCG...

Key Insight:

Senior VPs are mostly from Marketing or business backgrounds. Without any digital background, they hold the legitimacy necessary to push for the projects and make IT move faster.

A growing number of CDiOs are promoted as SVPs. In this study, we still considered them as the Digital leaders even when they recruited one to replace them.

Most CDiOs stressed that this organisation can be very effective if their SVP holds enough influence and understands all the challenges of Digital and how they should impact the business.

According to the Chief Digital Officers, in the last three years, many SVPs who didn't consider Digital as a priority were replaced, sometimes by a CDiO.

Reporting to a Vice President or similar outside Excom:

- Digital is still perceived as a tool and not a necessity.
- This organisation can be found in groups still in the early stages of their digital transformation.
- Often less impacted than other sectors by competition from pure players or large technological groups, these groups which chose not to position Digital at the core of their business recruited Chief Digital Officers to be in charge of eCommerce, Innovation, Digital Factories, or in some specific cases, Data and AI.
- The Chief Digital Officer will often come from within the group or the same industry.
- Although less and less frequent, this configuration nevertheless offers the possibility to groups not to "brutalise" other managers and regions within the group, allowing Digital to grow and progress without being too exposed to internal conflicts over budgets and resources.

Sectors: Energy, Real Estate, Pharmaceutical, Consulting.

Key Insight:

Although it is a good indicator, it's still hard to relate the level of digital maturity of a group to its choice of organisation.

Each company makes its own choices and the group organisation should be nothing more than an extension of the strategic choices and the vision.

Some groups, because of their size, history and culture, need to understand first and foremost the extent to which all these transformations impact not only their business, but also their employees and processes.

In the same way that it is important - even critical - for many groups to transform themselves, the CDiOs concerned by this model confirm that it is sometimes equally important to take into account the specificities of a group before pushing it forward too strongly towards a new organisation, otherwise risking seeing major projects blocked right from the start.

CDaOs in organizations: the 3 main scenarios

CDaO reporting to a CDiO:

- This configuration aims at facilitating the transition between Data and Business. CDaO is 100% online with digital, as a full-fledged motor converting Data into knowledge and business.
- Common streams are Customer knowledge, Online/Omnichannel sales, media performance. Digital and Data teams work together using agile frameworks.
- Data are prepared, cleaned and structured so they can be used by the other teams. Such an organisation implies, however, that Infrastructure and IT also work upstream on the right data setup.
- This organisation works very well when it comes to BtoC, with a CDiO who is already or almost a member of the Excom.

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- Some groups decided to place their CIO in a more global direction led by a CDiO with extended responsibilities, which also includes data. In this configuration, the CDaO reports either to the CDiO or to the CIO. This organisation has the advantage of allowing all parties to be aligned around the same strategy and to facilitate collaboration. The implementation of agile work methodologies is then even more effective between digital, data and IT.

Sectors: Retail, Travel & Tourism, Apparel & Cosmetics, Telecom, FMCG.

Key Insight:

This organisational model often involves management other than Data and Digital to hierarchically report to the C-Level acting as the CDiO. The choice was a result of the vision and the strategy, but seeing the Chief Data Officer sitting next to the Chief Information Officer, the Supply chain Director, or other key C-Levels, is no longer surprising.

Data Science and Analytics are key assets and both Digital and Data Teams now work very closely together. Communication is easier and budgets are mutualised for more efficiency.

As for Digital, we noticed two different operating models:

- Global and centralised Data teams, where the CDaO is responsible for structuring and delivering all the projects for the whole group. Recommended when the company with a lower Data literacy needs to accelerate in regions and/or subsidiaries.
- Global Data team acting as a Shared services center. Used when Data literacy is already mature and needs more coordination between regions.

CDaO reporting to a CIO member of the board:

- Found in groups where Data plays a major part within the central IT and with a strong technological activity. Some groups decided to choose this organisation, especially in the case of an internal move.
- The proximity of data and IT subjects facilitates the allocation of budgets for the transformations necessary for the implementation of ambitious data projects.
- This organisation is found particularly in industry, where data is a valuable tool in production and supply but also in maintenance and prevention (AI, IoT, robotisation...).
- This organisation implies that the CIO has already begun his own transformation, particularly all projects related to IT Legacy and Infrastructure, but also working processes. And this is why it is not especially backed by CDaOs, as it depends very much on the profile of the CIO and the allocation of budgets. Indeed, data projects require investments and resources, while IT departments are more concerned lately by lowering costs.

Sectors: Heavy Industry, Real Estate, Energy, Aeronautics...

Key Insight:

This set up is more efficient In a tech or R&D environment, where IT is strong and supported by investments.

Most of the CDaOs working in this configuration feel they can't achieve their objectives because of budgets and not enough proximity with other teams (Marketing, Digital...). Several even mentioned that they struggled to deliver more than just POCs.

Data labs (or Data factories) require a lot of investment and IT is cash consuming. Companies should not expect quick results.

CDaO as an Excom Member:

- Probably the least common scenario observed, but one we will observe more and more. With the advances made in AI, IoT, Robotics and Technologies, Data are accepted as a strategic asset.
- Companies in sectors such as financial services or industry are moving faster because Data are at the core of their activity and business.
- Pure players or industries that rely heavily on Data and those where Digital is an integral part of their DNA.
- The companies that have made this choice are most often moving toward a Data First strategy, with major challenges that they must accelerate.
- The majority of CDOs surveyed wish to join Excom one day, but they are clear on the steps required to take a permanent post. Just as it was for CDiOs, it is important for a good position to have the necessary IT and budget guarantees. To date, few groups have a Data First strategy and the ambition to install a Data boss at Excom.

Preferred sectors: Pure Players, Financial Services, Pharmaceuticals, Medias.

Key Insight:

This position requires a lot of maturity and a Data-oriented strategy.

So far, we haven't seen any companies where the CDaO rules over IT and the CIO.

Some very mature companies amongst pure players, Entertainment and Technological groups pointed out that after two years of major investments in Data and AI, with a Data first approach, they are now thinking of taking a step back. According to what they told us, they have been relying too much on Data and may be missing out on some opportunities.

Having a leading figure for Digital and Data activities is now standard

In 2015, and again in 2017, some sectors differentiated themselves by their choice not to name a "head of" for their digital activities. In 2019, all of them took the plunge, with more than 75% of companies in all sectors now having the resources to lead digital projects.

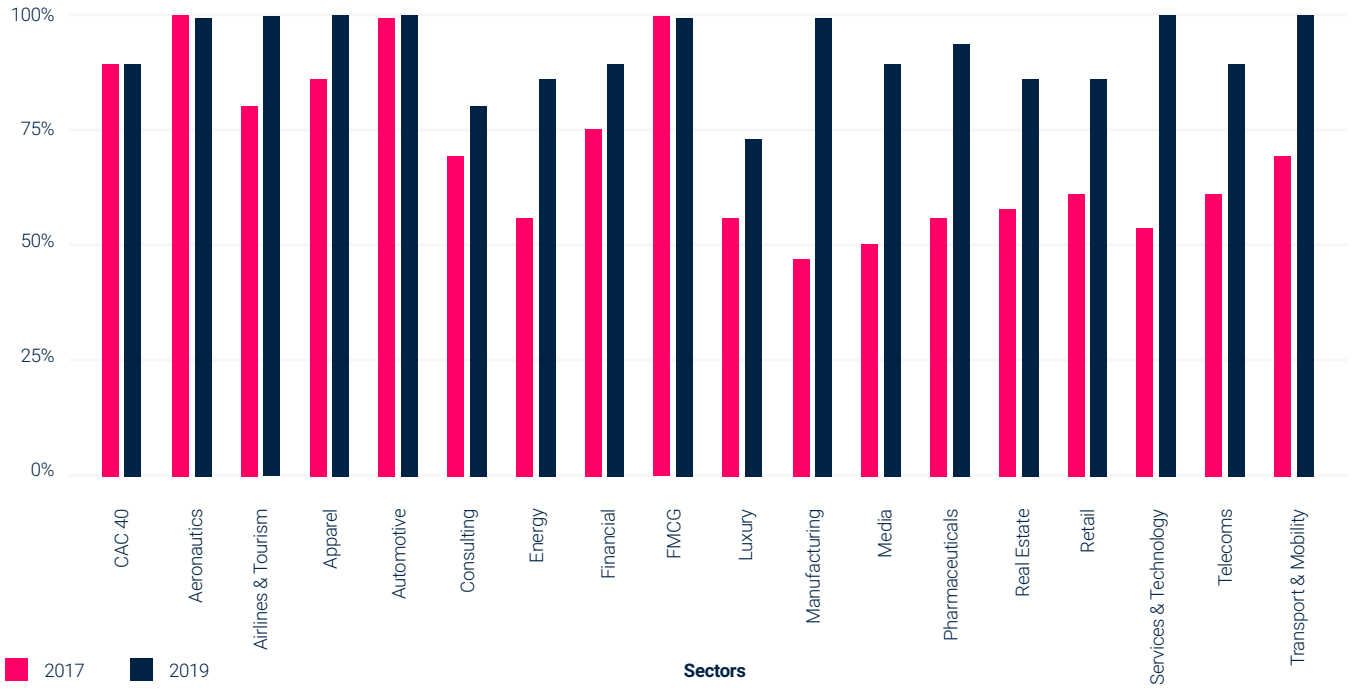
Aware of the importance of the subject, some companies, like Airbus, have even appointed a VP in charge of Digital.

Major listed Companies

CAC, DAX, FTSE, IBEX...

Almost all major groups have now nominated a leader for their Digital activities. The strategy to transform their organisation has to build as the need to do so is commonly shared. In the previous studies, CDiO were asking for more support from their CEOs. The message has been received, as most of the biggest listed companies have launched ambitious transformation programs, impacting all their departments (Finance, HR, Supply...). The position of CDiOs in organisations is still a question mark, but more and more feel that they can make a difference and have a real impact on overall strategy. It's also interesting to note that some CDiOs entered the Excom not long after the arrival of a new CEO.

2017 and 2019



Source: LinkedIn

Aeronautics

The sector was one of **the most backwards 4 years ago**, as were many other players in the industry. **By 2017**, most major groups had taken the step of appointing **a person in charge of Digital technology**, generally from the sector, to successfully **transform tools and business processes**. Major companies like Boeing or Airbus even nominated a Digital leader to the **executive board**. In this sector especially, Data acceleration is the **cornerstone of many projects** around production and supply. We also note the **increase in the number of developers** who are working more and more with other teams in agile methodology. However, by its nature, the **sector is still lagging behind** in terms of **customer experience** when it comes to constructors.

Airlines & Tourism

Traditional actors have been **hit hard by the Digital revolution**, especially travel agencies. The actors still present today are those who have been able to adapt to these new subjects. Airline companies such as Emirates, Air France-KLM or Lufthansa have been **nominating Chief Digital Officers for more than two years**. The challenge is primarily to develop new services to retain customers who have taken power given the multiplicity of competitors, which first involves **new loyalty programs**. On the other hand, **Data has revolutionised sales and pricing methods**, and it is therefore **necessary to master Data and AI in order to adopt effective commercial techniques**.

Apparel

While there was a difference **five years ago** as most brands without any retail networks were **mainly focusing on Digital marketing** (Media and Social), most companies now have **an e-Commerce/e-Retail team** and are moving forward to more **customer-focused strategies**. Maturity is especially strong in very competitive markets such as the UK, but other countries are catching up as new actors have emerged very rapidly through social media. Lots of efforts are being made on **Customer experience** and **rethinking their omnichannel strategies** as the **“threat”** of actors like **Amazon** is now taken very seriously.

Automotive

As **one of the first** industries to **nominate a CDiO** close to Excom 2011, they changed a lot in the last 4 years. Digital is becoming more and more important in their global strategy, with **increasing eCommerce and Omnicanal projects**. Interesting fact: the Automotive Industry is slowly **becoming a more service and technology-oriented industry** as demand is growing and while it offers the opportunity to **collect more Data and engage customers in different ways**. Their biggest challenge right now is to align this strategy with their networks which include many franchises. D**ata and AI are also key to the future of production**, with the increase of automatisation thanks to **IoT and Robotics**.

Consulting

Large consulting firms are still **slightly behind** the market as a whole. The structure of **governance itself**, very different from other sectors, has often **penalised major transformation** projects, with a **greater focus on human resources** and **staffing** rather than the transformation of **tools** and **processes**. Under pressure from their clients, and to face increased **competition from smaller players**, who are more **agile** and **closer** to their customers, many have ended up appointing CDiOs tasked not just with working on the **modernisation of tools**, but also of all **business processes**. Major firms also created Data Factories to support their missions.

Energy

There have been many advances in the sector, particularly in BtoC energy distribution and businesses where the **customer experience is at the heart of transformation**. The main areas of focus are the **digitisation of customer relations, performance improvement and innovation**. With organisations that are ultimately not very centralised and which integrate many different activities, the sector is still looking for a f**ully functional organisational model to transform itself in depth**, particularly in the field of **energy production** activities.

Financial Services

Due to the omnipresence of Data, the finance, banking, and insurance sectors were among the **first to embrace the arrival of new technologies**. While **new players** have taken advantage of the **digital revolution** to establish themselves (Revolut, N26, Allan...), traditional players seem to **react quickly** by creating their own online banking and insurance services, with efficient user paths, greater cost control and more reliable risk management. However, there are still **significant differences in maturity between business and personal services**. While retail banking is on its way to more efficiency and transparency, corporate banking is slowly catching up, using **data and technologies** to **enhance risk management** and **customer satisfaction**. Finally, it should be noted that there has been a significant **increase in budgets and expenditures** (tools and resources) on all data-related topics, particularly in response to GDPR.

FMCG

With the major changes in the distribution sector, the exponential growth of GAFA (Google, Amazon, Facebook, Apple), and pure players, taking their cut and keeping first data, these **last 3 years** have seen a **drastic change** in the way companies and brands have shifted their strategy. From **Social Media and Branding campaigns**, CDiOs have been hired to speed up **eCommerce implementation**, develop **omnichannel strategies** and **engage customers** in a better way. Data Collect and e-Commerce acceleration are now core to their strategies. The shift **from a product-centric to a customer-centric** global strategy is taking root and we are even seeing some major companies now buying or siding with startups and being more customer-centric and data-oriented.

Luxury & Cosmetics

Some groups were amongst the first to nominate a CDiO some years ago. But the **sector has taken longer than others to address main digital issues**, allowing **new innovative players** to enter the market. However, it should be noted that the major groups in the sector have marked the subject as a **priority**, with executive appointments to **Excom focused on Digital**. While the first effect of this Digital revolution was represented by **radical changes in terms of communication** levers for brands, we are now seeing the emergence of new use cases: using **AI to detect trends** and **optimise operations** or using **augmented reality** for new user experiences. Most of the groups are now very mature when it comes to Digital, but they still face some problems regarding Data uses and still **don't have any structured Data departments**, although some **CDaOs were appointed recently**.

Manufacturing Companies

Certainly one of the sectors that has assigned the most **importance to Digital and Tech**. Having already experienced a wave of **automation** and **robotisation several years ago**, the sector seems to be better prepared for the opportunities represented by IoT and AI: **predictive maintenance**, **production** line **planning** and the development of **data-based services** are all new projects that will have to be carried out by the CDaO. Many companies, although **they don't always have a CD²O, invested heavily and treat Data as a critical asset**.

Media & Entertainment

The media have undoubtedly been the **first to suffer the impact of Digital,** radically **transforming** both the **sector and its players**: new giants have appeared, totally redistributing the cards. Nevertheless, data and digital represent a **great opportunity** for the media, whether by taking advantage of **AI for content creation**, creating new digital means of access to content, or benefiting from **increasing interaction with the user/consumer**. Right now, most of them are all trying to **find new ways of monetisation** and to **retain "customers"**, and Digital and Data are strategic assets.

Pharmaceuticals & Health

After having taken time to adapt their internal organisations to these topics, the sector now seems to have the resources to develop the **enormous potential of Digital and Data** for their businesses. With the growth of **self-medication** and **telehealth**, customers are becoming more and more **autonomous in their treatment**. If pharmaceutical groups want to be able to benefit from this trend, they will have to meet the challenges of **data collection** and **harmonisation** to set up effective use cases. Interesting fact: some **CDiOs also hold PhDs**, which gives them more **legitimacy within the groups**.

Real Estate

Real Estate has changed in the **last 2 years**, pushed by the BtoC market and numerous actors such as **WeWork**, who are trying to disrupt and get their share of a very profitable sector in the long term. But unlike financial services, there are still only **a few CDiOs** making a real impact. The main focus is **around home automation**, **data collection** and **building technologies**. Digital is seen as a simple channel and not a key asset yet. Companies are still entangled in a **pure financial mindset** - related to asset management - and still struggle to create **strong and lasting innovative strategies**. Digital leaders don't feel that CEOs have fully grasped the importance and the need to transform. Outside competitors aren't yet seen as a threat, as it will take some time for them to be profitable.

Retail

Retail was one of the first sectors to be exposed to Digital, with the very rapid arrival of **new giants** who mastered digital issues perfectly. The challenge is therefore very great for traditional players: first of all, to build an **effective digital experience**, then to unify the physical and digital customer experience, all while taking advantage of these technologies to get closer to the user and collect Data too. **Omnicanality** is the main trend for companies as they face strong competition and the continuous **rise of Amazon and Alibaba. Customer satisfaction** and **sales efficiency** are key to global strategies. Chief Digital Officers are now shifting to **Chief/ VP Omnicanal positions**.

Services & Technology

The topics of Digital and Data have truly revolutionised the service sector, with the emergence of many new giants and a need for all companies in the sector to develop the right skills (all companies surveyed have **appointed Digital and Data managers**). The challenge for service companies now is to **upgrade their technological and digital skills** and find uses and **opportunities related to digital**. These mainly correspond to **two premises**: either use Digital technology to **optimise various processes and reduce costs**. Or use collected data to **develop new services**, improve existing services and increase the company's revenues.

Telecoms

Operators have **managed the first phase of the Digital revolution** quite well by quickly appointing directorates responsible for these topics and launching each of their related offers. However, it is the **emergence** of **indirect competitors**, and in particular online messaging services, which now appear to be a major threat. The challenge is now to **find new levers** to **defend and extend their market shares** against these new competitors. This **requires a more appropriate organisation**, a more **extensive use of AI in cost management**, and **new use case implementation**; above all, it requires an effective use of the **opportunities opened by 5G and IoT**.

Transport & Mobility

Right now, Transport and Mobility companies are in the midst of a **complex transformation**. While major actors struggled some years ago to find new business models to continue growing, these last two years have seen the sector change in a major way. Large institutional groups have begun a real transformation of their activities by **multiplying investments**, **partnerships**, **and more recently acquisitions** related to the sector. Whether it is the purchase of Eurolines by Flixbus, SNCF's investments in LeCab in 2016, or Blablacar more recently, or Uber's desire to become a world leader in mobility, the race to be the one offering the **most complete mobility solutions** has been launched. And to achieve its goals, each group has robustly transformed its organisation and its processes by investing heavily in Digital and Data. However, the downside to this race is a **high-level cash burn** which could make it **difficult for smaller actors to survive** alone.

CdiO: a sustainable and promising position

—

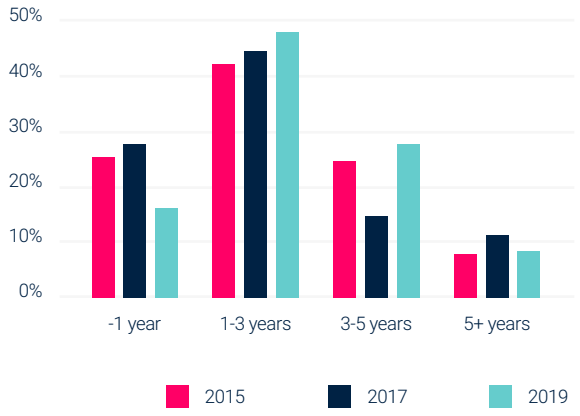
More than just becoming a sustainable position, the CDiO is moving up in the organisation

By staying longer in the position

Comparison of the seniority vs 2015 / 2017

- **Takeaway**: there are fewer CD²Os who took the job less than a year ago for the benefit of the one-three years category. This highlights the fact that CD²Os are staying longer in their position and that this role is maturing.
- On the other hand, most of the best candidates are now very carefully scrutinising mission details and are less eager to accept positions outside of Excom.

CDiO seniority distribution over the last several years



By expanding their scope or moving up in the hierarchy

Being a CDiO is now a good opportunity as you can move up or obtain a good position in a larger company. **The ones lasting longer are more often part of Excom and recruited by the CEO, meaning that their mission are on the « long term » and their scope more frequently includes IT or Marketing departments to aggregate all efforts**. According to most CDiOs, they now choose their jobs with extreme care, moving from a digital stamp to a more business-oriented position. Although they are still regularly challenged inside the organisations, having the full support of the CEO is a key indicator for attracting and retaining the best talents.

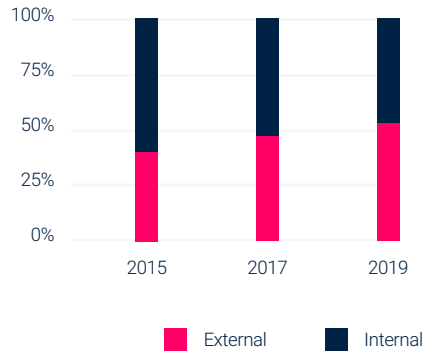
A clue to the increasing importance of this role within companies is the growing number of CD²Os who are reaching strategic positions and boards. At Oui.Sncf, for example, CDiO Arnaud Coiffard is also in charge of strategy. At Sodexo, Denis Machuel was appointed CEO after having been group CDiO. The list of former CD²Os moving to higher positions is growing and we counted 12% more compared to 2017.

Experienced profiles are the most desired, leading to an external recruitment trend

CDiO recruitment is becoming more and more external

Formerly proposed to the “digital champion” of the company, CDiO positions are now more frequently offered to digital-experienced profiles specifically recruited for the role. Numbers and feedback show that companies are now mostly recruiting their CDiOs externally, while four years ago more than 60% were internal moves.

CDiO hiring process distribution over the last several years



A first explanation lies in the fact that companies still in the initial phase of transformation have prioritised internal legitimacy and organisational control to facilitate evangelisation, digital acculturation, and also the "political" dimension. Once this first step was completed, many chose to seek external expertise, but with profiles close to their core business.

External recruitment is also very often an opportunity to structurally modify the organisation of top management and to promote an acceleration that is often necessary.

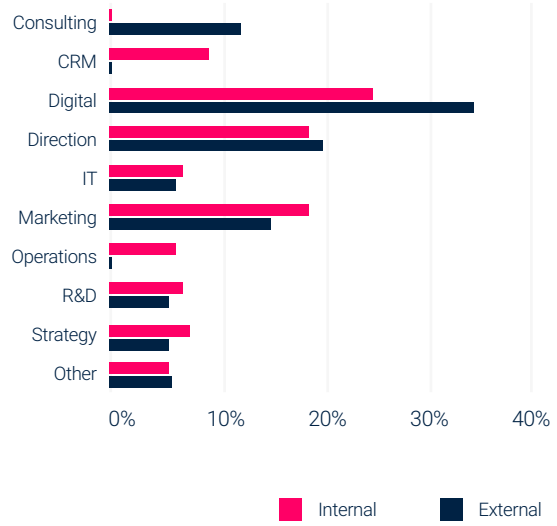
Source: profiles of 500 European Digital and Data leaders sourced on LinkedIn

CDiOs are generally recruited for their experience in the digital world

Unsurprisingly, the majority of CDiOs formerly worked in **digital-related** fields (30%) or **managerial positions** (19%). The **marketing sector**, a pioneer in these digital subjects, is also over-represented (17%).

When hired from outside the company, digitals skills are the most highly valued (35% vs 25% for an internal move). Experience in E-business, Customer Experience, and Digital-related skills are now valued above sectoral knowledge.

CDiO professional background distribution with regard to hiring process



Experience is still the most valued criteria

While diplomas are still highly rated in most southern European Countries, at Kienbaum we noticed that companies are expecting more and more significative experiences for the CD²O. While some years ago there was a shortage of executive digital talents, that is no longer the case. Digital Leadership, e-Commerce and CRM knowledge are the most commonly sought hard skills.

Interesting fact: we see more and more CDiOs coming from a marketing/business background, with no experience as a CDiO. This highlights the need for Digital and Data leaders to embrace a larger set of skills if they want to reach Excom positions.

Because the role is gaining importance, people are specifically training to reach this position

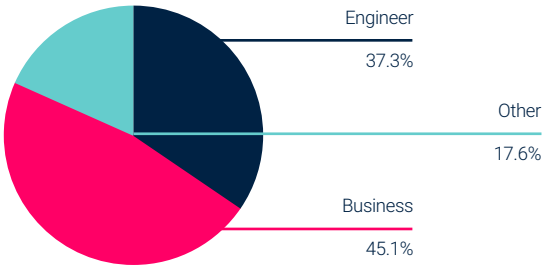
In France, 35% of CD²Os = Top 3 Engineering or Business schools

Our study shows that engineering profiles are increasingly appreciated for this position: they represent 37.3% of CDiOs compared to 28% in 2017. However, a business background remains in the lead, represented by 45% of the profiles now in place.

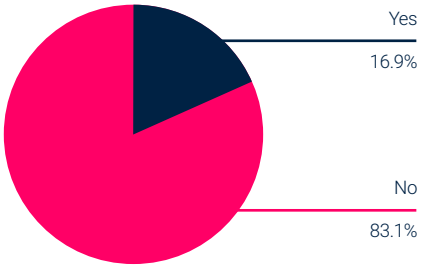
The acquisition of an MBA is not mandatory, but it will increase the likelihood of obtaining this role, especially in southern European Countries. An MBA can be viewed as a necessary step in order to be acknowledged by other Excom members. This trend is not as strong in the UK and northern European countries, where diplomas are not as highly valued as in southern European countries.

- Diogo Santos Franco, Head of Digital Transformation at Generali Spain since 2014, completed an MBA at INSEAD in 2016 (Generali invested in him to increase his skills)*
- Karolina Korth, CD²O at Siemens Spain, first worked in the Regional Direction, then she obtained an MBA at ESADE which allowed her access to the CD²O position

CDiO educational background distribution



Share of CDiOs who completed an MBA within the last 5 years



* Generali Group nominated a new CD²O Group in April 2019, Steven Zuanella, while M. Franco left the group un July 2019.
Source: profiles of 500 European Digital and Data leaders sourced on LinkedIn

CDiO interview feedback

During our interviews, we asked Digital and Data leaders to give us their visions of upcoming trends, along with what they see as their positive aspects and their main difficulties. Below is a non-exhaustive list of their opinions.

Upcoming trends and vision:

The scope of the CDO is enshrined: for the last few years, the position was perceived as temporary, but it turns out, at least for the largest group, that their role is being continued. It will evolve to cover **the entire Data value chain**; they also may have **to manage larger or new businesses**.

AI is not just a fashion: it will have a significant impact on their historical and new businesses, so **it is very important to fully understand what it can and cannot do**. So far, only a few companies are really using it to impact their business.

Leverage IoT to propose new offers to businesses. The growing numbers of connected devices collecting data will allow Digital and Data to provide more and more meaningful insights for all businesses within groups.

The CDiO should remain focused on the business dimensions of the organisation and not limit himself to the role of a digital evangelist or only be in charge of tech partnerships. Customer experience and the way Data will be used will have critical roles in the way companies will reduce churn.

GAFAs won't stop searching for new business verticals, and more industries might be heavily impacted if they continue to postpone critical transformation of their services and IT.

Using Digital and AI **to optimise their margin or seek incremental revenue** on existing projects.

Main difficulties:

Data Access and Quality: still struggling to collect all Data within the group

Recruitments difficult due to high market demand. Many find it difficult to hire experts due to fierce competition with startups and pure players.

Heterogeneous understanding of digital issues within the group, leading to more complexity in making global decisions.

In BtoB sector, innovation and digital acceleration are limited by their customers' digital maturity. They sometimes have to wait for them to be "ready" to push certain solutions (up to 1.5 years of talking with a customer before being able to integrate their tool).

Executive committee is willing to push digital topics, which is good, but can barely see the differences between Tech and IT.

Strong evangelisation work: many efforts are being made to help the mindset evolve toward more connected commerce (e.g. difficult to make the Group see that a down website is as important as an idle factory).

Group legacy: to stay agile, best-of-brick approach has been chosen for the tool ecosystem but due to Group decisions, they had to stick with the Microsoft suite (e.g. Workplace by Facebook was successfully launched but they had to come back to Yammer as it was supported by Excom).

Positive aspects mentioned:

Strong Sponsorship from the board and access to a massive Dataset (clients and market) which offers many business opportunities.

The **IT teams** are attached to the Group CIO but in practice, and thanks to strong sponsorship from the CEO, the Chief digital is the one who makes the decisions, as the matrix links are stronger than the hierarchical ones.

Update meetings are frequently organised with the **Supply chain Director** to monitor the progress of projects that impact the customer experience.

CDaO: an equally crucial position that seems to be more "standardised"

—

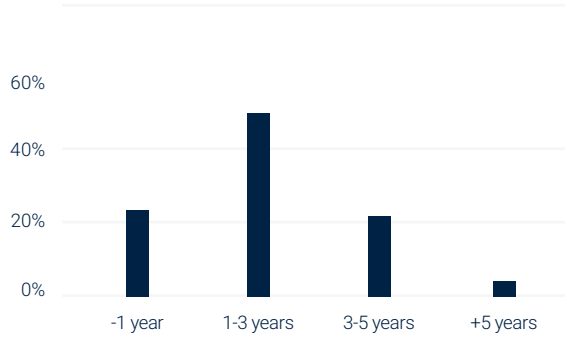
A more recent position that requires a strong technical background

The first CDaO positions in major groups emerged within the last 3 years

Stat: 75% of CDaOs have been appointed during the last 36 months

As with CDiOs five years ago, the number of CDaOs is still low compared to global demand. Major companies are competing with startups for these profiles, which makes them harder to recruit.

Seniority (%)



A role corresponding to technical profiles

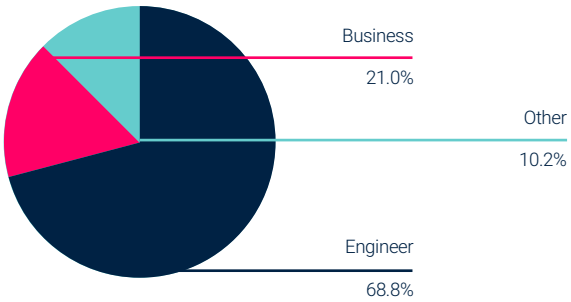
Takeaway: the prerequisites for this job are, above all, technical skills.

Stat: 10% of CDaOs recently completed an MBA (takeaway: not required, but a business complement to an engineering background).

Due to the growing number of companies searching for these talents, we see more and more people from education and research being hired.

Note: some sectors such as finance prefer profiles with a strong background in the sector (ex: Guido Van Aubel, who was head of investments at Van Lanschot Kempen)

Educational background



Former job

Data	50%
Digital	10%
IT	8%
Operations	7%
R&D	6%
Other	19%

CDaO scope and missions appear to be quite comparable from one company to another

Key Missions:

- Data governance strategy
- Data quality monitoring
- Data-based use case management
- Data protection and security

A standardised role that promotes CDaO "transfers" between industries

- Christopher Bannocks, Chief Data Officer @Danone and ex-CDaO of ING
- Ruben Lara, Data and Analytics Director and Tesco and ex-CDaO of Standard Life Aberdeen

10% of CDaOs recruited were already working as CD²Os in their former companies.

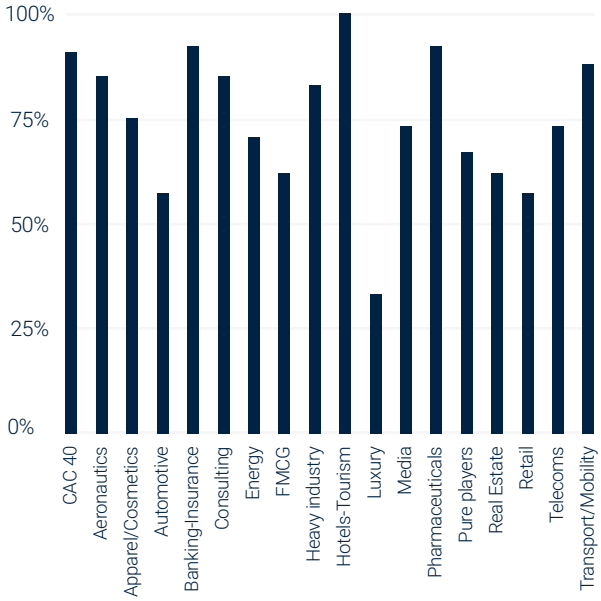
Besides specific sectors such as pharmaceuticals or heavy industry (aeronautics, heavy machinery, energy production), main missions are very similar from one CDaO to another. Main skills appear to be transferable from one industry to another and several candidates already crossed bridges with success. Some sectors favour these transfers such as Telecom and Financial Services, Retail and FMCG or Fashion and Apparel.

However, this role does not enjoy the same importance from one sector to another

Data Vs Product

While financial services and tertiary sector companies have moved faster due to their core business to manipulate Data, other industries are still struggling to find the right organisation and where to position CDaOs.

In many product-oriented companies, Data management is still only related to CRM and managed by marketing or Digital executives. But be it luxury or automotive, both are catching up with a more customer-centric approach and building up Data factories to deal with all expectations.



Historically located below or adjacent to Digital, Data is gradually gaining ground

From CDi(& a)O to CDiO and CDaO

11%

of CDiOs are specifically mentioning data in their scope => fewer and fewer people are combining digital and data, whereas 75% of surveyed companies have a person in charge of data, meaning that Chief Data are now more and more on similar level with Chief Digital Officers.

This new setup meets the need of structuring the new Data department

60%

of internally promoted CDaOs are former IT or Data project managers a need of defining a hierarchy in this department.

The trend is tending toward a restructuring of the Digital and Data departments, often with a global VP managing a CDiO and a CDaO below him/her. In some configurations, especially when Data departments are being centralised at group level, Chief Data can be in a different direction without any direct link to Digital.

CDaO interview feedback

Upcoming trends and vision:

Chief Data and Chief Digital roles: it was believed by some that these two roles could merge but now they are no longer sure. They now intuit that the Chief Data position will last in the longer term, as Data brings real value, whereas Digital is gradually permeating all departments.

"Legitimacy from below" is key to Data/ AI project success: you need to prove that you are capable of delivering and know the importance of being humble; you must be able to put yourself in business teams' shoes to understand their needs.

The **next challenge will be to identify and prioritise long tail optimisations** to support all divisions and allow companies to differentiate themselves from their competitors.

Push open-source strategy to leverage collective intelligence: use AI to enrich CRM scoring and improve campaign performances.

IoT coupled with 5G will be a game changer and will allow companies to collect and treat more and more Data in real time, offering companies opportunities to develop new services for their customers.

Main difficulties:

Data governance: frequent internal tension about Data, The objective is to make it clear that Data belongs to the company and must be shared to extract value from it. But Data ownership is still something they are struggling with.

Organisation: as a legacy of a company's evolution, it is sometimes difficult to enact change in order to achieve agility at scale (ex the SaFE framework shows its limits when there are over 120 persons and questions the role of the managers).

HR and recruitment: difficult to recruit high level profiles; a strong need to offer truly challenging missions to attract talents and avoid churn

ROI: "Big Data" is not a magic wand where machine learning and AI can solve all problems in a short time span. Explaining that there is not always visible ROI on Data projects takes too much time.

IT Legacy: historical and new IT infrastructures are now connected to each other but the result is sometimes
shaky.

Cyber-security: companies are targeted by a minimum of about one attack per month (clearly identified as a top priority by CTOs). Working with a CISO has become essential and strategic with regard to Data and privacy protection (GDPR).

CRM is split into three different divisions: Marketing (targeting), Communication (operating) and Data (scoring), making it difficult to align all objectives without a strong sponsor.

Positive aspects mentioned:

Strong technical knowledge and great connections with top talents and partners in their fields.

The way Data science projects are presented to product teams is very important: it is vital to make them clearly understand the business value so that they don't feel their position is threatened.

Digital and Data relationships are excellent thanks to a great human fit and a very positive mindset.

Strong **Executive committee support**, with increasing budgets and visibility.

The end of Data sanctuaries and the new understanding that there are opportunities to create by building bridges between different industries.

02

CD²O Challenges by Industry

CDiO and CDaO projects vary across industries

02

Introduction.

As seen previously, CD²O' profiles may vary in terms of educational background or position within the company. Still, it appears that they share common streams and will have to work closely, if they do not already do so, to deliver their roadmaps.

Based on our hundreds of CD²O interviews, in this second part we will focus on the Digital and Data streams identified as top priorities in the upcoming months. We have identified about 20 industries* and will correspond as closely as possible to the specificities of each and will discuss the main challenges to be achieved. Each section is also illustrated by a use case to show concrete examples of what needs to be developed.

**Public sector and Education are not covered in the scope of this 2019 study due to a lack of qualitative information.*

Industry-specific challenges

Banking & Insurance

have significant short-term UX challenges and longer-term opportunities offered by Data and AI

Bankers and insurers have pioneered the collection of Data and the use of AI. Check-scanning with OCR technology is of one the first AI use cases. As the digital revolution is revving up, these industries are now among the most threatened. Both GAFA and agile startups have begun eating up market shares by providing competitive and innovative financial services.

Digitisation is a no-brainer, as traditional actors must offer the same seamless user experience as neo-banks or neo-insurers do.

Faced with the arrival of these new competitors, legacy actors need to work on UX and costs. The experience needs to be designed mobile-first and offer self-care for most financial operations, such as adjusting payment limits or temporarily blocking credit cards. Competition for customers is so fierce that it also leaves less leeway on operating costs. Often cheaper than traditional actors, Digital natives have put an end to the era of hidden costs which was a major source of irritation for consumers

Implementing dynamic pricing based on advanced, data-driven risk analysis.

Paired with AI algorithms, 2nd/3rd party Data provide banks and insurance companies with the means to discern risk profiles in a much more granular and sophisticated way. This marks a first step toward the development of highly dynamic pricing or usage-based products tailored to the behaviour of individual consumers. These new products serve to empower customers, while also helping insurance companies overall in minimising financial risks by defining the right price for each type of customer.

+8M

of clients in Europe have chosen to open an account in a neo-bank
Source: Inteliace Research

Reducing claims costs through early detection and efficient intervention.

One of the leading French insurance companies resolves and processes an average of 80% of daily incoming calls, dropping to 40% on certain days, leading to client frustration and churn. Increasing this resolution rate is a key challenge for banks and insurers. To do so, two processes could be improved:

- Identifying, thanks to advanced analytics, the reasons behind a call to route customers toward the best resolution path (Digital self-care for simple cases, contact with an advisor for complex ones).
- Empowering advisors with smart tools such as "**whisper agents**" providing them with advice to support complex situation resolution.

Less than
40%

of calls to customer support can be treated on certain days

Case study

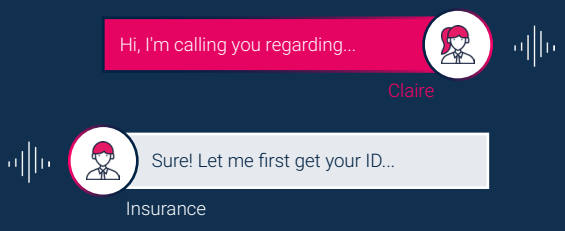
Swiss Insurance Company

Reducing call center costs by detecting and anticipating latent topics discussed during calls with customers

Proposed solution:

- An algorithm has been trained to transform audio files into text (speech-to-text), clean transcripts (natural language processing) and output top 10 discussed topics (Latent Dirichlet Allocation, Non-Matrix Factorisation).
- To help support this algorithm, a custom Data infrastructure has been built on GCP using various products including Compute Engine, Google Cloud Storage, Google API.

1 Claire calls Call center



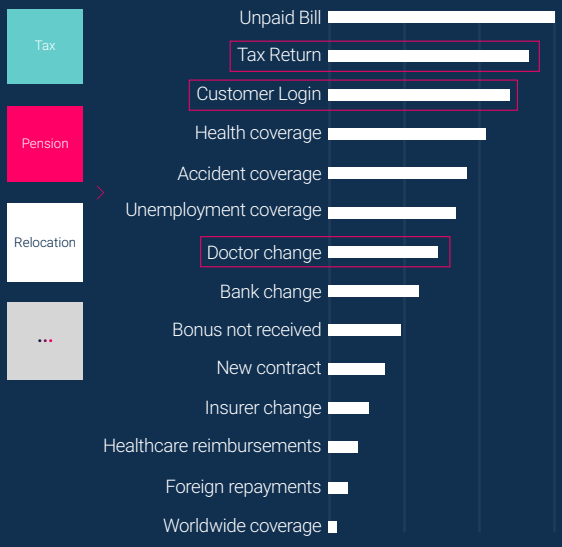
2 Her voice is isolated from the operator and transcripted

N°	Transcript
124	Claire: Hi... ~~Operator: Sure!...~~

3 Latent lopics are identified and labeled

N°	Transcript	Label(s)
124	Claire: Hi... ~~Operator: Sure!...~~	**Tax**

4 Labels are then ranked per potencial of automation



For CPG, F&B, High-tech or Apparel, the current challenge is to bypass intermediation to re-create a customized relationship with the end consumer

Usually cut off from the relationship with their end consumers, brands have now the possibility to build this link. Unlike with traditional retail, e-commerce allows brands to offer the desired user experience and to retrieve more insights, whether on their digital assets or on a third-party platform. To reconnect with their consumers, CRM 2.0 appears as the main lever for brands to establish a direct, bidirectional relationship while retrieving crucial end-user data.

E-commerce platforms allow brands to regain control over their customer experience.

Rightly considered as direct competitors, brands now agree that e-retailers represent a high potential distribution channel. This potential is mostly based on the fact that brands can access millions of prospective customers and are turning themselves into a medium. However, despite easier access to customers' Data (vs traditional offline retailers), brands still do not regain full control of Data.

Brands can take advantage of these new media and their large amounts of Data by using the three levers in their hands:

- **Owned media**: building brand stores, product pages,... to educate customers and regain control over brand environment
- **Earned media**: using customer reviews to promote and improve products (i.e: insights for product teams)
- **Paid media**: target prospective customers with sponsored products based on platform visitor Data

> Consumers no longer see the difference between online and offline, but brands do. We need to erase this by all means to offer a seamless experience and meet their expectations

Domitille Doat.
Chief Digital Officer at Danone

To succeed in this ecosystem, CD²0s must:

1. Define the **right strategy** (platform, business model, assortment, pricing,...)
2. Ensure **best in class operations** (product catalogue management, e-merchandising, supply...
3. Set up a **dedicated organisation** (overall dedicated marketing and sales teams)

x2 **the value of an omnichannel client is twice as high as an offline one**

CRM 2.0: accessing Data by revamping relationships with consumers.

As the spearhead of customer relations, CRM 2.0 aims to establish a new two-way relationship between brands and their consumers. CD²Os must leverage Data and AI to create a virtuous circle by:

- **Creating scalable and actionable personae** based on all Data assets (transactional, media, behaviour, interaction Data, ...)
- **Defining efficient omni-channel user journeys**, building data-driven scenarios to touch every user on their favorite levers
- **Monitoring the effectiveness** of multi-channel journeys using big Data dashboards integrating all Data sources **to draw insights and enrich personae**

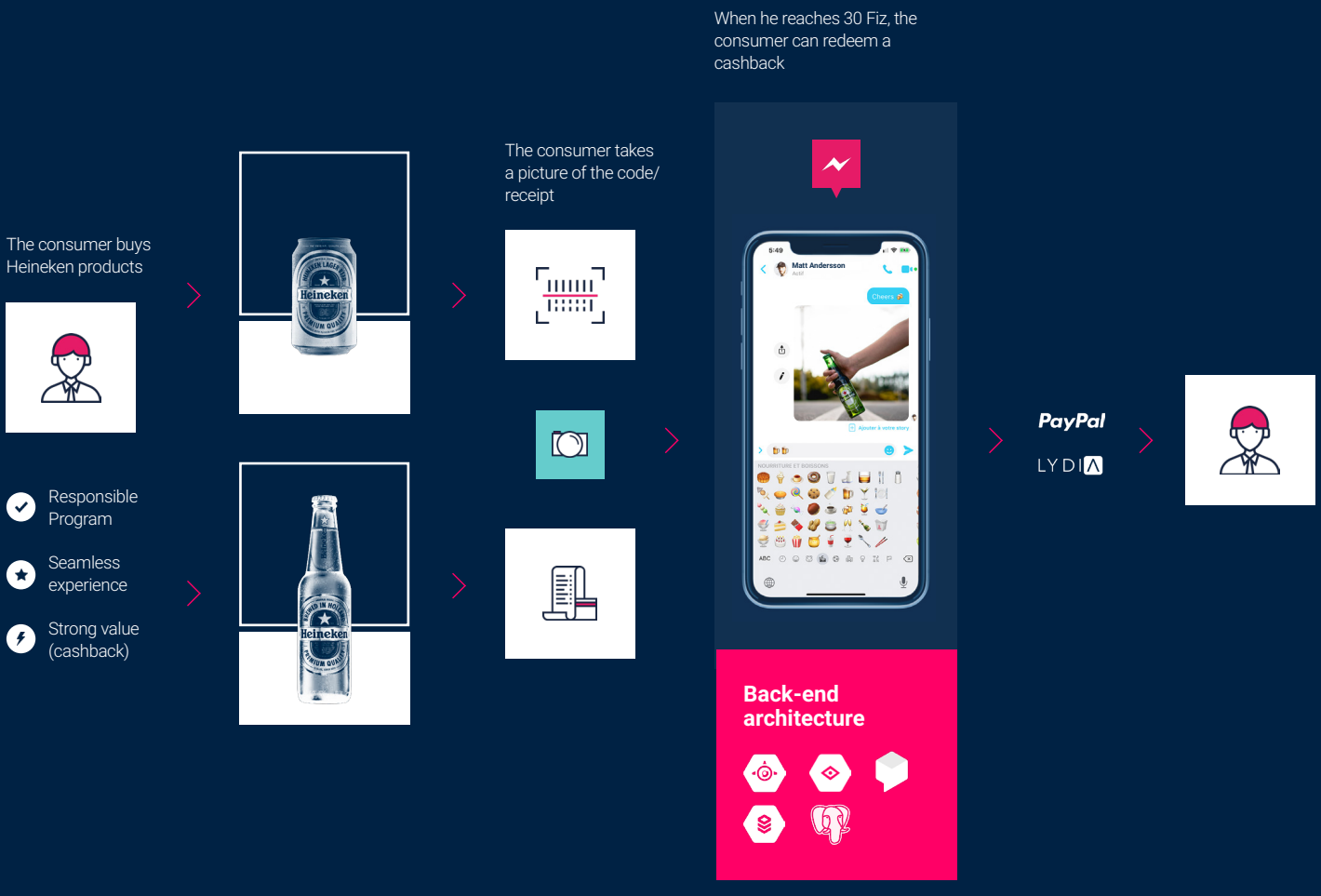
Case study

Heineken - Scanobar

Engaging end-users Data through CRM 2.0 experience

“Scanobar” is a bot built on Messenger that rewards Heineken customer loyalty
Its construction implies three parallel project streams:

- **Data**
  Implementing a visual recognition algorithm to detect and read glass codes and receipts
- **Tech**
  Building a robust and scalable technical architecture to integrate all the chatbot features
- **Creative**
  Defining the tone of the chatbot, the paths, and the specific wording



Facing disruptive competitors,

Travel & Tourism industries are turning to Data to find a new place within the value chain

According to the World Tourism and Travel Council, the Travel and Tourism industry grew faster than the global economy for eight consecutive years. At the same time, the customer journey has been fully disrupted and digitised by new pure players pulling prices and margins downwards and driving up the share of online bookings (making for more than half of all bookings). In this highly price-sensitive market, incumbents must leverage other assets to ensure both long-term margins and customer loyalty.

Empowering Revenue Management and Yield pricing.

Yield pricing is usually based on the knowledge of a few basic rules. In such a competitive landscape, combining Data and AI can support travel companies in identifying not only the most suitable price, but also the most accurate product for the right person to maximise margins. For example, a supervised machine learning model on historical Data can foresee demand and predict the best-fit pricing. In parallel, highly specified audience segmentation is possible thanks to unsupervised modeling. The combination of both allows enhancing marketing campaign ROI.

+17% **average increase in monthly revenue when introducing machine learning**

Airlines and Tourism companies must renew their CRM strategy to enhance loyalty.

Travel booking is an anxiety-laced activity for customers: it's expensive, in a place they've probably never been before, websites are pressuring them and pushing them to book the "last room on this website"... Understanding how to treat this anxiety and turn it into a differentiating factor is key to coping with the competition of pure players. We identified two ways to treat this challenge:

- Companies must **create an omnichannel traveler experience** all along the trip. According to a Google/ Ipsos study, 69% of travelers are more loyal to a travel company that personalises their online and offline experience. That's why companies decided to become travel partners rather than just a piece of the value chain, offering support before, during, and after the stay, from the search for a destination, to user communities to consult before the trip, or on-site activities.
- The other opportunity is to **upgrade your CRM with "money can't buy" perks** rather than common benefits customers will struggle to redeem. AccorHotels perfectly understood this by leveraging the AccorHotels Arena concert hall to offer its customers concert experiences accessible only with Accor points: access to the best seats of the hall in a VIP lodge, pre-sale tickets, VIP lounge bar...

69% **of travellers are more loyal to a company that personalises their online and offline experience** — Google Ipsos Connect 2016)

Case study

Predict offline visitor journeys to create better activities packages

Data

Offline footprints of visitor behaviour have been mapped by setting up Data partnerships with a credit card and Electronic Payment Terminal providers. *60% of all offline transactions (activity, budget, time, location) are tracked and processed*

Tech

The mapping relies on a recommendation algorithm predicting visitor journeys based on their activity, location, value, and time of transaction

Creative

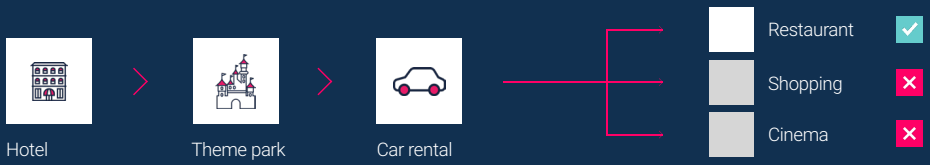
Thanks to algorithm outputs, tailor-made offers are packaged and proposed to accurate audiences

Tracking

Assessment and implementation of a partnership

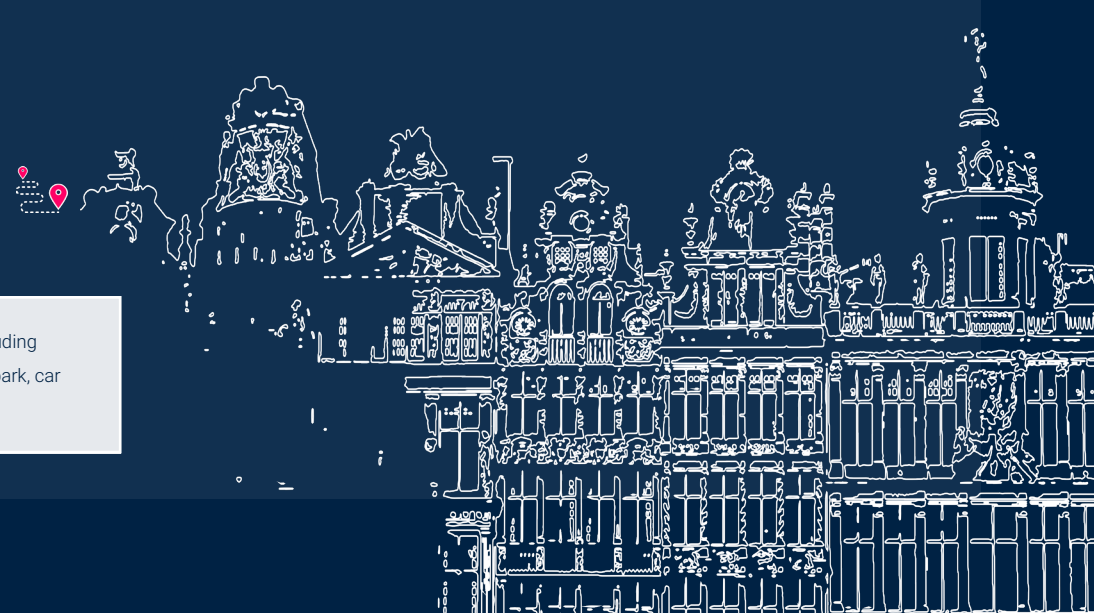
Modeling

Modelisation of probabilities of doing activities at certain location



Visualization

Showcasing of the most probable visitors journeys per segment



I create a **packaged offer** including several activities: hotel, them park, car rental and a restaurant.

Luxury & Cosmetics

industries have to cope with new brands that leverage the power of social networks

Whether they are Indie brands (“Milk Make Up”, “Kate Von D”,...) or brands created by prosumers (“Into the gloss”) or influencers (Kylie Jenner, Huda Kattan,...), there is no shortage of threats hanging over the historical players in the cosmetics industry. More generally, the luxury ecosystem still has a genuine opportunity in tapping into the value of Data to guide its RandD and optimise its operational excellence.

Customising experience and empowering clients through “beauty tech”.

Beauty is one of the most thriving social networking categories, and both giants and newcomers promptly understand it. “The future of the L'Oréal group is the second phase of the digital transformation, the Beauty tech company”, said M. Agon, L'Oréal CEO, back in 2018. Far from being just words, the multinational has taken action by acquiring the AR beauty company ModiFace under the impetus of its CD²O Lubomira Rochet. It is important to keep in mind that technology is not an end in itself. To ensure their virality, the experiments will have to be accessible to as many people as possible. This requires strategic partnerships with tech giants (Apple, Facebook, Alibaba, Tencent,...) but also offline relays that can extend the social experience to physical stores.

82% **of customers have faced the unavailability of a product in-store in the last 12 months**

Leveraging Data to anticipate trends and become a disrupting company.

Mainly fed with 3rd party Data coming from social platforms, predictive models are now able to draw impactful insights for brands, both during creation and production phases. In fact, thanks to machine learning, the viral potential of a specific trend such as leopard or sneakers can now be evaluated by analysing historical Data (see use case below), offering insights to Retail teams. Besides, after a Fashion Show, brand social buzz can be measured and associated with 1st party Data such as onsite behaviour to draw insights about the success of each look. Refining the granularity at a country level can help boutique buyers order the right volume of pieces and thus decrease, or better monitor, grey market share.

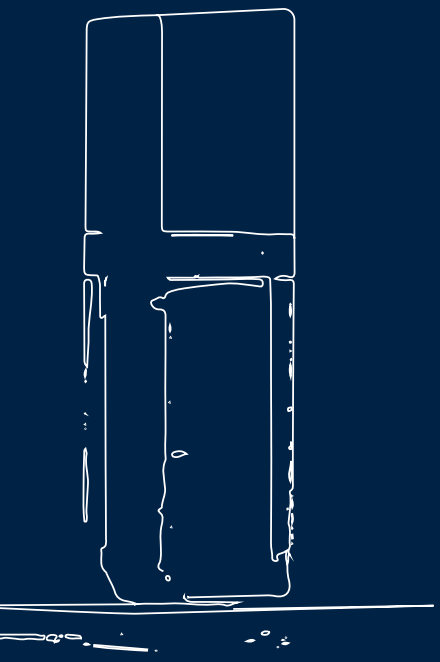
Operational excellence: forecast consumer demand to optimise supply chain and avoid out-of-stock.

More than 80% of consumers have experienced the unavailability of a product in-store in the last 12 months, about a quarter of whom abandoned their purchase. This shows the importance of anticipating customer demand to enhance business results. The role of the CD²O is thus to identify the factors that most influence sales whether they come from 1st party (previous sales, onsite behaviour, ...), 2d party (partner Data), or 3rd party (social buzz, weather, tourism affluence,...) Data sources. Predictive models can then be built, tested, trained, and applied to draw insights. Last but not least, CD²Os need to collaborate with other departments to optimise processes across all companies (supply, production, buying...) to make the most of these insights.

Case study

Trend detection

- **Enhance the efficiency** of the product development cycle by developing the right product earlier than the competition
- **Adapt activations** in local markets by leveraging trends on a shorter time horizon
- Overall: build a **competitive advantage** with differentiative actionable consumer insights



 # 1
Identify influencers

Dermatologist, surgeons

 # 2
Data structuring

Cloud Vision
Cloud Video
Cloud Speech to Text

 # 1
Experts

Cactus

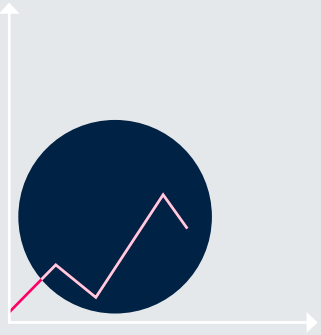
50k posts
200k likes
20k mentions

 # 3
Trends extraction

- Morning peeling
- Cactus
- Coral
- ...

 # 2
Data structuring

Cactus

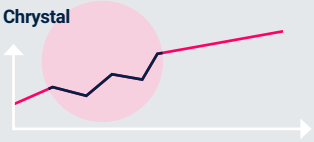


 # 3
Trends extraction

Nuts

Charcoal

Chrystal



83% **of customers said they want their shopping experience to be personalized**

Omnichannel and e-commerce are prerequisites to succeed in **Retail**

As the last link in the value-chain, retailers are in direct contact with end consumers, collecting abundant Data on the latter. After years of trying to cope with Digital attackers on the e-commerce front, former brick-and-mortar retailers are at a crossroads: the future of retail is no longer about offering a fully digitised customer journey, but rather being able to create a seamless omnichannel experience at all phases of the funnel. Leveraging distribution networks is key to keeping up with the competition, on the condition that they become agile, digitised and data-driven assets.

Innovate to offer an optimal omnichannel User Experience.

Keeping up with the competition is no small task for former brick-and-mortar as they need to be as innovative as their Digital competitors across channels. This means upgrading the customer experience to offer a seamless experience, whether the customer is shopping online or offline.

Let's take a look at what a customer journey could look like... Throughout the week, Ben is spelling out items to add to his shopping list to his **voice assistant**. This assistant can identify if **Ben forgot some products** (based on historical Data or on products he enounced) or **propose customised promotions**. Once in-store, Ben can find his **omnichannel shopping list** on his smartphone which he uses to **scan the products** he puts in his basket. The products on his list are automatically ticked as his shopping list is completed, and Ben doesn't need to queue at the cash desk since the payment is processed as soon as his shopping is over. If a product is out of stock, the retailer offers a **24h delivery at home**.

Upgrading the shopper experience with services is forcing retailers to transform their operating models. To develop a best-in-class e-commerce experience, Monoprix will soon launch an end-to-end online grocery, a solution powered by Ocado Smart Platform. Launching such initiatives impacts the whole company as it requires optimising the operating systems.

Leverage Data to optimize Supply chain and Operations.

Data has long been used to enhance the relationship with customers but it can also be leveraged higher in the value chain, for instance by empowering in-store operations and revamping relations with providers.

In-store operations is a crucial lever to generate millions of euros of savings and reduce churn

Retailers still struggle to predict their sales accurately and this issue has a dramatic impact on operating results and churn rate. To overcome this technical challenge would help tackle two crucial wastes:

- The throwing away of thousands of products every day for exceeding their expiry dates
- The maintenance of sufficient stock of products to avoid shortages and cover both in-store demand and online orders. retail industry reports that up to four of every five e-commerce orders cannot be fulfilled in their entirety for those reasons.

A smarter relationship with providers must be established to manage promotions

Nowadays, most negotiations are conducted at the national level between brands and a central purchasing office. These high-level agreements don't take advantage of customer knowledge nor are they compatible with meeting the specific needs of local stores. Building a smart promotion platform would allow retailers to monetise Data and offer customised promotions to each customer.

61% **of promotions are at loss among the 10 billion euros spent annually in France**

Case study

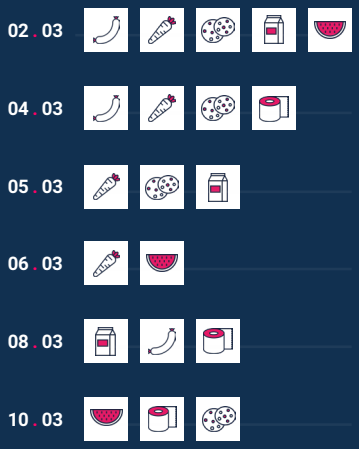
Predictive shopping list to assist customers in their shopping experience

Building a voice-based predictive shopping list relies on two technical features:

- Speech to Text, Natural Language Processing and customers' past purchase Data (online and offline) are used to understand which products customers want to add to the shopping list *(to define product type but also brand and format)*

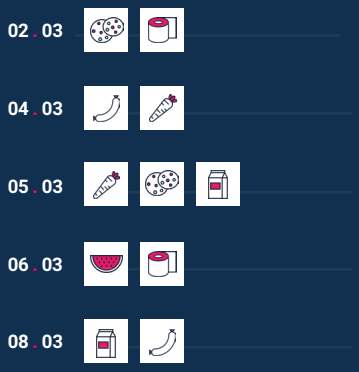
- A recommendation engine that learned from thousands of carts and recipes can identify the associations between products and recommended products client might have forgotten (see example aside)

Purchasing records

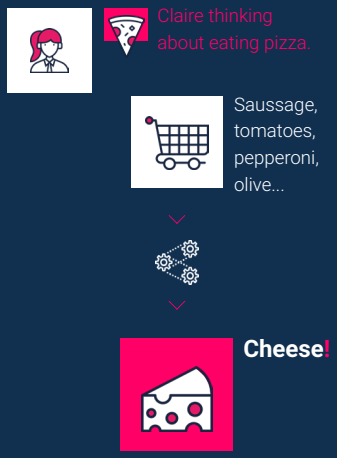


Frequent pattern matching algorithm

Most frequent associations



Illustration



The collection of new Data is bringing

Manufacturing Companies

a step further in their digitisation

Historically a manual sector, manufacturing had already taken a significant step with the arrival of robots and automation. The convergence of IoT and AI brings opportunities for modernisation even further. At the heart of these strategic trends, CD²Os have to deal with hardware projects. Their scope also integrates the transformation of Data generated by their products into new business lines.

17% **of IoT projects are connected-industry related, in 2nd position behind Smart cities (23%) and front of connected buildings (12%)** — Forbes.com)

The convergence of IoT and AI enables both production line planning and predictive maintenance.

A few years ago, companies were only able to retrieve Data from their most critical tools, the only ones presenting connective capacities. With IoT, every single part of the production line can now be tracked. Paired with the potential of AI algorithms, this Data could be used, on the one hand, **to optimise plant ergonomics and production lines** through advanced analytics. For example, creating digital twins to model the performance of physical assets and then take the right decisions. On the other hand, **IoT Data makes it possible to anticipate machine failure** by analysing wear and tear (predictive maintenance).

Although CDiOs are commonly unfamiliar with the task, managing hardware streams is now part of their duties. The CDaO, collaborating with the plant management team, has an important role as well in ensuring rigorous Data collection and treatment to make it accessible for monitoring purposes. Their close collaboration is needed in this area to go further than the PoC stage. Scaling and using algorithm outputs for business purposes are two major limits identified in IoT projects.

Offering new services to enhance experiences around products and generate new business lines.

With the ability to collect Data directly from their material, manufacturing companies can now **offer optimised experiences** to their clients. For instance, Lighting-as-a-Service (LaaS) consists of charging light on a subscription basis rather than via a one-time payment. This allows bulb producers to optimise their maintenance planning as well as client cash flow and electricity costs.

The challenge for CD²Os is to build business plans to **seize the potential gains** of these new offers, whether they are quantitative (financial) or qualitative (UX uplift). Once prioritised, it is also in their scope to **manage delivery**.

> The main challenge for the industry is going to be the adoption of the digital assets by operational teams, bringing up a key question: how to communicate the value of these assets to maximise adoption?
>
> **Fabien Cros.**
> *Industry Lead, Artefact*

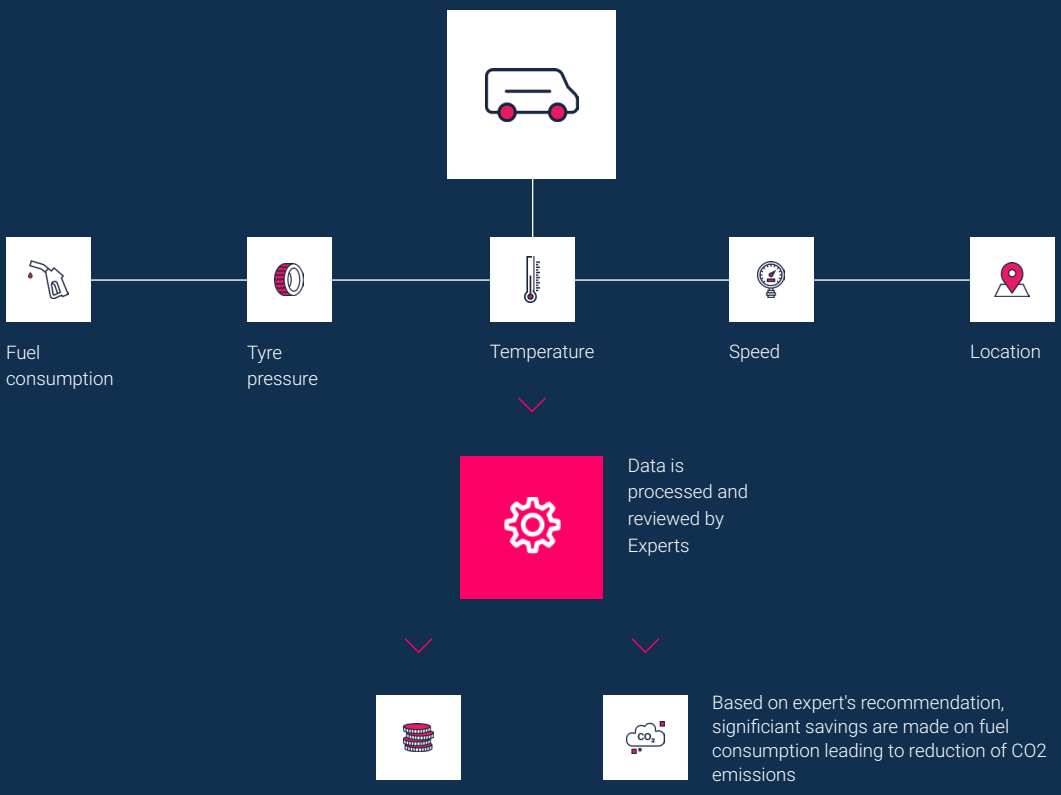
Case study

Michelin

Tyre-as-a-Service

Leveraging IoT to provide eco-driving recommendations through EFFIFUEL program

- Michelin built an ecosystem leveraging truck sensors to collect vehicle Data such as fuel consumption, tire pressure, temperature, speed, and location
- This Data is then processed and analysed by Michelin experts, who provide recommendations and training in eco-driving techniques
- EFFIFUEL has unlocked significant savings for its customers: a reduction in fuel consumption of 2.5 litres per 100km, representing annual savings of €3,200 for long-haul transporters travelling over 120,000 km



100 000

Is the number of client EDF (historical french energy provider) is losing each month in favor of newcomers
(laviedesreseaux.fr)

Faced with the arrival of new providers, historical

Energy companies need to digitise their process to avoid massive churn

In the UK, newcomers in the energy sector have captured about 20% of the market in the past five years. Thanks to digital assets and large sales forces, challengers are competing with low prices, simple offers, and seamless experiences. Moreover, customers who are used to such levels of service in other industries become increasingly demanding toward traditional brands. The traditional commodity relationships between energy retailers and customers need to be revamped in favour of more digital and smart ones, empowering the end customer.

Emerging from the commoditised market of energies thanks to IoT.

Current generations are undoubtedly more and more concerned about energy savings for both ecological and economic reasons. With the rise of IoT and its convergence with AI, energy providers have the chance to seize several opportunities:

- First, by revamping their relationships with customers by giving them back autonomy, and supporting their willingness to manage their energy consumption through the launch of platforms or apps connected to all household appliances, power meters, and devices
- Second, by emerging from the commodity market through diversification and launching IoT products or services while differentiating from other providers
- Last, the key opportunity is the whole data this will generate about customers, their devices, their habits,... data that could be used internally or monetised

In light of the evolution of the legal/competitive environment, deploying smart anti-churn strategies is a priority for incumbent providers

Even though IoT might improve customer satisfaction and retention, the competition and the legal environment require historical energy companies to reshape their customer retention strategy. Data and machine learning might be powerful tools to identify weak signals, making it possible to anticipate customer attrition. The early detection of these signals, or the "moment that matters" in the customer lifecycle, will require energy companies to cross-reference 1st, 2nd, and 3rd party Data within an AI-friendly ecosystem.

Smart grid is the new grid

Big Data is usually accused of very high energy consumption, but what if data coupled with advanced analytics were the solution to their drawbacks? Energy networks coupled with Data and advanced analytics are slowly emerging (Smart Grid). In a nutshell, smart grid means:

- Many small power producers closer to customers rather than large national plants
- Empower customer by allowing them to produce energy and to sell it (through micro-grids)

Such grids are based on a combination of IoT (advanced sensors and meters), 5G/low power networks (robust two-way communications) and advanced analytics enablers (distributed computing technology) to improve the efficiency, reliability, and safety of power delivery and use. Finally, the arrival of powerful newcomers (such as Amazon Wind) reinforces the idea that incumbent providers must catch the wave.

3000 **Is the average number of newcomer clients Total Spring Direct Energy is acquiring each day**
(laviedesreseaux.fr)

Case study

Churn detection

Earlier detection of churners and their reasons for attrition to empower retention strategy

- Identification, validation and consolidation of relevant Data sources to detect churn (call content, navigation, customer profiles, historical Data, satisfaction surveys,...)
- Exploration and validation of weak signals thanks to advanced analytics techniques (NLP, scoring, lift analysis,...)
- Industrialisation of the best-performing prediction techniques
- Construction of retention plans addressing these weak signals

Example:

Outbound calls triggered by the cancellation of an option

The model delivered makes it possible to associate at least one reason for churn with 50% of the churners over the period studied

CRM Data:

Elisabeth

Woman
28 yo
Electricity plan...

M-3

M-2
Termination of the Invoice Insurance service

M-2
Challenge the amount of his Invoice via the chat

Automatic enrichment of CRM data:

Termination of a paid service

Challenge Invoice or index

+20 - 40%

Is the uplift growth agile companies have experienced
(McKinsey, Agile Marketing: a step-by-step guide)

The Telecommunication

industry has embraced digital transformation and is now settling the enablers to leverage AI opportunities

Competition is increasingly fierce and leads to lower margins in the core business.

Consumers have grown savvy and now exert strong pressure on telecom businesses: they do not hesitate to change operators given the slightest promotion by other competitors. Thus, as one of the TELCOS' most important budgetary expenses is customer service, a lot of effort is devoted to the digitisation of this field. But a long-term strategy is needed: operators must **begin to tackle new markets to diversify their sources of income** and ensure their prosperity.

Applying agile at scale principles to catch significant value.

Incumbent telcos must pursue the transition of their organisation, transforming it from a digital company to a data-driven one while continuing to develop and improve an innovative and agile spirit.

Rather than undertaking long term projects, telcos must apply agile ways of working, delivering results in a couple of days/ weeks instead of months/years, creating cross-functional squads, each the owner of a clear perimeter. These teams learn that failing fast is key. These changes go far beyond a simple way of working. They require a fundamental cultural shift led by top management, empowering employees and focusing on the customer.

2 500 000

Is the number of calls to Orange customer service each month — (Les Echos, 19/02/2019)

Data as a revenue: leveraging Data to save OPEX and CAPEX.

Coping with the competition is expensive and requires an efficient cost structure. Digital and Data investments have created a significant opportunity to achieve cost efficiencies. For example, advanced analytics could be used to reduce the global volume of interactions telcos have with their clients by:

- Identifying customer journeys that require an inordinate number of interactions to improve them
- Setting up tools that empower their employees and foster the "first interaction resolution rate"

Regarding CAPEX, Data can empower expensive investments by bringing in machine learning. For example, a leading French company in telecommunications developed a model recommending the optimal path, taking economic and operational stakes into account, to roll out fiber networks across the country. The same kind of model could be used to deploy the 5G network.

Upcoming technologies: up-sell, cross-sell development, and new services toward business customers.

In its first years, 5G won't be anything but a more powerful 4G. Regardless of the country, the real promises of 5G are not expected before 2025/2026 due to the need to create networks made of non-existent components like 5G network cores from scratch. As a result, the first growth driver telcos can leverage is simple: enhance B2C cross- or up-sell thanks to 5G subscriptions and 5G-enabled services. Meanwhile, there is no need to wait for the "real' 5G to diversify activities. New generation networks such as LPWAN (low power wide area network) are creating opportunities for telcos to go beyond connectivity and to extend their position within the value chain. Based on their network expertise, telcos could be turned into software companies bringing services and enablers to business clients willing to develop IoT use cases today, and edge computing or virtualisation later on. Besides, the volume and the diversity of Data collected by telcos will skyrocket in the years to come due to the tremendous volume of data IoT devices will generate on their networks (LPWAN and GSM), and this is something they must be prepared for.

Case study

Plan network routes to deploy optical fiber while minimizing costs

- AI has been used to develop a route suggesting the most optimised deployment journeys, making the most out of **Operations Research** (shortest path) and **Machine Learning** algorithms (clustering).
- Algorithms ran in parallel on a cluster of GCP **Compute Engine** using the powerful spatial computation of the **PostGIS** database on **Cloud SQL**.
- Formerly done by hand by network engineers, taking months to achieve, it now runs in a couple of hours at a low cost.

Data collection

Geographic Data of available infrastructure and roads

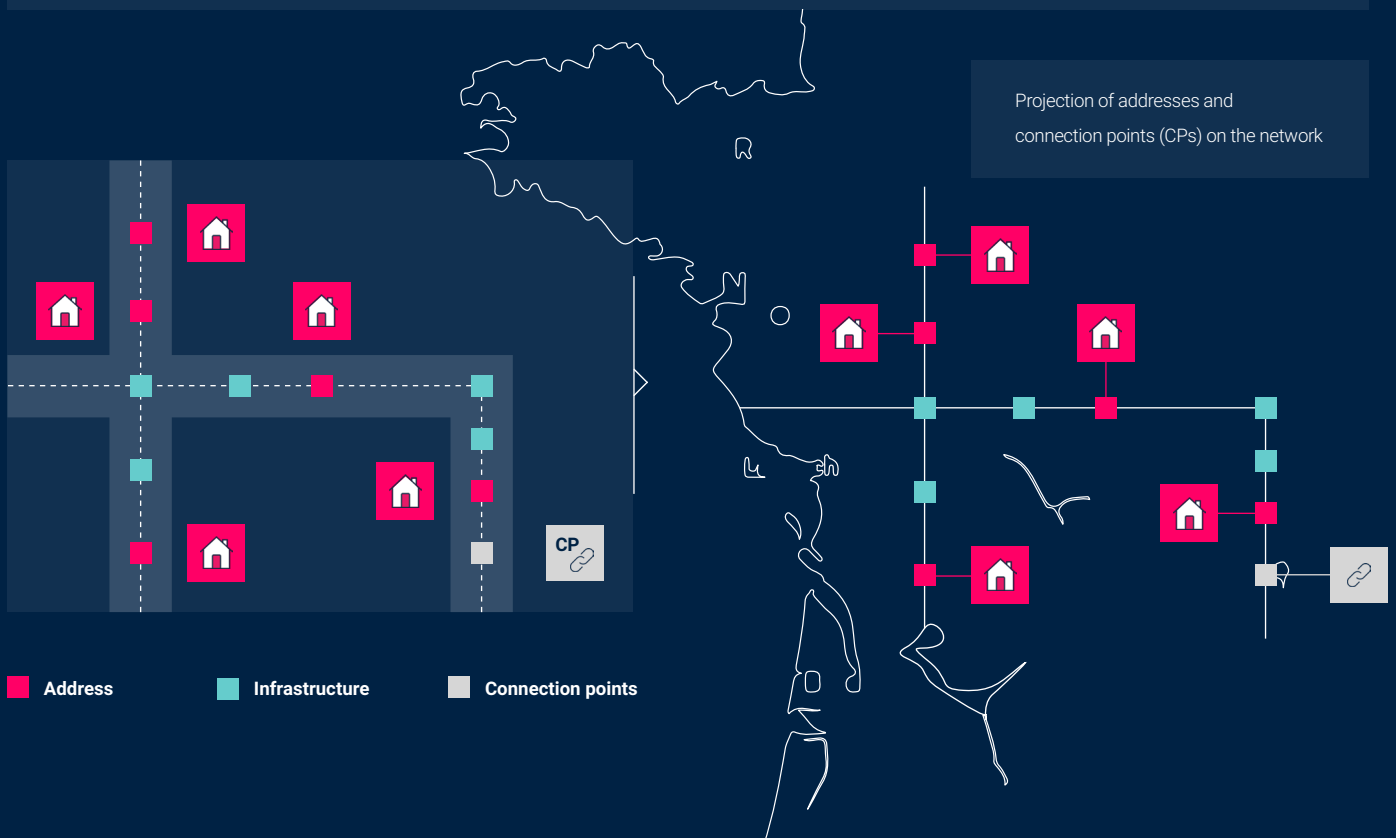
Costs (existing infrastructure, new infrastructure, road)

Calculation of optimized routes

Calculation by algorythm (Dijkstra) to define the shortest path/low cost between several points

Graphics

Creation of a dynamic route (Postgis) representing all the most optimized deployment routes



Projection of addresses and connection points (CPs) on the network

Media & Entertainment

industries need to innovate and completely rethink their value chain

The convergence of digital technologies and entertainment has led to new consumption patterns impacting the whole industry. At the same time, Digital giants have entered the competition, as distributors, but also as producers of content, reshuffling the value chain. Who better than Facebook can understand who you are, what you like, and how to entertain you? Tremendous amounts of Data and emerging Digital capabilities are revamping the way the industry is producing and distributing entertainment.

Empowering content creation thanks to Data and AI

Data and AI are usually seen as the opposite of creative thinking. Nevertheless, at Artefact, we strongly believe that the combination of both is a competitive asset. To cope with international competition, AI must be turned into a competitive asset all along the content creation process, from ideation to creation. Machine learning can identify hot topics that must be treated by journalists. By scrapping social networks, it can dig into a huge amount of customer data to find insights, behaviours or patterns never identified before to create impactful content. AI can also perform granular content indexation thanks to image recognition and Natural Language Processing. To finish, AI might enrich content creation by handling low-value tasks employees have abandoned. For example, The Washington Post developed a tool called Heliograf, to write sports and political news briefs they didn't have time to cover.

1.5x **of the advertising base rate can be charged by companies when gender and location are known** — *(BCG, Media Companies Must Reimagine Their Data For A Digital World)*

Building new interfaces and new business models to engage users/viewers.

Within the entertainment industry more than any other, people's loyalty to brands decreases. Driven by the possibility of free and fast media consumption, viewers reserve their engagement (and thus revenues) for brands with excellent content and experience. If Data and AI can improve your creative process, it is mainly in the distribution experience that it can be enhanced. Personalisation of the experience, recommendation, but also diversity in distribution mode; so many ways to enable brand media adaptation to current consumption trends. Voice assistant, for example, is an opportunity to reshape the way companies distribute news, podcasts, music,... Coupled with customisation based on advanced analytics and very granular segmentation, a media company could, for instance, propose a personal press review by voice every morning.

+30% **Digital commerce revenue growth expected for brands that leverage voice interfaces** — (Gartner, The top 5 marketing predictions for 2018)

Content everywhere, every time thanks to 5G and streaming.

Thanks to new network capabilities brought in by 5G, the media industry is expected to double its revenue by 2028 (Ovum/Intel). In the long run, it will completely disrupt the industry, enhancing far more than just the simple mobile consumption of content. Thanks to the speed (up to 1 Gbps), stability, and very low latency (designed to deliver 1ms of latency) of 5G, entertainment companies will have the opportunity to:

- Develop new modes of interaction, such as augmented and virtual reality, creating new channels for brands to interact with customers
- Increase digital advertising revenues by allowing brands to advertise in an immersive way
- Enhance touch and feel the experience in games and films through VR and haptic suits (cf Ready Player One)

Case study

Better understanding the news through archives


What we have done to make it the most durable car in its class

Need analysis
How to use newspaper archives to create an innovative and useful service for people?

Strategy
Leverage artificial intelligence used as an archivist that explores the archives to reveal articles from the past that can help to better understand the news.

Creation of an ad hoc algorythm
Processing of millions of archives, using OCR technology.Development of a semantic analysis algorithm to match articles from the past with those from the present.

Creation of a voice experience
Creation of a vocal experience: voice scenarios, cross-device user path, sound design, answer writing.

Services & Technology

industry will leverage advanced analytics and AI for both cost and revenue optimisation

Data and AI must be used by Services and Technology companies to **reduce their costs and optimise their profits**. On the one hand, the digitisation of processes allows them to monitor their performance and optimise their efficiency. On the other hand, having a holistic position on their business line gives them access to strategic and highly valuable Data. However, leveraging this opportunity often requires Service and Technology companies to educate their customers, who are usually in the midst of their Data transformation and therefore not mature enough.

Cost reduction in digitizing processes.

Using **technological devices and AI** to enhance process efficiency has been widely adopted across the Service industry. It can help from Data collection (*e.g. using drones to scan wind turbine wear and tear*) to Data transmission (*e.g. results of field tests sent through mobile instead of on paper*) and, obviously, Data treatment. To do so, Service companies are usually supported by a Technology partner that provides them with custom software solutions.

This process also intrinsically eases the digitisation of information. By reconciling Data from all departments (Operations, Marketing, Sales, Finance, …), top management can precisely monitor their company's activities. Thus, strategic decisions based on data-driven insights can be made to optimise costs. These dashboarding projects imply a strong adoption stream to ensure tool usage and the delivery of actionable insights that impact the main business lines.

40%

Is the reduction obtained by Google in its Data center cooling fee using DeepMind AI — *(https://deepmind.com/blog/article/deepmind-ai-reduces-google-data-centre-cooling-bill-40)*

Find value to 1st-party data.

Frequently dealing with competing companies, Software and Technology firms can access strategic Data. For instance, offering a payment solution can allow calculating the market share of commerces within a specific location or on a bigger scale. Tapping into this Data could turn out to be very profitable but it comes with challenges.

Because Data is not at the heart of historical business models, it is usually not sufficiently exploited, and most importantly, not fully acknowledged as a potentially important revenue driver in company cultures.

Moreover, since the amount of Data collected can quickly become overwhelming, it becomes necessary for CD²Os to ensure a key role in assessing the s potential gain of use cases, ranking them according to their business impact and identifying human, financial, and technical resources to ensure successful deployment at scale.

> Many of the AIs created out of this exercise will be efficiency-enhancing tools that will give the company some kind of a lift—possibly a 1 percent to 10 percent increase in EBITDA or some other measure of productivity.

Ajay Agrawal.
Professor, University of Toronto
interviewed by McKinsey and Cie

Case study

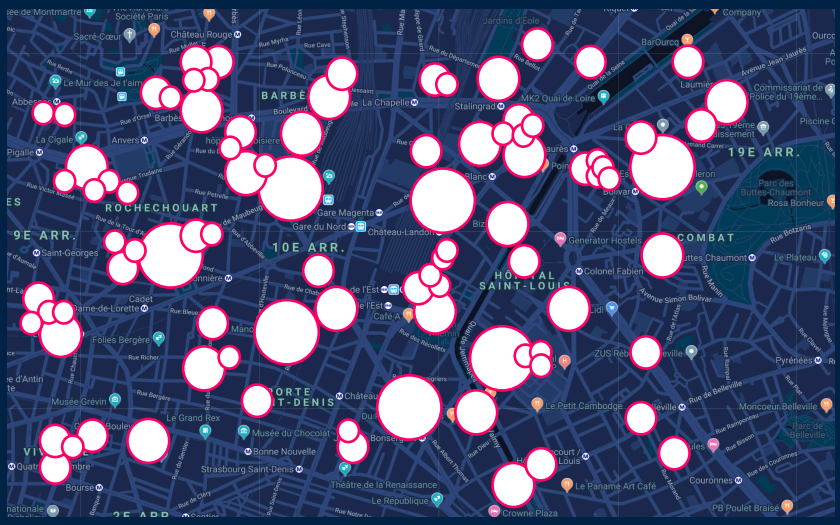
Edenred

Payment provider for casual spendings (meal, gas...)

Proposed solution:

- Using Edenred 1st party Data from its Restaurant ticket card solution **to provide merchants with a precise vision on their local market share**
- The solution required to **work on Data** (cleaning, enrichment, KPIs calculation, pre-calculation), **infrastructure and visualization** (construction of customer front using Edenred in-house solution, cloud-based infrastructure allowing quick calculation)
- The core solution has been built in 6 weeks by a Data scientist and a Data engineer

Competition in the area



Turnover	**85,063,62 €** (+61.2 %)
Turnover in the area	**3,214,769,59 €** (+65.2 %)

Market share and Market Share Year on Year

Market share	**2.65 %** (-2.5 %)

Edenred Turnover Distribution by merchant type

Fast food	1,117,359,73 €
Restaurants	1,084,197,16 €
Bakeries	219,732,93 €
Grocery stores	186,381,18 €
Supermarket	178,330,55 €

Edenred Turnover Distribution by Merchant

ELIOR CONCESSIONS GARES, 75010 Paris 10	67,182,07 €
FRANPRIX — 32 rue de Paradis, 75010 Paris 10	25,774,59 €
MONOP' — 76 bd de Magenta, 75010 Paris 10	23,236,58 €
MONOP' — 24 rue de Dunkerque, 75010 Paris 10	21,541,82 €
CARREFOUR CITY — 296 rue de la Fayette, 75010 Paris 10	15,798,65 €
CARREFOUR CITY — 24 rue de la Grange, 75010 Paris 10	13,610,95 €
FRANPRIX — 31 rue des Vinaigriers, 75010 Paris 10	11,664,57 €

Autonomous vehicle technology is completely reshuffling cards for the **Automotive & Mobility** industries

OEMs are threatened by the arrival of new players (Tech giants such as Google, Uber, or Tesla, other transportation service providers) and have to tackle autonomous vehicle challenges. Dealerships (owned or private) are compelled to deal with new digital UX standards and face OEM empowerment due to car Data collection. The role of CD²Os in these industries will be crucial to capture the value of opportunities brought by Digital and Data.

Building technical infrastructures capable of storing and treating the massive influx of Data generated by connected cars is a fundamental challenge for OEMs.

Agile and robust, **Cloud infrastructures** are set to become the new norm, offering excellent uptime, and serving as an enabler for employee and asset productivity optimisation use cases. On a more technical side, Cloud solutions are better suited to process unstructured Data, which is becoming increasingly dominant.

300TB

Avg volume of Data produced per year by an autonomous car

An efficient operative model between OEMs and dealerships needs to be found.

The shift toward a direct relationship between OEMs and end-users is completely redesigning their roles in the value chain. While OEMs will need to be creative to generate new income sources, dealerships must offer a digitised experience, although this may be difficult due to their physical resources.

On one hand, automakers see their positions reinforced by the access to 1st party data. They have to tap into these opportunities to **enhance user experience before, during, and after the purchase**. An optimal journey goes from engaging potential consumers as early as possible, supporting them with all information to ideally overcome the "touch and feel" need, and finally offering them new services such as Mercedes Conciergerie thanks to Data processing.

On the other hand, the dealership network is threatened by a B2C model already adopted by Tesla. Their added value may then shift toward maintenance. Their sales performances will be directly related to their ability to **embrace Digital transformation on the field**: managing e-reputation, optimising online presence (opening hours, online booking...) and doing local marketing. This requires permanent training to enhance the adoption of digital tools by the workforce.

> "The first OEM able to define a valuable and efficient operating model with its dealership network is going to unleash the full power of Digital, making the customer experience so immersive it will completely disrupt the marketplace!"

Fabien Cros.
Industry Lead, Artefact

Case study

Generic OEM

How to rethink the customer's journey by using Digital & Data?

3 main Data sources could be leveraged:

- **Customer Data**
  - Socio-demographic (age, gender, address, …)
  - Relationship with the brands
  - Moment of life (1st new car, …)
  - Purchase drivers (price, consumption, …)
- **Vehicle Data**
  - Generic model Data (maintenance planning)
  - Usage (distance traveled, wear and tear,..)
- **Exogenous Data:**
  - Influencer analysis
  - Social trends detected

Optimized trade-in

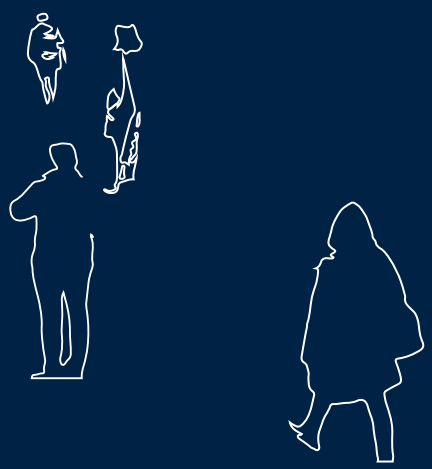
As it's a painful moment, OEMs need to help car buyers sell their former car easily and without friction *(people always think it's worth more than it does)*

Custom driving test

Provide future buyers easy-to-book driving tests while offering personalised recommendations based on the drive test

Facilitated buying

Provide a Digital lever to make buying easier online, decreasing the number of physical touchpoints while enhancing the remaining one: make them memorable!



Pharmaceuticals & Health

industry are giving back autonomy and confidence to patients

In the highly regulated world of healthcare, Data can often be siloed and underutilised. Even between hospitals within the same system, it can prove difficult to track a given patient's health records. With the rise of self-medication, remote health, or electronic health records, Data, and AI use cases are expected to skyrocket in the years to come, generating opportunities but also issues that Data and Digital can tackle.

Foster customer autonomy through Digital.

With the rise of auto medication or telehealth through connected products, patients are expressing their willingness to be more and more autonomous in their treatment. One of the possible answers to these new challenges is to develop IoT offers enhancing patients' autonomy. So far, the application of IoT in healthcare has been mainly focused on monitoring and telehealth, but applications are expected to become increasingly diverse (smart sensors, wearables, smart pills, and even treatment of diseases).

Developing such offers is not only a requirement for healthcare companies to keep up with the times, but it is also an opportunity to reconnect with patients and collect tremendous amounts of Data (from patients and their connected devices). The direct distribution of such products through an e-commerce platform is key to better knowing end patients and learning from their product experience. Nevertheless, patient autonomy requires support and education on behalf of healthcare companies to initiate this virtuous cycle.

83%

of French people are in favour of sharing their health Data, if this makes it possible to improve diagnosis, care, and medical research — (Odoxa study for the Healthcare Data Institute)

Improving security and authenticity through blockchain solutions.

Increasing end consumer autonomy and removing reliable intermediaries inevitably generates security issues. The World Health Organization estimates that 8% of medical devices and 10% of drugs in circulation today are counterfeit copies.

The emergence of blockchain appears as the solution to tackle these issues. Blockchain provides real advantages for drug traceability and proof of authenticity: companies can track their products through the supply-chain life cycle, creating a hermetic circuit impermeable to counterfeit products. Furthermore, it gives pharmaceutical companies the ability to follow the exact location of their drugs or devices to optimise recall procedures if needed.

> E-commerce is going to become an important distribution channel but it will take time due to the heterogeneity of legislation on the online sale of medicines.

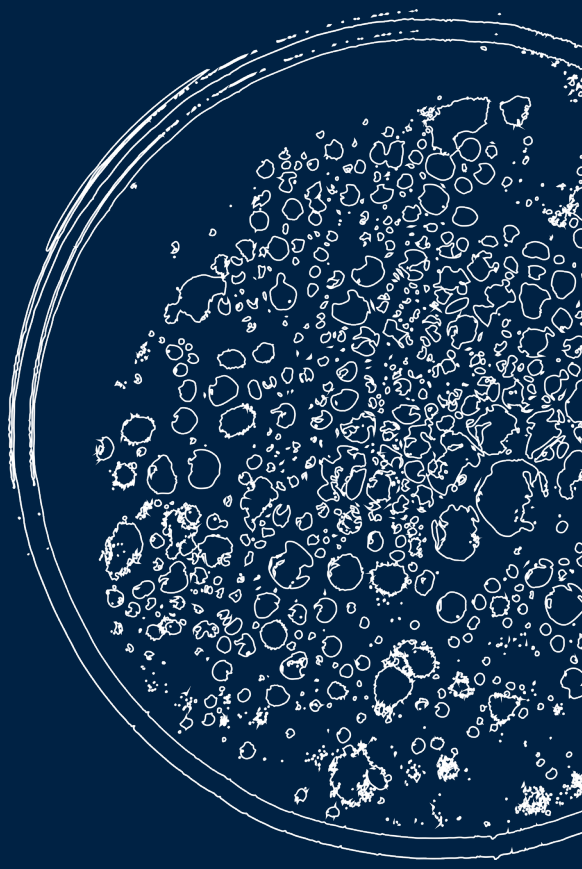
Guido Merighi Buitoni.
Head of Digital Business Transformation at Sanofi, Consumer Healthcare Business unit

8% **of all medical devices in circulation are counterfeit** — (World Health Organization)

Case study

Leverage computer vision to empower Lymphoma detection

Proposed solution:



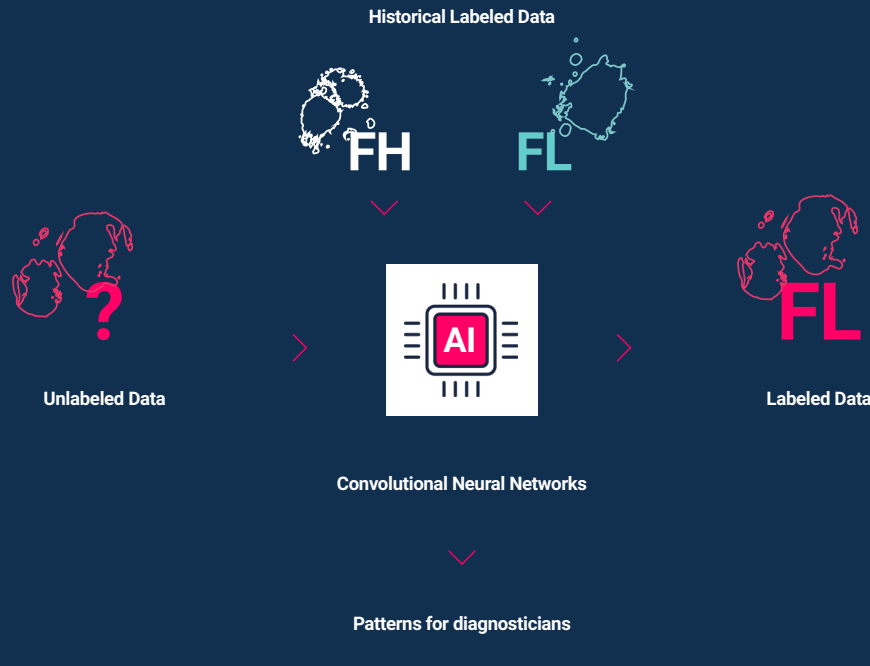
Thanks to Convolutional Neural Networks and Computer Vision our proposition relies on two steps:

- **Step 1**:
Distinguish and classify benign lymphomas (follicular hyperplasia) and malignant ones (follicular lymphoma)

- **Step 2**:
Classification of the different grades of the disease by extracting and clustering characteristics of lymphoma images

Zoom on step 1:

Computer vision uses labeled Data to define the status (FH or FL) of a lymphoma and enlighten on detected patterns



03

Unlock Data and AI Values

Enablers to enhance Data and AI transformation

03

Introduction.

As seen previously, significant benefits could be obtained by launching efficient use cases that leverage the power of Data and AI.

Such a transformation must be addressed in a well-thought-out manner. To do so, throughout our interviews and research, we have identified enablers facilitating the launch of activatable use-cases that bring tangible business gains.

Due to the specificities of each organisation (company history, industry, maturity level or internal resources), it would be irrelevant to draw out a one-fits all solution. However, many obstacles are shared by companies embarking on this process. Therefore, several best practices could have been identified to help CD^2Os leading their transition.

In this section we will look in detail at each challenge associated with data transformation and give our best tips on how to address them using our experience.

Define a vision to address strategic priorities

Launch AI Factory to create value

Build clear data governance as a prerequisite to ensure its usage at scale

Identify tools and infrastructure that will enhance time to market

Identify opportunities for capacity building and change management

Define a vision to address strategic priorities

Data has no meaning without purpose and vision

Before thinking of going forward with Data and AI, every company needs to think about why they want to move forward. Recruiting a CDaO is certainly an excellent idea and a necessary one at some point, but our interviews showed that this gives no guarantee of future success, and moreover, that data experts are expecting more even before joining new companies to properly address future challenges.

The first CDaO was Cathryne Clay Doss, recruited in 2002 by Capital One. 17 years later, the overflood of data has resulted in the rise of the CDaO as a C-Level leader. Today, most business leaders view the CDaO as a major role. But so far, no one can define precisely what it means to be a Chief Data, not even the CDaOs themselves. Technological transformation, data governance, or AI are clearly seen as pressing matters for all companies - but with a different approach in every company, which makes it even more difficult to know which strategy to prioritise.

Top down definition of vision

Despite this lack of clarity, the number of CDaOs is still rising, as is the amount of overall data generated daily. IoT, eCommerce, Social Media, or every other device. And as for Digital, there is no room for improvisation when it comes to Data Science or AI. Of course you can find many companies with Data labs, Data factories, and full squads of Data experts. Unfortunately, when you listen to CDaOs, quite often Data teams were created because competitors created them and CEOs or Excom members decided that they absolutely needed to accelerate their Data strategy, but without any vision.

Data acceleration is not only about investing, recruiting, and collecting data. The CDaOs interviewed mostly gave the same feedback: Data governance and strategy need to be aligned with a global vision and clear objectives to be efficient.

We previously mentioned their common ground with CDiOs, as well as their similar professional track when installed in a newly created position. For the same reasons it took so much time for digital to find its rightful place in the global strategy, CDaOs are lucid about the different steps they need to take, and realise that their success isn't only related to how much budget they have, but to the vision they have on "higher ground".

3 / 5 is the average grade CDaOs gave to the Data maturity of their company

Faced with a multitude of topics and challenges, it is essential that the CEO be the one deciding on global strategy and understanding how Data could help the company reach its objectives of transforming to face a very aggressive market. As shown in the Nike Inc. case, a CEO doesn't have to be a Digital or Data expert to send the right impulse to the whole company, as long as he is not ignoring the benefits of both.

The second step is to validate the most appropriate organisation to address the issues identified. Data projects are often expensive to finance, and without an immediate ROI, the importance of a clear and firm vision carried out by management can deflect permanent feedback amongst impacted departments - a situation that can create a financially penalising inertia.

There is no perfect organisation, but in order to allow Data and potentially AI to be a real support to the company business, the CDaO needs to be close to the core business.

The place in the organisation is of little importance initially as long as Data is at the core of the company's activity (eCommerce and CRM for Retail). As for the CDiOs, data leaders place more value on the success of their projects and their impact on the activity of the company than on being part of Excom. Only once the foundations are solid do they envision climbing in the hierarchy so they can accelerate and deploy the most impacting data projects to the whole group.

CDaOs need to move forward with specific goals or directions in which to go if the group is not yet mature enough on data topics.

Finance: Global versus Local

Once the vision has been defined and confirmed by the CEO and Excom, it is time for financing.

For groups that have not invested over the years, and who wish to accelerate by centralising digital and data directions, this phase is critical and often creates disagreements between Excom members. Investing more in human and technological resources means balancing OPEX and CAPEX elsewhere, which makes budget strategy complex for CD²Os as they will have to work closely with other C-levels.

Just as others, CD²Os have to present their strategy and needs to achieve their set objectives. The people we interviewed stated that it is difficult, if not impossible, to carry out all projects together without financial support from the group or other departments.

Determining the structure of the organisation has a direct impact on the efficiency and the delivery, but is also key to deciding how budgets will be financed and allocated:

Central teams working for the whole group

In this case, the amount of investment is the most important, as CD²Os must create and recruit their team, finance their various tools and technology platforms (eCommerce, CRM, analytics...), and their traffic acquisition. Quite often, IT budgets will be lowered by choosing Cloud solutions in order to reduce infrastructure costs, or by a decrease in offline media buying. What is important is for the final decision to be made at the highest level of the organisation to avoid going back and forth with the other Excom members. On the other hand, this creates opportunities as departments such as Marketing, IT, or Sales have to work together with CD²Os, thereby pushing the use of Agile methodologies in many groups by extension.

Global Team acting as a Shared Services center

In this case, a smaller team (usually five to ten people) works with regions and subsidiaries, and more often with local CD²Os. The role of Global CD²O, while remaining central, differs and investments are broken down between global teams, who centralise necessary resources and tools used for the whole group.

This organisation favours co-building with all the entities, making them take responsibility for their own performance, and offering them the support of a smaller central team of experts. It is thus less expensive because it is often half funded by the actors concerned. This organisation facilitates funding but needs to be supported by management.

Data Literacy

Gartner defines Data Literacy as the ability to "*read, write and communicate data in context, including an understanding of data sources and constructs, analytical methods and techniques applied — and the ability to describe the use case, application and resulting value*".

Data literacy is not understanding that Data is important, by why and how it is important.

As previously stated, CDaOs do not expect CEOs to be proficient in Data Literacy. Of course it would make things easier for them, but they understand that it is also part of their job to evangelise inside the company.

Nethertheless, as stated in the Gartner survey, Data Literacy is not perceived as a priority (only ranked 12th by CdaOs), but is still considered as "*the No. 1 roadblock to creating a data-driven culture and realising its business benefits*". Companies, and with them most departments such as HR or Finance, need to get on board and understand why Data and AI will play a major role in the future.

> By 2020, 80% of organisations will initiate deliberate competency development in the field of data literacy to overcome extreme deficiencies. By 2020, 50% of organisations will lack sufficient AI and data literacy skills to achieve business value.
>
> As organisations become more data-driven, poor data literacy will become an inhibitor to growth.

Gartner.
Chief Data Officer Survey 2019

Vision must be defined to address strategic priorities

Our Tips:

#1
–
Defining a Group Vision

- Excom - or ideally the CEO - should clearly define what the company is expecting in terms of business development from the future use of Data.

- Once decisions have been made about what they want to achieve with Data, the CEO or influential members of the board should maintain strong sponsorship to avoid overlap between departments who might see Data as a career booster, and not a business enabler.

- It may seem obvious, but as for Digital, the best visions and strategies for Data are those closely linked to identified business needs.

- Choose one member of the Excom who will be the main stakeholder to ensure that the vision doesn't shift from its original goal. Ideally, this person should be a CDO, but with enough "power" and influence within the group to make things happen.

#2
–
Financing Data Acceleration

- To be efficient and bring real value to a group, Data strategy needs important financial backup. Data strategy without investment will never go further than a PowerPoint file.

- Because Data projects have a high cash consumption rate (tools, recruitment), this requires fixing realistic objectives beforehand and identifying the department within the company where Data can be best used and will be properly financed.

- The most advanced groups have already included data strategy within several departments through agile frameworks, making financing and co-delivering easier.

- Centralised Data teams should act as shared services centres, providing support to the whole group in exchange for co-financing.

#3

Expand Data Literacy

- Once key leaders and stakeholders for efficient Data strategy have been identified and specified as such, what they are doing and how it will impact the whole group must be explained.

- Onboard other departments through projects and use cases that will help them in their daily work.

- In some Groups, Chief Data dedicated some resources for HR and financed impactful projects. Some companies even managed to directly include them as a full part of agile projects.

Example:

Create an HR Tribe within a global Agile framework and have them work on dedicated projects where they are directly implicated, such as recruitment, employer branding, HR Information Systems projects...

Launch AI Factory to create value

The beginning of AI among companies

The growing understanding and experience of artificial intelligence by organisations may seem contradictory given the lack of significant implementation of AI in most companies.

72% **of executives believe that AI will be the most significant business advantage of the future**
(Pwc - 2017)

In this part, we will examine both the underlying reasons for this dichotomy and explore the conditions required to achieve success.

Organisations which are successfully implementing AI technologies are seeing the emergence of new models, especially in the form of an "**AI Factory**", a combination of talents, methods, and technologies at the service of the entire company.

- **Innovation Trigger**: in this stage, a potential technology gets things started. There may be prototypes, and lots of media interest and publicity, but frequently there are no commercially viable products available.
- **Peak of Inflated Expectations**: at this point, the technology is implemented; it produces a number of success stories – but far more failures. Some companies adopt the technology; many do not.
- **Trough of Disillusionment**: interest begins to fade as flaws and failures come to light. Some producers of the technology drop out of the race. Investments continue only if the surviving providers improve their products to the satisfaction of users.
- **Slope of Enlightenment**: ways in which the technology can benefit companies become more apparent. More enterprises test it; some companies produce second and third generation products.
- **Plateau of Productivity**: the technology becomes widely implemented. Its market applications become clear and high-growth adoption starts.

90% **of US and Europe companies are working on AI projects**
(DataBricks - 2018)

As the cycle demonstrates, each phase of concrete success is preceded by a phase of disillusionment. Too many complications can impede the success of these projects. The stakes of meeting the challenge of Artificial Intelligence are high: according to Accenture, **enterprises which make good use of artificial intelligence could see their profitability grow by more than 30%!**

Added to this are potential new sources of revenue, which may result from enhanced customer experiences or increased competitive advantage.

+38% **of increased productivity in Businesses using AI technology**
(Accenture - 2017)

70%

of companies develop Proof of Concepts without transition to industrialisation

–

Study Boston Consulting Group/MIT Sloan Management Review 2017

But problems may arise after initial successes, as only a small part of these tests end up in production mode, generating not only frustration but, obviously, lost opportunities.

" Nobody phrases it this way, but I think that artificial intelligence is almost a humanities discipline. It's really an attempt to understand human intelligence and human cognition. "

Sebastian Thrun.

AI Factory recipe

The **Artificial Intelligence Factory** comes as a blessed help to companies facing difficulties in generating value through artificial intelligence. Indeed, AI Factory follows a certain number of guiding principles which are simple but crucial to the success of AI initiatives.

Let's deep dive into the ingredients of an efficient AI environment:

Centralized Governance

Features Teams

Systematic Methodology

Tools & Infrastructure

The AI factory begins with centralized governance

One with very ambitious goals… The idea is to pool and coordinate investment and steering efforts. Only highest-value projects will be examined by internal stakeholders engaged in their success. The selection of these use cases must be extremely rigorous: specifically, no project should see the light if it doesn't respect the simple law of 10X (offer a 10:1 return on investment). The success and impact of each use case should be measurable according to a simple and understandable KPI, and the systematic improvement of this KPI should be the main goal of the teams.

Λ Feature teams ensure dedicated project organisation.

Popularised by Spotify, feature teams respond to the challenges of reducing time to market, transversality, and project continuity. Directed by a business manager, the feature team is composed of a product owner, data scientists, data engineers and DevOps experts. The inclusion of DevOps / IT in the feature team ensures excellent supervision and perennial maintenance of the AI solution. A "platform team" ensures the technological coherence of the building blocks deployed by the feature teams. It is important to note that this organisational model works very well at scale.

The Benefits of Feature Teams

Λ Feature teams evaluate the impact of Design decisions.

At the end of a sprint, a feature team will have built end-to-end functionality, traversing all levels of the technology stack of the application. This maximises members' learning about the product design decisions they made (Do users like the functionality as developed?) and about technical design decisions (How well did this implementation approach work for us?).

Λ Feature teams reduce waste created by hand-offs.

Handing work from one group or individual to another is wasteful. In the case of a component team, there is the risk that too much or too little functionality will have been developed, that the wrong functionality has been developed, that some of the functionality is no longer needed, and so on.

Λ It ensures that the right people are talking.

Because a feature team includes all skills needed to go from idea to running the tested features, it ensures that the individuals with those skills communicate at least daily.

Λ It keeps the focus on delivering features.

It can be tempting for a team to fall back into its pre-Scrum habits. Organising teams around the delivery of features, rather than around architectural elements or technologies, serves as a constant reminder of Scrum's focus on delivering features in each sprint.

Right methodologies for AI...

Λ AI Discovery.

Using a methodology ensuring the right realisation of this very first step of an AI use-case is crucial in order to avoid the risk of entering a stillborn process.

Many ideas may seem compelling and it can be difficult to figure out which one deserves a try. However, organisations must not focus on ideas that contain the highest value but concentrate on ideas that show the most interesting value and implementation difficulty ratio.

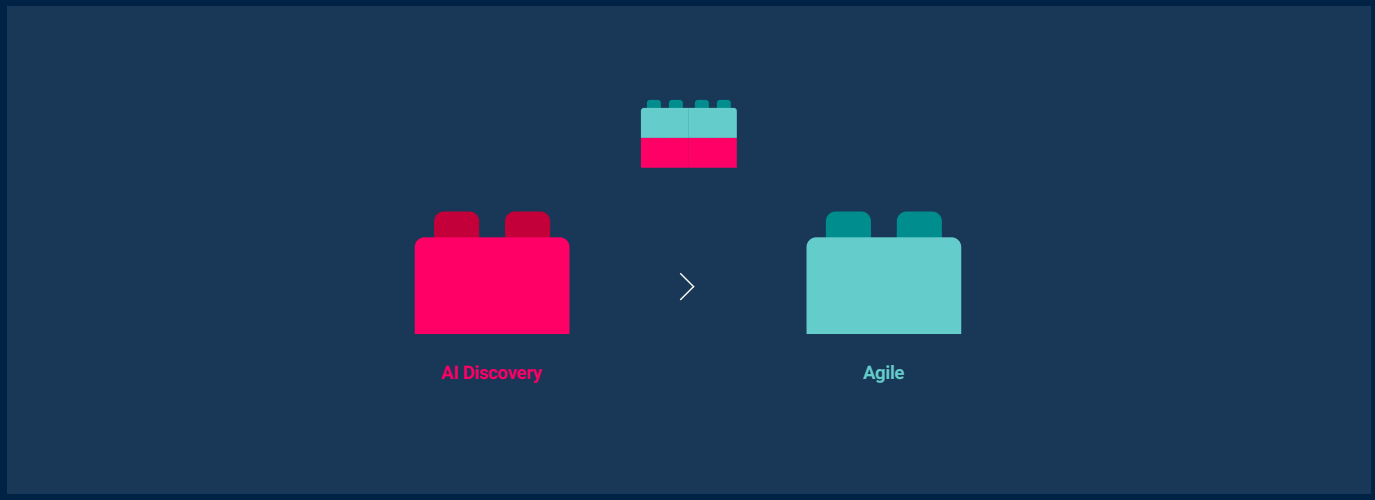
Λ Agile Delivery.

Agile methodology is the perfect fit, as it reduces the uncertainty of the efficiency and applicability of the required AI solutions. AI models are never perfect and must be tested in real-world situations. The Agile method consists of a continuous improvement loop of short cycles which includes the formulation of hypotheses, the identification of pertinent data, and the construction and testing of one or more models, followed by deployment on a test perimeter and collection of user feedback. The cycle is repeated with the formulation of new hypotheses, new data, etc. This method enables testing in real situations, then the improvement of cases not explored, until a level of satisfaction considered acceptable by the organisation is reached in order to begin production.

...Along with adapted tools and infrastructure

Today, more and more algorithms and "intelligence products" are on the shelves. At least on the lower levels. Europe's first Cloud partners, Amazon (AWS), Microsoft (Azure), Google (GCP), and IBM, all offer various levels of abstraction which enable companies to "produce" AI in-house (Google recently launched a new managed universal service called Anthos); these solutions work a bit like the chemistry kits we played with as children. They propose simple access to infrastructures specifically designed to respond to machine learning needs, such as Google's TPUs, which are managed services enabling the concentration of teams on given applications. Also available are numerous open source libraries (Scikit-learn, TensorFlow, Pytorch) as well as proprietary APIs (image, text, and voice recognition).

Moreover, deployment should be envisioned from the very first days of the project in order to avoid starting from scratch in a different technical environment. The creation of new data silos must also be avoided by making maximum use of the organisation's existing data lakes and data wells. AI applications should be built in a service-oriented architecture logic. Containerisation and orchestration technologies such as Docker and Kubernetes enable simplified management of microservice ecosystems, facilitating the use of AI models via APIs which can be used by all the organisation's divisions. Tools and infrastructure will be discussed in more detail in the chapter: "**Set up an AI friendly infrastructure and toolset**".



Setting up an AI Factory with Carrefour and Google

Discovery

- Build an effective and impactful operating model
- Enhance use case ideation and qualification

Build

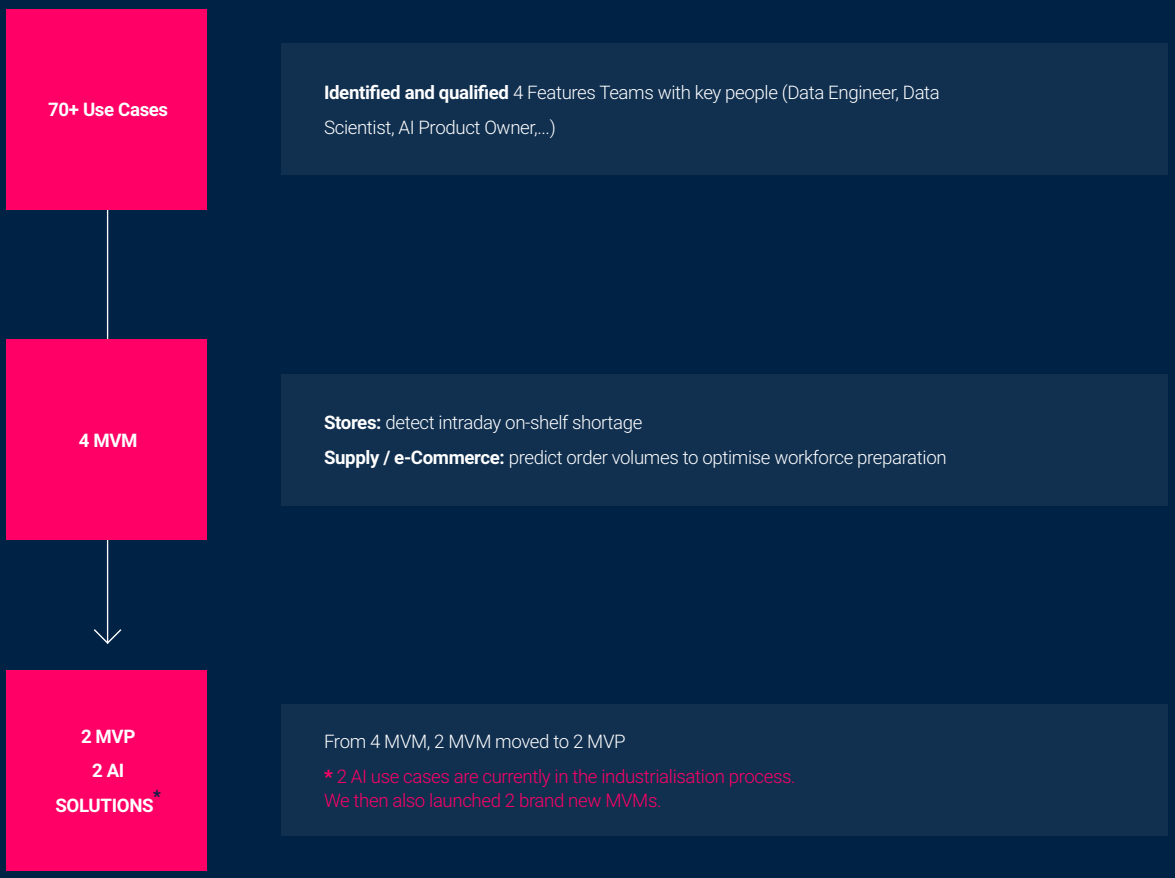
- Prove benefit of AI for all Carrefour business domain
- Boost use case production with ambitious delivery timing

Scale

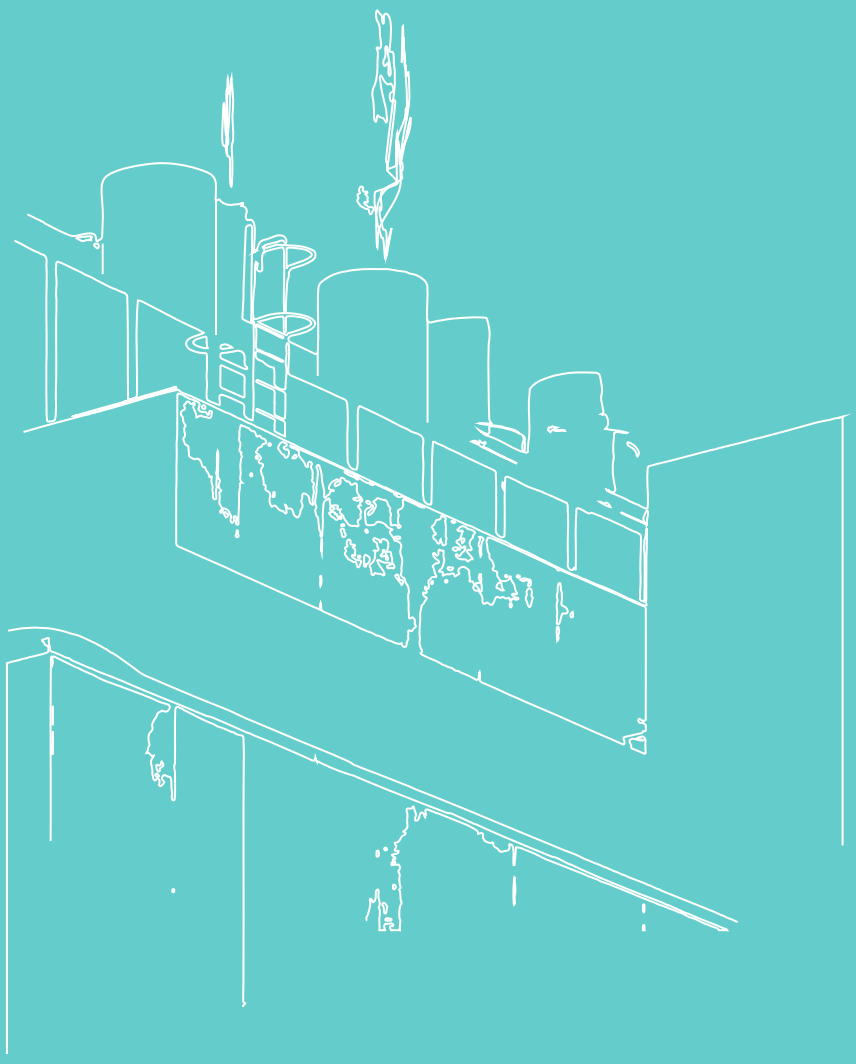
- Industrialise use cases into AI solutions wich bring business value
- Transmit knowledge and train Carrefour teams

> "Our ambition is really to select the best, the easiest and most value-creating use cases and to be able to iterate quickly enough [...], and it must work in all Carrefour stores, not just one."

Amélie Oudéa-Castera.
Head of e-Commerce, Data and Digital at Carrefour
During HUBDAY DATA 2019 - Presentation



The organization of the AI Factory



Board AI Factory

Defines the main objectives, the roadmap and the pipeline

Sponsors

AI Factory Program Management

Defines and pilots the global roadmap

AI Factory Director | Program Manager | Project Manager | IT Manager | TBD...

Agile teams — Work on the AI use cases

Feature team #1

In charge of a sub-problem

Product Owner

Data Scientist

Data Engineer

Feature team #2

In charge of a sub-problem

Product Owner

Data Scientist

Data Engineer

Feature team #N

In charge of a sub-problem

Product Owner

Data Scientist

Data Engineer

Platform Team

Provides feature teams with infrastructures and data product standards

Guarantees the coherence of the global ecosystem

IT Representative | Data Architect | Product Owner | Data Engineer

Growth team

Challenges the teams, mobilises the business owners, gets the achievements of the factory adopted, communicates on the victories

Growth Manager

Change Manager

Partners:

Bring methodology and technology

Solution Editors:

(Google, Amazon, Microsoft, IBM...)

— Consulting Firms
— Agencies

Define, launch and scale impactful AI use cases

Our tips:

#1
–
Choose the right use cases

- Balance different business areas and different value layers.

Go for quick wins - both to ensure true incremental value and to facilitate implementation. It is more important that the first use cases succeed than that they deliver the greatest value.

Be pragmatic - choose the easiest option on both technical and organisational levels. Choose the easiest use case aligned with the business team.

#2
–
Organise feature teams

- Establish agile teams, each in charge of a major business problem, driven by a KPI. For example, a retailer might create an agile performance store team and an agile performance supply chain team.

Divide these agile teams into feature teams, each in charge of a sub-problem. For example, the agile supply chain team can be subdivided into a sales prediction team, a team focusing on automating warehouse work, etc.

#3
–
Break down the complexity

- Segment each sub-problem into basic subunits.

For example, the feature team in charge of sales prediction is primarily interested in predicting sales of fruits and vegetables, but more specifically in the prediction of tomato sales.

#4
—
Build skills

■ Establish processes which promote the sharing of knowledge and skills, for example:

- **Tech talks**: organise weekly events for feedback from a team on a specific point (a tool, a challenge etc.)
- **Pair programming**: set up pairs within the feature teams, working together on the same code

Create a lab academy to run a training program within the lab.

#5
—
Make it scalable

■ Be able to rapidly increase the capacity of lab teams by adding feature teams or creating new feature teams.

Build clear data governance as a prerequisite to ensure its usage at scale

—

Why is Data Governance critical to companies?

It's time to address data governance for the CD²Os

It is time to address data governance for the CD²Os

Although Data Governance has always existed, it has not always been the priority for CD²Os. Digitisation of companies at any cost was done at the expense of Data Governance: the most important thing was that it worked. After all, it was difficult to invest significant costs when the return on investment was difficult to measure. Data Governance was one of those "do it later" tasks that was **constantly being pushed aside** but finally became problematic as information systems and data accumulated throughout the company.

Today, this is no longer the case, because there is growing awareness among CD²Os toward data governance as **we can now quantify its return on investment**. For example, not having proper documentation about data localisation has led to several inefficient communications that could have been avoided.

20% **of productivity is wasted because of bad data quality** *(IDMA)*

No data governance, no AI

Data is at the core of AI use cases and the **sanction is unavoidable**: at the time of AI transformation, the AI use cases, although in principle full of value, are frozen at the idea stage for several reasons (poor data quality, untraceable, inaccessible...).

Without **effective and clearly defined Data Governance**, it is almost impossible to raise AI cases and thus benefit from their value. If CD²Os do not act as quickly as possible, company growth would be delayed, which could lead to a future loss of market share.

80% **of time spent by data scientists is allocated for the search of good quality data** — *(Forbes)*

The success of the Data Governance lies on key success factors

Setting up a Data Governance program is a wide-ranging initiative and implies carrying out two main streams: installing a data governance culture, and delivering the program. This part of the report won't deep dive into these streams, as they would require a report of their own. However, succeeding in such an initiative relies on a few key success factors:

- **Sponsorship and direction from the top management**
  Sponsorship and strategic direction from top management will ensure the success of the Data Governance program and will enhance the successful spread of the data governance culture throughout the organisation.

- **Pairing data consumers with the data providers**
  It is essential to pair the people on the consumption side with the people on the production side to ensure both parties agree on the same KPIs and data quality standards.

- **The program needs stewards both on technical and business teams**
  Data stewards (detailed job description page 101) serve as the subject matter expert to the business unit they represent and are trained to lead the data governance initiatives within their respective business functions while Technical stewards take care of technical requirements to fulfill the needs of the business teams.

- **Business teams must be the treasurers of the data they consume and produce**
  Data Accountability is key to the successful implementation of the Data Governance Roadmap. At all times, Individual business functions should be accountable for the way they use, store and manage their Data. The Data Governance team will help the business functions in realising this ambition.

A clear operating model must be set up to ensure the success of the data governance program

EXECUTIVE STEERING COMMITTEE

Mission: *Provide strategic direction and Funding for Data Governance activities.*

- Chief Executive Officer
- Chief Data Officer
- Legal & Compliance Officer
- Chief Technology Officer
- Chief Finance Officer
- Chief Risk Officer
- Chief Business Officer
- Chief Experience Officer
- Chief Marketing Officer
- Chief Operations Officer
- Chief People Officer
- Chief Security Officer

DATA GOVERNANCE COUNCIL

Mission: *Define policies and set up the Data Governance roadmap for the business and IT; define KPIs to evaluate success; monitor the implementation of the Data Governance roadmap.*

- Chief Data Officer
- Data Governance Officer
- Legal & Compliance Officer
- Chief Security Officer

TECHNOLOGY TEAMS

Mission: *Provide support to the business teams to efficiently carry out Data Governance activities.*

Technical Steward — Translates business requirements into technical architecture to be implemented within the organisation and ensures easy accessibility for business users.

Security Officer — Provides access of Data to relevant stakeholders, develops data security procedures and secures IT Infrastructure on behalf of business units.

Data Architects — Evaluates and recommends data governance tools, oversees data modelling between systems and ensures they are compliant with best practices.

BUSINESS TEAMS

Mission: *Define and document the Data that will be used by the business function and implement governance policies set by the DGC.*

Data Steward — Implements changes and policies as directed by the council, regularly communicate governance requirements with all stakeholders and ensure proper data quality and documentation. The more mature the company, the more companies need a Data Steward.

Business Functions

Corporate	Product	...
Data Owner	Data Owner	Data Owner

Expert for their particular business domains, they work with the Data Steward to assist with data documentation and quality management, ensure easy accessibility to Data, and manage data requests.

Data Consumers and Producers

Mission: *Use data to make data products and to generate business insights for efficient decision making; maintaining the integrity of the data used.*

- Data Scientists
- Data Analysts
- Marketing Managers
- Finance Managers
- ...

A clear operating model to ensure the success must be set up to ensure the success of the data governance program

Chief Data Officer

Responsibilities:

- Chair the Data Governance Council
- Hands-on involvement in discussions & share outcomes with the executive steering committee
- Make sure project goals, data governance processes, and institution strategies are in alignment with company mission and strategy
- Give guidelines and direction to the Data Governance Officer for defining standards and roadmap
- Set goals for future state of Data Management Capabilities
- Determine and define measurable success indicators for evaluating the effectiveness of Data Governance policies with Data Governance Officer

Example(s) of Responsibility:
"I evaluate the data governance policies defined by the Data Governance Officer and develop an implementation roadmap for the same."

Data Governance Officer

Responsibilities:

- Create data standards and business rules across the six key data governance guiding principles
- Ensure operational team is competent and well equipped with the right set of tools to accomplish their mission
- Create and maintain the Data Governance roadmap for the entire business
- Manage the delivery of the Data Governance programme
- Resolve issues raised by Data Stewards and Technical Stewards in the Data Governance Council
- Conduct regular audits to ensure Data Governance within the organisation

Example(s) of Responsibility:
"I define data management policies and standards to be followed throughout the organisation."

Data Steward

Responsibilities:

- Participate in Data Governance Council
  - Implement changes & policies as directed by the Council
  - Escalate potentially critical issues to the Council
- Regularly communicate governance requirements to all the stakeholders
  - Communicate new and changed business requirements to individuals who may be impacted
  - Align business producers with consumers
  - Promote data citizenship roles & responsibilities
  - Share knowledge & support with other stewards
- Ensure proper data quality & data documentation
  - Assure validity & consistency of data
  - Assure data stored is aligned with data dictionary & data quality standards
  - Contribute to metadata management & maintain business glossary
  - Maintain & update the enterprise data catalog regularly

Example(s) of Responsibility:
"I make sure that all the Data generated by my department is of good quality and in line with the enterprise glossary."

Data Owner

Responsibilities:

- Subject matter expert for their particular business domain
- Assist with data documentation & quality management
- Ensure easy accessibility to Data
- Work together with Data Stewards to prioritise and manage data requests
- Escalate data and reporting issues to the Data Governance Council

Example(s) of Responsibility:
"I analyse and manage the data generated and make sure that the data adheres to governance standards."

Clear data gouvernance is a prerequisite to ensure AI usage at scale

Effective data governance is key to maximising the quality of data and allowing the organisations to deliver high quality services

Therefore, Artefact has defined 5 main principles to achieve this journey:

#1
–
Data shall be highly supervised

- Data management roles and responsibilities must be assigned to individuals who are accountable for the management of a specific data perimeter.
- Measures should be implemented to control the application of all data governance principles.

#2
–
Data shall be secure and treated in compliance with regulations

- Security and compliance with regulations must be taken into account from the beginning and all along each project lifecycle. Teams must be made accountable to ensure compliance.

#3
–
Data shall be widely understandable

- All Data, metadata and Data processing should be precisely described in functional and technical terms using tools to increase agility and velocity to operate change management.

s.

#4

—

Data shall be of good quality

■ To be usable, Data should be qualitative. Its quality shall be assessed and controlled continually to eventually generate real life impactful use cases.

#5

—

Data shall be accessible and used

■ Accessibility of Data within the company shall be facilitated and managed accordingly amongst departments to ensure easy and timely access to Data to those who have proper authorisations.

Identify tools and infrastructure that will enhance time to market

Creating value through Data and Digital usually means industrialising use cases. Although the cost of switching between design and production phases is high, complete switches are rare, as teams prefer to iterate until the incremental value justifies the switch to production. Setting up streamlined technologies enables companies to leverage the power of Data and Artificial Intelligence, but overall, they facilitate the critical switch from design to production phase. Doing so relies on two pillars:

- A **toolset** made of both proprietary and editor solutions, fostering value creation and use case success
- A flexible and evolutive **infrastructure** on which a company can either connect or remove tools at their discretion

Make or Buy?

Even if Proof of Concepts (PoC) are not intended to systematically switch to production, how can it be explained that 70% of AI projects are blocked at the PoC stage? According to Tata Consultancy Services, in 50% of cases, the difficulty for AI initiatives is cost, not the lack of evidence that AI will generate value once industrialised.

This situation might be explained by the simple fact that companies tend to deploy technologies in a very traditional way: they either **MAKE or BUY** technologies but don't combine both. However:

- **MAKING** technologies is a huge upfront cost with uncertain ROI
- **BUYING** technologies often comes at the expense of your exact need and is also very expensive in the long run

This unagile vision of tools is slowing companies down. Instead of deploying one integrated application from scratch, or developing their own tailored solution, the right strategy would be to assemble tools. Tools can be seen as Lego bricks the company can assemble to build the best ecosystem possible to enhance use case success. But they also must be seen as accelerators of transformation, and must be integrated in a scalable, modular, and agile infrastructure designed to make Data and Artificial Intelligence accessible to non-experts.

The benefits of setting up a blended tool strategy are multiple:

- **Best-of-breed**: make the most of the market by selecting the most appropriate existing tools (BUY) and developing others for more critical cases (MAKE)
- **Tailored**: be easily integrated into IT legacy architectures which are usually old and rigid
- **Sustainable**: set up an agile ecosystem thanks to switchable and independant Lego bricks that don't require architecture evolution when adding or removing one of them, which fosters independence from editors

As a consequence, industrialising data projects requires an in-between vision, choosing the best balance between MAKING and BUYING to make the most of both approaches. For example, if you were to develop a churn detection application in your call centres, you would have independent bricks for speech-to-text algorithms, topic modelling, churn detection, etc. These are bricks that make no sense to develop from scratch but they do need to be customised to specific use cases in order to be efficient.

in **50%** **of AI initiatives, difficulties come from the cost of technologies** — *Tata Consultancy*

Which infrastructure should host and support your Data and AI strategy?

Public, private or hybrid cloud: a tailored solution

Public cloud

Λ **Cloud** is **'public'*** when its resources (servers, storage, etc.) are made available by a third-party provider and delivered over the Internet. The whole infrastructure remains the property of the cloud solution provider. Resources are shared between several organisations while ensuring separation and security.

Usage example:
Office applications, deployment and testing environments etc.

Benefits:
Payment for use of service on very short time scales, lack of maintenance (supplier's responsibility), and the ability to scale resources at almost unlimited demand.

Private cloud

Λ **Cloud** is **'private'*** when cloud resources (servers, storage, etc.) are used exclusively by an organisation, via a private network or the Internet. It can be located physically in the organisation (internal cloud) or hosted by a third-party provider. If the entire infrastructure does not belong to the organisation, service and infrastructure maintenance is still the organisation's responsibility. Compared to the public cloud, the private cloud is customisable and adaptable to various needs.

Usage example:
If there is a need for optimal control of the environment.

Benefits:
Flexibility of the environment (customisation), increased security (additional levels of control and security possible due to the private nature of the cloud).

Hybrid cloud

Λ **Cloud** is said to be **'hybrid'*** or 'best of both worlds,' when it combines public cloud and private cloud (or "on- premise" local infrastructure).

Usage example:
Using the public cloud for large requirements that aren't high-security (e.g. office automation applications) and using the private cloud (or other local infrastructure) for sensitive and strategic operations (e.g. financial data).

Benefits:
Full control over sensitive resources, flexibility (taking advantage of additional resources only when needed), ease of migration to the cloud (phased migration of loads).

Λ In companies, the choice of* private, public or hybrid (mixed public and private) cloud use is evaluated according to four factors: level of security, technological requirements, flexibility of resources and skills required.

The main reasons to choose

	An On-premise or 100% private cloud infrastructure	A public cloud computing infrastructure	An hybrid infrastructure composed of public and private cloud
Security criteria Identify the level of control to be carried internally and delegated to 3rd party	Company wants to have the direct control over **the physical security of its infrastructure to sanctuarize its data assets**	Company **trusts cloud partners in providing best in class physical and architecture security** and wants to focus its own efforts on data confidentiality, user awareness and management (e.g.: access rights management)	Company wants to adjust **the level of control** over security according to business criticity and sensitivity of data
Technology requirements Select the combination of build and buy architecture strategy	Company "make strategy" is to build and develop its own private infrastructure and **limit the "lock in effect" of 3rd party vendors**	Company wants to use the cloud to avoid **the effort of closing the existing and future technological gap** with the most advanced cloud vendors	Company wants to keep the benefit of their legacy systems while **pragmatically using cloud as an extension of their IT infrastructure** (e.g.: AI off the shelf solutions)
Agility analysis Define how to optimize resources while delivering fast value	**Company wants to stay on a CapEx cost model**, amortized over time, and capitalize on its existing processes and investments	**Company resource allocation strategy is** centered on core business (managed services with maintenance delegated to 3rd party). There is a high opportunity cost for company of not going to the cloud (turnover, savings, TTM)	**Company wants to use the cloud as an "agility boost"** delegating too demanding use case (computing power) to the cloud while capitalizing on their existing infrastructure.
Change management Evaluate the human organisation and skills required to welcome the architecture strategy	Company wants to invest in highly skilled resources while **capitalizing on a validated change management processes**	**Company belongs to tech community** with highly skilled resources and **delegate the architecture management**	**Company partners with tech** community to innovate and runs an **efficient change management**

Set up a Data and AI-friendly infrastructure and toolset

Artefact has defined four guidelines for optimising AI infrastructure

Any artificial intelligence project consists of an industrialisation phase and a deployment phase.

The industrialisation phase is when the value of artificial intelligence is captured - as soon as AI is deployed as a service for other users or systems. Although the cost of switching between the design and production phases is high, complete switches are rare, as teams prefer to iterate until the incremental value justifies the switch to production. How to favour the industrialisation of artificial intelligence projects?

Simplify your infrastructures with microservices

Λ In the case of complex applications, it is necessary to focus on several simple functional units: microservices.

Each microservice works like a Lego brick that functions independently from the other bricks and allows for greater agility of development. A brick can be added, modified or deleted without impacting the entire structure.

For example, if a data scientist creates a micro-model to classify the intention of a call to a call centre, they do not need to integrate it into a "mother" application to guarantee its operation. The micro-model is a "mini expert" able to autonomously carry out its task.

The data scientist can then develop another micro-model, offering advice according to the intention of the detected call. This second model will be able to exchange information with the first through APIs without being constrained by its evolution.

Both micro-models have been developed independently, but are used together with APIs. Each model can be used by another service in isolation or as part of another application, without the other being impacted.

At Artefact we believe that, "*Artificial intelligence applications are 'data products' built in the form of microservices. The main challenge for the project team is to maximise their consumption. The more the data is used, the more value it generates. The easiest way to start building data products is to use containers*".

Pack your "data products" with containers

Data scientists do not have the expertise to manage the optimal deployment of the models they have built. Here, data engineers come into play, with the responsibility of making the data scientist's work "eligible" for production. The specificity of each model complicates the work of the data engineer, who must interact with the data scientist in order to fully understand the models.

Λ The challenge is to get away from specific elements and standardise the switch between prototyping and industrialisation.

Containers allow data scientists to "package" all their work inside a module with known geometry (standards of weight, size, components, etc.)

Containers come from an open source project called Docker, which launched the best-known container format, making the terms "dockers" and "containers" interchangeable today.

The person in charge of moving the container does not need to know its content - the container becomes the standard. The role of the data engineer is to understand the prerequisites of the containers they have delivered: Do they need to run it on a TPU machine? Does it contain critical data requiring production on the on-premise infrastructure?

Λ By putting standardised instructions in place and using containers, the number of interactions between data engineers and data scientists is reduced, improving the company's organisational scalability.

Unify cloud and on premise infrastructures with Kubernetes

Artificial intelligence applications are composed of several containers. For example, in the case of a machine learning algorithm, typically one container is developed for the model, a second for the API that exposes it to the outside world, and a third to periodically re-train it.

Orchestration work is completed so that containers rotate at the same time, communicate with each other, and evolve together in a consistent manner during a load increase.

Kubernetes is an open source container orchestration platform that has been adopted by the majority of cloud providers. It is an as-a-service platform that data scientists use to intuitively deploy their model.

Its visual interface orchestrates the relationship between different containers and ensures that everything works together for best practice. It can also trigger and follow the execution of pre-defined rules (eg. the CPU load of the application must never drop below 50%) by performing actions such as adding or removing containers.

The same container can be deployed on Amazon cloud, Google, IBM, Microsoft, private cloud or on-premise; the containers can be used "Plug and Play" in an IT ecosystem where each option and each alternative has its own merits. A containerised application designed on a public cloud can be migrated to a private cloud or to an on premise architecture. Douglas Willcocks says, "Before, everyone had physical machines and the main issue was to channel these physical machines into VMs (virtual machines). Then, with the arrival of serverless, we wanted to get away from VMs. Now, we also want to disregard the service provider by putting a layer above the on-premise data centres, above the various private and public clouds; in the same way that you do not choose the physical machine in your data centre, soon you will not choose the cloud provider on which your application is running."

According to Douglas Willcocks, there are three different areas to keep in mind when making a decision regarding hosting for AI applications: agility, cost, and security.

At its last Cloud Summit in June 2018, Google announced the launch of "on-premise" Kubernetes, with the goal of meeting the needs of companies running microservices in their own data centres. The machines run on the on-premise data centre but the work of parameter setting, monitoring, and maintenance is carried out remotely by Google.

The aim is twofold:

- Offer on-premise managed services to reduce the barrier to entry (Kubernetes is complex technology)
- Facilitate access to the cloud by using Kubernetes as a secure gateway to gradually move certain on-premise applications to the cloud

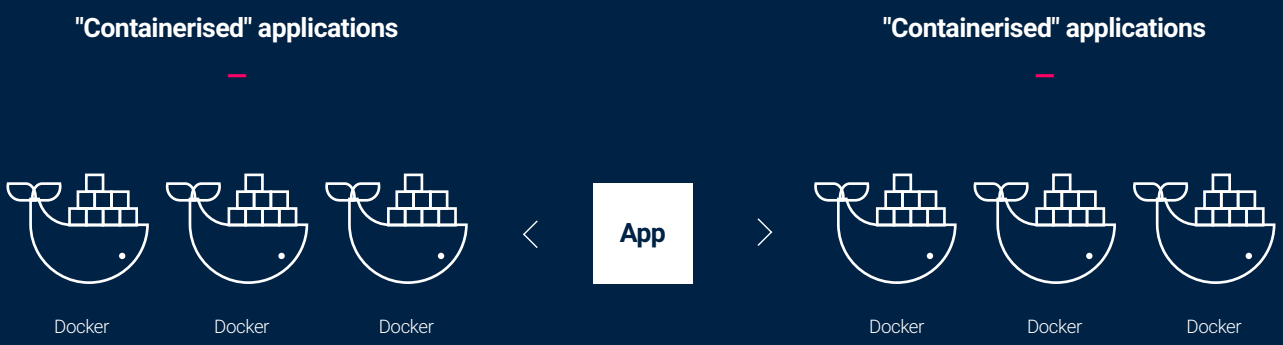
With containers and orchestration, AI has become agnostic in terms of infrastructures. There is no need to choose between platforms or technologies. Kubernetes provides flexibility which allows companies to independently choose who hosts the storage and processing of their Data.

Parallelise test and production operations by adopting "continuous delivery"

The main goal of using microservices, containers, and orchestration platforms is to move toward complete automation of the development process.

We can think of this process like a port - if the shape of the container is known and understood and the bar code can be read, then a robot crane could autonomously move the containers around the port to put them onto a ferry.

Kubernetes containers let you forget about the existence of a data centre



On premise ⟷ Integrated service mesh for Data and applications ⟷ **Cloud**

Low unit cost of storage and computing (CAPEX)

Objective: to achieve the highest possible use

High unit cost for storage and computing (OPEX)

Objective: to ensure that the resources meet the requirements

Lowest cost for stable workloads

Maximum flexibility for dynamic or specific workloads (for example, TPU)

Source: Artefact

Containers and service meshes allow for the seamless integration of on-premise and cloud environments to obtain the best combination while capitalising on the same set of tools and skills.

Our Tips to achieve a reliable and scalable “AI Growth”

#1
–
Availability

- **Highly Responsive**: using auto-scaling and dynamic load balancing, we can ensure that the system always meets its SLA.
- **Fast Recovery**: automated backups and failover mechanisms allow rapid recovery from system failures and minimise downtime.
- **Data Timeliness**: the most recent Data should be available at low latency to ensure metrics are relevant to business owners.

#2
–
Error minimisation

- **Minimal Human Intervention**: an automated building, testing, and deployment environment must be set up to reduce the probability of error and increase agility.
- **Observability Points**: a clear and detailed monitoring mechanism must be set up in the system to receive early warning signals and allow quick and efficient diagnoses.

#3
–
Cost effectiveness

- **Cloud Elasticity**: using cloud elasticity enables the quantity of resources required to be adapted according to the load at any time, thereby optimising costs.
- **Core Business Focus**: using managed services allows teams to concentrate on core business value.
- **Budget Planning**: using cost management tools gives transparency over existing costs and improves short-term and long-term cost predictability.

#4
—
Standardisation

- **Technologies Homogenisation**: the homogenisation of technologies within the system is key to accelerate the development of use cases and ensure effective maintenance.

- **Modularity**: a highly cohesive and loosely coupled system integrated with containerisation allows the construction of a flexible and scalable environment.

- **Infrastructure As Code**: it is key to provide automated, reproducible, testable, and self-documented infrastructure.

#5
—
Evolutivity

- **Multi-Environment Management**: model versioning and configuration driven packages enable the construction of a common structure that supports local specificities.

- **Non Regression**: a highly-tested system is key to ensuring that code modifications or new features don't affect existing functionality.

Identify opportunities for capacity building and change management

—

Recruitment : Profiles that fit

Traditional recruitment processes do not always fit with digital and data talents as they have specific expectations and as the market is highly competitive. In addition, while GAFA and major Tech companies are capturing a lot of these talents each year, there is also the growing interest by startup ecosystems. Talent acquisition is crucial to enable digital transformation and organisations have to work on being attractive to these new talents as they can't always rely on external resources.

Even if this historical split between IT and business has faded under the recent pressure of digital transformation and data, we still observe siloed management of business and technical skills in most companies. It is interesting to note the presence - or absence - of some new roles in departments such as IT. Although we didn't manage to quantify the percentage of companies lacking these positions, most Chief Data Officers mentioned that they struggled to explain the need to hire such profiles.

Data and AI transformation should radically change organisations' core business, and this cannot be done without new cloud technology. Data or digital projects are perfect bridges to unify both sides around a major issue for the company. The change must be driven by a core team of both technical and business experts who speak the same language and work toward the same goal.

Without business experts on board, there is a greater risk of delivering a product that is disconnected from business needs and which under-delivers on the original scope. Without a technical expert, the project cannot be scaled up.

We listed the main profiles companies must recruit to make this move happen :

The product owner: the sweet spot

- Within the core team, the product owner (PO) represents the business side. The PO is accountable for planning and final delivery, plus translating business needs into technical specifications. "Trilingual" in information sciences, data, and business, this role moves between verifying technical deliverables and evaluating feasibility of business demands. POs should be able to challenge technical teams on their choices and participate in the design of final products.

Data scientists, data engineers and data architects: a winning technical trio

- **Data engineers** work up and down-stream of data projects, collecting and processing data from datalakes and deploying a model at the end of the project. They are responsible for setting up and maintaining infrastructure.The role of data engineers is central to the delivery of projects, and even more so in the context of projects carried out in the cloud.

- **Data scientists** focus on the cleaning, preparing, and modelling of data brought by the data engineer. They must focus on deploying an optimal model, increasing the number of iterations and therefore the quality of the end result.

- Unlike data scientists and data engineers, **data architects** are more involved in the design than in the delivery of the project. Data architects define target architecture in line with IT strategy and anticipate the integration of the final product with legacy information systems (IS).

Other profiles are also critical to set up such agile organisations:

- **Operational teams**: in addition to a Business Owner supporting the project on the business side, operational teams should also be involved in providing use-specific information to guide the configuration of the model and validate the relevance of the solution with the PO.
- **Compliance team expert in AI and data issues**: the role of privacy lawyers is to guarantee compliant processes, while considering the uncertainty inherent in any AI project (due to the "black box" effect of algorithms). They should have detailed knowledge of data deposits, technologies, and associated business practices. Mastering the operational complexity is a prerequisite for mastering the legal one.
- **IT service-oriented teams**: as part of a full cloud architecture, information systems no longer have to manage infrastructure or complete maintenance tasks. Its role, then, is to provide services to internal clients. These services can be offered by infrastructures on-premise, in the cloud, or in a hybrid way. The hybrid option makes integration work more difficult. IT teams must be part of the extended team to seamlessly integrate the final product with existing infrastructures.
- **Information security experts**: Chief Information Security Officers and Infosec/Cybersec experts have a very important role in securing data and preventing data breaches or leaks. They must work together with Data and IT teams and are key actors with the newly appointed Data Protection Officers when it comes to Data Privacy and GDPR laws.

Train to develop and retain

The key is making sure you have the right people on board and focussing on developing their skills: AI engines are often specific to cloud providers and require considerable training. To respond to this challenge, Allianz, for example, has contracts with solution publishers to provide the level of support needed to master these new technologies. In France, OCTO Technology - part of Accenture Group since 2016 - offers workshops and training on Agile methodologies to their customers, including Business and Human Resources.

Companies must invest heavily in training on several levels: certification of technical teams in cloud technologies, training directors in the philosophical implications and challenges of the cloud, the organisation of ideation workshops and so forth. To achieve this, Human Resources departments must be integrated into the transformation early on, notably by participating in pilot data and AI culture workshops. Their mission requires a clear vision of the challenges and needs in order to roll out appropriate training plans, adapted to the range of roles and skills needed to implement the innovative mindset at scale. According to all the people interviewed, retaining and nurturing experts in Digital and Data requires stronger involvement from corporate functions such as HR or even Finance, as both play a key role in the capacity to hire and retain the best talents for the company. CD²Os all mentioned how important is it for them to feel that HR are working closely with them in development strategies. The “Talents war” has always existed in every industry, pushing HR to bring their “A game” when it comes to market and jobs knowledge.

These skill building programs should focus on two areas:

- Repositioning and broadening the skills of existing data experts.
- Developing creativity and "out of the box thinking" for more operational roles.
- Taking into account the top trending coding languages favored by experts.

Change at scale

The three pillars of Change

Everyone needs to: demystify, teach and engage. While responsibility for implementing new technologies lies with management, operational staff (who are usually excluded from the decision making process) are the first to be impacted. Whether this impact is perceived as positive or negative, it has a big impact on people's daily jobs. Roles can disappear, others are modified, and new training needs emerge. In other words, artificial intelligence disrupts the status quo.

Programmes that encourage a data first culture are catalysts for Data and new technology transformation in companies. By understanding the impact and benefits of the transformation, employees can be engaged in the process from the start. Three-phase process adoption within organisations:

- **Demystify**: reassure participants about the positive impact of Data, artificial intelligence, and new technologies.
  - Be transparent about ambitions, expected results, and implications. Communicate in understandable language free from technical jargon.
  - Encourage and organise exchanges between experts and beginners during events.
- **Teach**: provide everyone with the tools to understand data, new technologies, and their challenges.
  - Organise internal sessions on data and artificial intelligence, touching on a range of examples and challenges.
  - Develop a common language: help everyone understand technical jargon by distributing training documents that promote understanding between experts and beginners.
- **Engage**: rive an inclusive transformation, where everyone has a role to play.
  - Bring support functions into the transformation (Human Resources, Communication, Finance, Legal etc.).
  - Communicate about projects and their impact.
  - Build a consistent interconnected communications roadmap.

Building up and nurturing a Data team requires market knowledge

Recruiting the best talent requires a certain knowledge of the talent market upstream, but also of wages and technological trends. The problem is related to the gap between technological advances such as artificial intelligence (AI), the internet of things (IoT), robotics, or any other technology based on the use of data and the skills and experience that talents must have or develop in order to use one or more of these advances. Although these technologies are the promise of optimising productivity, sales, customer satisfaction, or even security, they can not generate significant gains without human resources who possess the required skills.

While Tech and Data profiles are among the most sought-after profiles when it comes to recruitment worldwide, it is important that CDaO and Human Resources are in sync with these profiles, their expectations, and levels of wages.

> " Data workers in Europe will increase up to 10.43 million, with a compound average growth rate of 14.1% by 2020. The EU is forecasted to face a data skills gap corresponding to 769,000 unfilled positions by 2020 in the baseline scenario and being concentrated in particular in the large Member States (especially Germany and France). The European Commission suggests that 100,000 new data-related jobs will be created in Europe by 2020. "
>
> **European Data Market Study.**
> *Jan. 2017*

Key Market Insights:

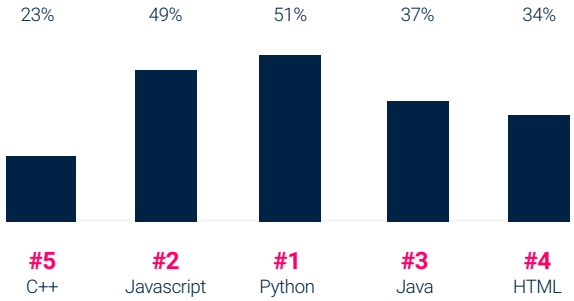
- The value of the European data economy for the 28 Member States is expected to grow from €377 billion in 2018 to €477 billion by 2020 and €1.054 billion by 2025 in a high-growth scenario*.
- San Francisco (USA) pays tech workers the most, with a 145K$ average yearly salary, while they are paid 68K£ (87K$) in London.
- Only half of tech talent in London believe they're paid fairly given the city's cost of living.
- TypeScript is the most in-demand programming language in San Francisco, London, and Toronto, while Ruby is 1st in New York and Go is 1st in Paris. Python is still highly appreciated and ranks before Java.
- The highest data science salaries can be found in Switzerland, with an average annual data science salary of 115 475€, followed by the Netherlands at 68 880€..

What types of tech are Data and Tech experts most interested in learning?

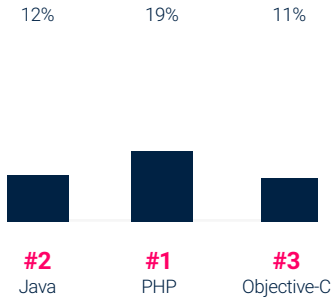
Hired 2019 survey* revealed that : *"company demand and developer interests don't always match. For example, blockchain engineering is the most in-demand skill on the Hired marketplace in USA and Europe, yet only 12% of survey respondents identified blockchain as the top technology they want to learn about, while 19% said the opposite"*.

For machine learning, interests and demand are in sync: **61% said machine learning is the number one or two technology they're interested in learning about.**

Most Loved Programming Languages



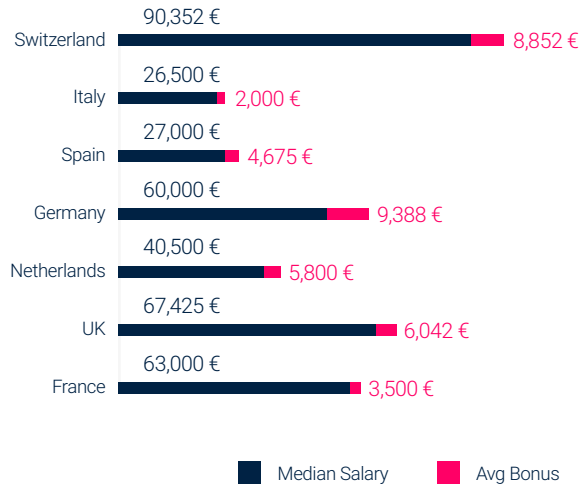
Most Hated Programming Languages



* *2019 State of Software Engineers - Hired*

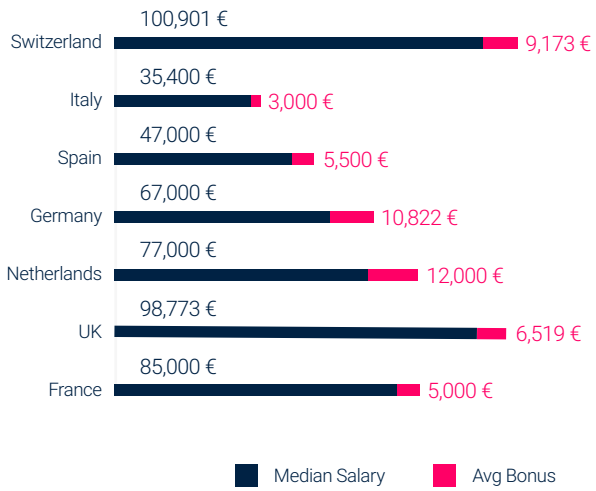
The starting point when building a data team is the validation of the budget for the team and its recruitment. The idea is to recruit the best so that the Chief Data can deliver and achieve the objectives. Recruitment is precisely the difficulty encountered by many HR and data managers. Salary is a thorny issue because it can be a major blocking point in recruitment or retention. Therefore, it is important for each company to know where it is located in relation to the market, otherwise its data teams will be permanently solicited.

Data Scientist



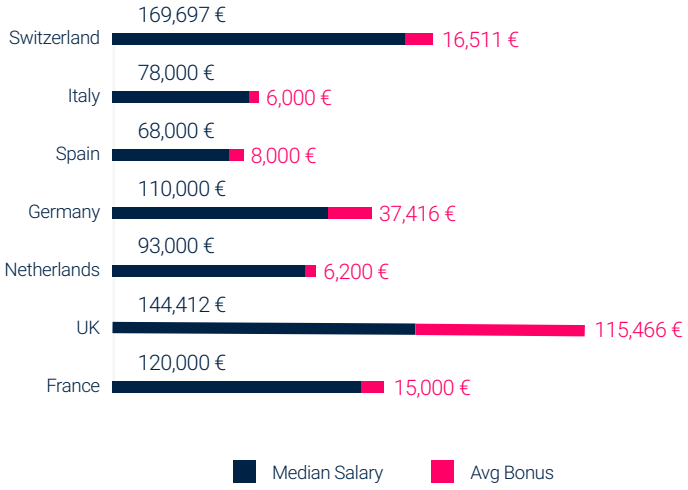
Wages have been more or less stable for the last year, with only a bigger increase in the Netherlands and Italy (from +6% to +10%). Data Scientist represents the major part of Data teams.

Senior Data Scientist



Senior Data Scientists are fewer and as the graphic shows, salaries range from +11% (Switzerland) to +92% (Netherlands) compared to Data Scientists. While Italy still has the lowest salaries, it is still +35% more.

Chief Data Scientist



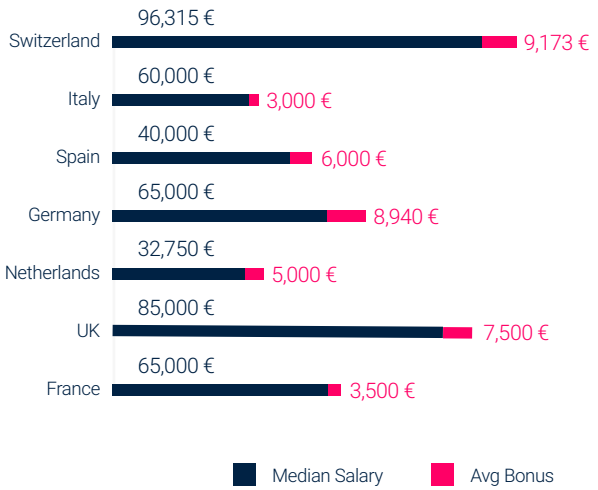
Chief Data Scientists, as managers, logically earn more, but depending on country, the gap can go from +10% (Netherlands) to +147% (UK), the explanation seems to be the maturity of the market as the UK has stronger competition for Data talents. One interesting point is the share of the bonus in UK which amounts to half the total package, meaning that Chief Data are highly incentivised on successes.

Chief Data Scientist can also be considered as Chief Data Officers in mature businesses.

Data Architect

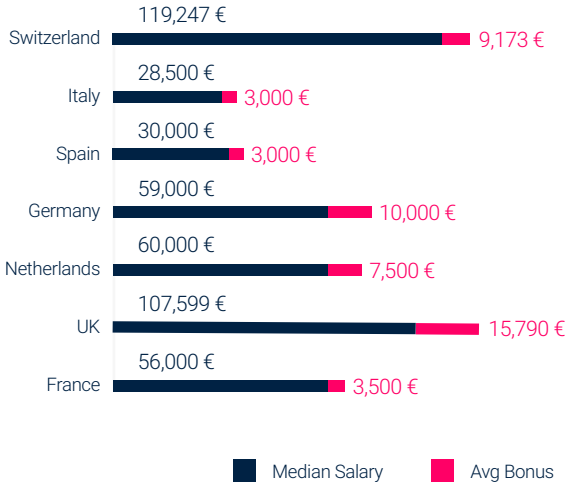
Data Architects are a very important resource for all data projects, which makes them rare and expensive. Their salary is in the same range as Senior Data experts. France and Germany are the countries where salaries rose the most, with an average +10% over the last year.

Data Engineer



As for Data Architects, Data Engineers saw their ratings rise over the last years. Salaries are not increasing as much as the others, but they might still continue to for several years. France, UK and Spain are the countries where salaries rose the most (from +6 to +10%).

Machine Learning Engineer



As a recent position created to link Data Scientists and Data Engineers, this position is still new in Europe. But as their set of skills is not common yet, salaries are not as high, except in countries like the UK and Switzerland. These two countries plus the Netherlands are actually the ones where salaries are rising the fastest (from 10% to 23%).

Source : Dataconomy - Snapshot: Data Scientist Salaries And Jobs In Europe

Identify opportunities for capacity building and change management

Set up a 3-step Change Management Program: “Adopt AI”

#1
–
Recruit the right profiles

Set up a 5-step digital profile recruitment strategy

- **Define** the role you are looking for (data scientist, data engineer, etc.) with the main stakeholders: CD²O, CIO, HR Directors and/or Talent Acquisition.
- **Understand** the scope of the tasks usually assigned to this role. It should be as clear for you as it is for the candidates.
- **Research** their traditional profile (school background or experience) according to the job, but keep an open mind, as there might be some very good surprises for profiles outside of your background expectations.
- **Anticipate** their professional expectations (career, autonomy, etc.) to reduce candidate drop rate during the process.
- **Tailor** your job offers to match their needs and choose the right channels to elevate quality over quantity.

#2
–
Nurture your talents

Data and AI experts are amongst the most researched talents on the market. Losing talents because of a lack of upskilling opportunities offered by your company could cost you a lot if you have to replace them.

- Nurture your top talents by helping them train and advance their skills and knowledge in new technologies, tools, and development languages.
- As for developers, Data experts very often seek upskilling in the latest technologies. Keep track of these and ask about the latest trends so you can offer training programs adapted to your activity.
- Just because you’re not using a specific technology or tool doesn’t mean you can’t benefit from training your teams on it if they ask. They might consider working elsewhere if they feel that it’s important for them.
- Just as many startups do, HR should work with Data managers on new career paths for all data experts.

#3

Embark your organisation

- Start with Human Resources. They are key partners. Involve them through workshops, trainings, or projects with Data teams. Too often, HR are not considered as full partners on data topics, even though they are on the front line in ensuring the quality of recruits and the development of teams.

- Making use of agile methodologies and flex working is a great way to mix Data and AI teams with others.

Example:

In the energy sector, a Chief Digital and Data Officer agreed with HR and Data teams to regularly relocate their workplace in order to mix them with other departments, organising sessions where people can discover what projects each other is working on.

04

Artefact and Kienbaum Forecasts

Kienbaum: opinion on the positions and the evolution of organisations

—

Matthieu Watremez.
Head of Digital and Data Kienbaum France

In 2015, I conducted a similar study about CDiOs in France which I concluded with: "*Some CDiOs believe that their functions may disappear in the coming years, once all companies have been digitised. On the contrary, we believe that this CDiO function should be strengthened and evolve in the future, potentially by "cannibalising" other functions of the company such as Marketing or Sales Departments. Some could be appointed to general management positions*".

The second study in 2017 and this one confirmed this hypothesis. CDiOs didn't disappear. On the contrary, they climbed the ladder and assumed more responsibilities. Why so? Because companies need to change. This is no longer about being more digital because media and markets are saying that you're late. This is a necessary transformation concerning all sectors, as well as CEOs and shareholders, and one which can't be ignored, because even for industry leaders, things are moving fast, very fast and still accelerating.

And the same now applies to CDaOs. As the figures show in Part 1, there is more than just common ground between CD²Os. Not only are their profile similar, but their expectations, missions, and interactions make them the two sides of the same coin, and you never get very far if you try to throw the same coin in two different directions.

A CEO acting as the first lever for transformation, both Data and Digital

"The CEO should be the first CD²O".

The most effective digital transformations occurred in companies that had no choice but to transform themselves in order to "survive" against more innovative competitors, a drop in income, or the growing addiction they developed to GAFA. While not all the groups are concerned or endangered, the last few years have proven that CEOs don't need to be experts in Data or Digital, but they do need to embrace the change and push their whole organisation to transform.

Putting data and digital at the heart of companies is generating major challenges and transformations. It is necessary for CD²Os to have the backing of the entire C-Suite, or at least that of a strong CEO, as each member is impacted by data and digital transformation. It would be a mistake to think that only IT directors (CIO, CTO, Infrastructure and Architecture, CISO) are involved in the process. Data transformation must be driven at the highest hierarchical level, by the CEO who sets up and selects a multidisciplinary team of "change leaders" (C-Suite executives carrying out the transformation project)".

One very important point we discovered is that the vision must answer a simple question: Why?

As explained by Simon Sinek in the book "Start with the Why" (2011) with the concept of "Golden Circle". The neuroscience behind the Golden Circle idea is that humans respond best when messages communicate with those parts of their brain that control emotions, behaviour and decision-making.

When we make decisions, an unconscious dialogue can be established between our belly - or liver - and our brain. Sometimes, the belly "wins" and the brain will only rationalise what the belly has decided. This analogy with companies highlights the fact that there are more complex exchanges between the core of companies and management than just a top down approach. Some decisions from deep inside the group can directly influence a global strategy or decisions from the Excom, without any apparent rationality if you look at them from an external point of view. This is where every company and leader should take a step back and think more rationally about the "WHY" instead of beginning with the "HOW" and "WHAT".

This basic question is not as easy as it seems. It represents the very heart of the global vision and lays the foundation for all the ensuing strategies by making sure that you won't just deal with consequences. Whether it is the choice of organisation, major projects, or people who will occupy the key positions, all these choices are impacted by this simple question. And it can't be done by the CD²Os who are already expecting to have the clearest view of where they have to bring the company.

Example: Nike Inc.

Neither the founder and former Chairman Phil Knight, nor his successor Mark Parker, were ever digital or data experts.

- Mark Parker was the first CEO of a major brand to decide to stop all TV ads and fully switch to Digital in 2009, investing in Social Media, eCommerce, Data, and customer experience...
- +12% growth for eCommerce, with 10.4 Billion $ online revenue in 2018.
- Mobile now represents more than 50 % of Nike's digital commerce revenue in 2019.
- Nike acquired two Data/AI companies: Zodiac (Consumer Data Analytics) in 2018 and Celect (retail predictive analytics and demand sensing) in August 2019.

"Ambitious digital transformation is driving the strong results you see today [..] Our digital disruption is fueled by breaking old models, building new commerce partnerships, emerging new talent with our years of industry experience. Our teams are driving change and it's yielding excellent results."

Mark G. Parker.
CEO NIKE Inc.

As mentioned before, they are often asked to prove a ROI on their perimeters and projects, but it is difficult to deliver results when you don't know in which direction you are supposed to go or when other CXOs might choose to go a different way.

Only once this vision has been defined can a CD²O ensure that it is properly spread and shared across the company and roll out their roadmap. In a nutshell, by instilling a digital and data culture throughout the organisation from the top, the CD²O might be able to more efficiently and voluntarily conduct the transformation or acceleration they have been recruited for.

Chief Digital Officers

What's on their minds?

Worldwide, a growing number of CDOs became Excom members, and more and more are being nominated as CEOs (or Managing Directors, depending on the structure of the board). While it might sound legitimate nowadays, the reality is different. Five years after my first study, many digital leaders still have strong doubts about their positions, the support of their management, and feel that internal politics still hold too much sway, whereas GAFA, or groups like Alibaba or Tencent will not wait for them.

While several years ago, they accepted the first role in the transformation, that of acting as digital evangelists, the second generation of Chief Digital Officers (or the third, depending on how they see themselves) has no illusions about the role itself. The experience of their predecessors, the way they sometimes struggled against old legacies and siloes, has made them realise that they could not be the only ones to act as change makers.

A majority (85%) believe that their CEO is the one who must set the course, impose courageous choices to facilitate expected changes, and align strategy between members of the board. But the reality of large groups is often more complex, more politic. And in the face of this complexity, more and more CdiOs are tempted to leave major companies to join more mature and agile structures. As headhunters, we are very frequently solicited by these profiles who think seriously about a "startup" experience. It's not because they

are Millennials or young graduates who think they'll have a bigger impact and financial reward. On the contrary, we're talking about senior profiles, who have not always worked in Digital but who now want to find "meaning" in their work by integrating a structure where all teams work toward the same goal. And for those who have already gone through this career process, the Startup dream has not always been what they thought it would be. Some became CEOs, Managing Directors, or CMOs of growing "startups". Among them, some found what they expected and some others not.

> "As demand for our product grows, we must be insight-driven, data-optimised, and hyper-focused on consumer behaviour. This is how we serve consumers more personally at scale."
>
> **Eric Sprunk.**
> *NIKE, Inc. Chief Operating Officer*

What we learned from the interviews during this study and from the candidates we receive every month for our recruitment missions is that Chief Digital leaders all have different expectations based on career, experience, and sometimes personal history. One thing they all have in common: they are being much more cautious about the opportunities presented.

What do they expect?

- Contrary to what most of us might assume, Chief Digital Officers do not only aim for the highest positions. While becoming part of the Excom would clearly be a desirable move for them, their careers, and in some cases, their egos, most are realistic and understand very well the downside that position implies, and what they need to achieve before then.
  - This is the case for major listed groups, where the role of internal politics is considered to be a barrier to the efficiency of their mission.
- The greater the impact required, the closer the position should be to the CEO or an influential member of the Executive Committee.
- Vision and Strategy should be decided and established clearly before they are even recruited or nominated.
- Budget and Resources should be aligned with the objectives the company fixes.
- In the eventuality where they have a strategic - or vital - need to accelerate eCommerce, Customer experience, or Data, they insist that they need to have a clear line of work with IT and the CIO, with strong support from the board when certain important decisions are required.
- In major listed groups where the Digital Core Team acts as a shared services center, support and resources are still vital in order to have a positive impact. CDiOs are pushing to have proper relays in the rest of the group; these include regional Digital or PandL leaders.
- More developed digital and data literacy within the whole group is required. Digital Learning expeditions for CXOs are a good start but need to be followed by more concrete actions through trainings and acculturation programmes.

Chief Data Officers

What's on their minds?

Many data leaders today face the same problem: the very rapid development of all data-related topics, regardless of the sector or organisational model within the group. This growth generates both high expectations and equally compelling constraints. Vision, budget, recruitment, relations with IT, the returns are the same. Their job legitimacy is not called into question, nor is their need to advance topics. Among the majority of respondents, most indicated that data is at the heart of group priorities and that they have budgets above the average of other departments.

The concern for them is different because although they are not challenged on their usefulness for the group and the business, their major obstacles remain the same:

- **Battle for data ownership**: although projects around Data are for the benefit of the whole group and the objectives are shared between several C-levels, internal policy is still too often a brake on the progress of major projects. Territorial wars to recover a piece of projects undermines delivery and business.
- **Data projects have a high "cash consumption" rate**, and as such, they benefit from rapidly expanding budgets, which often lead to certain departments seeing them as financial windfalls of their own, which is not always in the best interests of the projects or the group.
- **Support from management is still too ambivalent** when it comes to deal with other department "fiefdoms", which still exist despite strategies decided at the group level. Some even speak of a lack of courage when it comes to arbitrations within the group for data leadership.
- **The duo with the CIO**: whose borders are not always clear - especially in the allocation of resources and the implementation of adapted agile methodologies. This relationship is very closely related to the personality and profile of the CIO.

Despite these pain points, CDOs remain very positive because the lines are moving within all industries, silos are falling, and data officers are moving up the ladder. Agile methodologies, organisations now centered around business imperatives, projects supported with IT, Digital, but also with other departments: the change is real.

What do they expect?

- Data strategy, governance, and ownership should be defined as early as possible by top management.
- The position of a CDaO should be close to the company's core business as possible. Too often they only work on sideline projects with little impact on the business, because somebody identified a nice trend they wanted to capitalise on (usually because a competitor did).
- More transparency on data ownership: while GDPR (General Data Protection Regulation) created opportunities to list all collected and owned datas, they need total collaboration from regions, IT and all data collectors within the group to establish proper data ownership mapping.
- They want their direct hierarchy to understand at least the basics of their job and the importance of Data. This is why they favour CDiOs or former Data/Digital CxOs as direct reports.
- As previously mentioned, building up an efficient Data team requires budget, resources and patience. This is where data literacy and support from HR and Finance are critical.
- Although they are totally in line with data protection and confidentiality, they are expecting more collaboration between all departments and subsidiaries, in order to avoid unnecessary negotiations when it comes to collect Data useful for their teams and the company.

Organisation is a major key to success

As a recruitment firm, we have been able to observe a shift in the requests from our clients over the last three years regarding CD²Os. The requests are now more specifically centred on both the roadmap and the appropriate experience, and seeking what I've previously called hybrid profiles, those able to handle more diverse topics (Omnichannel, eCommerce, CRM, Data and Analytics, Digital Marketing, Customer Experience ...) which directly impact the activity of the group.

But to attract such profiles, salary and the guarantee of resources are no longer sufficient. One of the key points raised by all CDiOs is the choice of the organisation and its suitability for their objectives. The first blocking point: not all groups are ready to change their organisation, while the rest are still looking for the right model. However, the success stories of some groups must incite leaders to look more carefully: Nike, Club Med, Carrefour, Accor...

The truth is that there is no perfect organisation, but a different one specific to each company. And this is why finding the right one is key. As with every project and strategy, there will very often be flaws, delays, things that will have to be changed. Because at the end, success is linked to the people and partners you hire and their efficiency.

People make your success, so the importance of choosing the right ones who fit your plans and objectives is critical

And it's the same when it comes to an efficient organisation that can drive your growth and your transformation: you have to carefully choose the right setup and make sure it will be adapted to the people you have or will hire. Too many times, we have seen companies create a specific position without taking into account their own culture, history, or management. If a company is determined to succeed, then they want to make sure that the organisation they have in mind will meet their challenges.

- The organisation should depend on what the company needs to achieve in the next one to three years.
- Radical transformation means breaking a lot of silos wherever legacy is too heavy.
- Someone must be hired to be in charge of "vital" departments where Digital and Data will have the strongest impact on the core business and which absolutely must be transformed for the roadmap to be delivered fast.
- If the CIO doesn't hold the keys and is still grounded by the legacy, then IT should report to this new Excom member to ensure that Digital and Data have maximal efficiency and a common goal.
- Depending on the sector, other departments such as supply and omnicanal for retail, sales, and marketing for travel, and hospitality or customer relationship for financial services, should also be attached to the same person.
- Companies, and particularly Excoms, should clearly identify their most important and strategic assets where Digital and Data can help the company with strong use cases within six months.
- We often recommend that our prospects and customers list all core functions which need to be transformed and decide how Data and Digital - and IT - could develop their business or assist the whole group.
- Digital and Data can be key assets, but they need to serve a purpose - if possible a global one - otherwise their impact will remain "local".
- The CD²O should be backed by an influential Excom member if he is not part of it, acting as the main sponsor to convince other members. This person should have legitimacy and be convinced by the need for transformation in the long run.

To go faster: Hack your organisation

Any organisation that wishes to transform itself effectively and sustainably must dedicate itself to a very simple objective: how can I do better and improve our results thanks to Digital and Data?

- A large group should not change its organisation to recruit a future Excom member simply because a competitor did it or because a consulting firm recommended him after benchmarking their market. An organisation is changed by conviction and not by retaliation. As mentioned earlier in this study (see page 82), vision is key and should not be dictated by someone else.

- A CD²O should hold a position as closely linked as possible to the core of the business and including all those departments that absolutely need to be transformed. Each sector has its own core and strategic assets that need to transform.

- Capitalise on the synergies between Digital, Data, and IT to shape the organisation with one clear and established leader.

- As it seems almost impossible to deeply and efficiently transform a group without coordination between the three parties, companies must ensure the greatest possible collaboration amongst Digital, IT, and Data.

    - If the maturity of the group is advanced enough and the CIO is in charge of all the digital and data projects, then this triumvirate can successfully achieve the implementation of agile methodologies to deliver more efficiently - and more importantly, as a team.

- The chosen Agile (or assimilated) framework should be extended to all teams, including Digital, Data, and IT as priorities, but corporate functions such as HR and Finance teams as well.

Market example:

A major international bank chose to transform its entire project management approach under the leadership of its CEO with the establishment of several "Tribes" dedicated to projects (similar to Spotify's Agile Framework), within a "Mega Tribe" led by the Director Marketing, Digital and Data. The highlight in this example is that the decision came from the top and all departments were engaged (HR, Finance, Sales network...) and now act as "feature teams" whenever they are concerned.

Stop "HR Risk Management": HR must become "Recruitment Owners"

If finding and recruiting very good CD²O profiles is something that most groups can do, for an executive search firm, guaranteeing a client that the candidates they find will be able to drive and deliver everything is an entirely different proposition.

Why? Because, as with other positions, one person can't change a whole group and uproot deeply entrenched habits and ways of functioning. It is the reason why many groups see their Digital or Data leaders depart after two or three years. This is recurring feedback we receive from CD²Os: too often they find themselves in the midst of internal conflicts with other CxOs because of fuzzy perimeters or because the organisation is not adapted to allow them to deliver in the best way. And this is where HR directors must act as key partners and need to be more implicated in a group transformation.

Stop thinking about what kind of talents worked before but more about what you need in the next five to ten years:

- Cultural fit and relationship skills are very important, and HR must still act as "guardians" on this subject, but recruiting a profile to transform a group means being able to invest in people and take some risks. This is a major pain point when it comes to recruiting the best Digital and Data Talents, as the temptation to copy/paste profiles to existing ones in the group is strong. Very strong, speaking from experience.

- This is absolutely not the fault of HR as they don't always have the power to decide or push different profiles (education and professional background). Empowering HR on this matter is a major key for success in any transformation. GAFAs, global technology groups, and pure players have applied it very well and for this reason represent strong competitors in the ongoing Talent War.

HR and CD²Os should be on the same page from the start:

- The discourse should be aligned between them. There can't be one speaking only for his department (CD²O) and the other trying to guess how things could fit without understanding job impact of the job. This gap is often due to a lack of communication and knowledge sharing between departments.

- Upskilling, training, and onboarding HR people on strategic trends and topics is vital, and should involve all CD²Os going forward.

- All the value of bringing in new talents is to add something that they don't have. Recruiting copycats facilitate some transitions in organisations, but rarely helps to speed things up. HR is not about reducing the possibility that future talents won't match your company's DNA, but more about helping the group grow, transform, and specifically respond to all upcoming challenges, especially in Data and Digital positions.

HR must get out of their comfort zone:

- This is another key to the overall success of a group transformation, and also what makes some startups very successful. If the leaders of Human Resources do not act as change agents themselves, why should others? Digital and Data are just tools, they don't transform anything by themselves. The main actors are still women and men.

- Fight the fear of change and the "risk aversion" of recruiting profiles from different industries or candidates lacking a perfect cultural fit by making more tools and knowledge regarding Digital and Data available to all. Lead by example.

Data and Digital should also be used to help HR transform and deliver

Too often I have seen HR disappointed with regard to the digital maturity of their group or embarrassed by their outdated tools. Asking HR to participate in their own change is also a good way to promote digital empowerment and upskilling to deliver their own challenges (talent recruitment and journey, "Candidate Relationship Management" tools, digitisation of HR management tools such as contracts, talent management, training...).

Placing HR resources inside Digital and Data Teams, working day to day with them:

- Several major startups and, recently, certain international groups, implemented HR resources within Digital and Data Teams, reporting directly to the CD²O. The goal is to make HR work within the teams on a daily basis, while still reporting to HRD. Is it working?

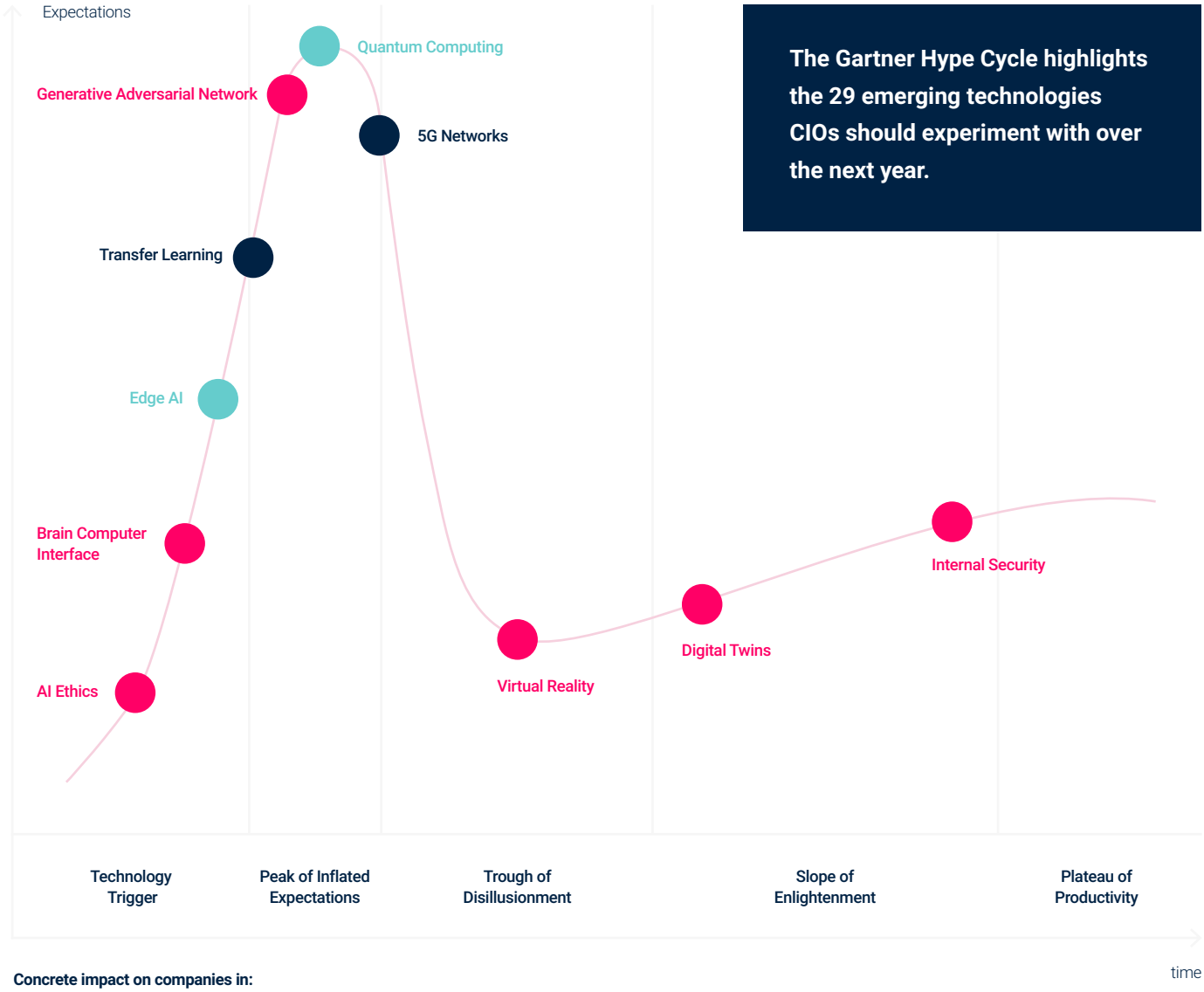
- Results so far are very positive, as they became what some called "HR Community Leaders", getting to know not only the projects teams are working on, but also the issues, their pain points, and the specificities and expectations of each member of the team. When we know how difficult it is for large groups to recruit and retain Tech and Data profiles, having an HR representative directly in contact with the people they recruit and support is a valuable asset. Benefits are many, from increased efficiency in recruitment (better recruitment channels targeting and speeches to engage candidates) to reduced turnover and promotion for the company in some communities.

Artefact's 10 trends that will impact CD²Os in the months / years to come

—

Do you remember Bi-Bop, Apple Newton, or even Google Glasses? Every single day, we hear about ever more sophisticated technologies and solutions. It's sometimes hard to identify which ones will truly impact our companies' futures and won't disappear as suddenly as they arrived. This perfectly illustrates a common pattern in the development of emerging technologies: a technological breakthrough arrives; it's followed by lots of noise; then in most cases, "disillusionment" or failure ensues. To distinguish between mere hype and a veritable trend, we decided to offer our own interpretation of the famous Gartner "Hype Cycle for Emerging Technologies" by choosing the 10 topics that we think will impact your business in the years to come.

10 trends that will impact CD²Os



Concrete impact on companies in:

Less than two years | Two - five years | Five - ten years

Anticipating AI 4.0

Transfer Learning.

- **Timeline**: now
- **Definition**: transfer learning is a machine learning method where a model developed for a task is reused as the starting point for a model on a second task. It is a popular approach in deep learning, where pre-trained models are used as the starting point on computer vision and natural language processing tasks.
- **Why is it important?** Supervised learning is among the most common approaches used in AI to tackle companies' issues. Whether to forecast user demand, calculate promotional ROI, or anticipate fashion trends, AI models are, in most cases, trained on historical data sets that serve as starting points.

Generative Adversarial Networks (GAN).

- **Timeline**: now
- **Definition**: generative modeling is an unsupervised learning task in machine learning that involves automatically discovering and learning the regularities or patterns in input data in such a way that the model can be used to generate or output new examples that could plausibly have been drawn from the original dataset.
- **Why is it important?** As explained in the transfer learning sections, training datasets are mandatory for building high value-added models whose final outputs are directly correlated to the size of these datasets. As access to qualitative data is an issue for almost all companies, using GAN allows companies to scale the size of training datasets, thereby optimising the quality of the model and finally improving business impact.

Edge AI.

- **Timeline**: Edge AI already has a long history closely linked to that of IoT. Big Data (data storage) and AI (data processing) are bringing it to the next level.
- **Definition**: Edge AI is a process where data is analysed and aggregated in a spot close to where it is captured in a network, meaning no Data needs to be sent to be processed.
- **Why is it important?** According to DBS Bank and BCG, the number of IoT-connected devices will skyrocket from about 11 billion today to 125 billion by 2030. In the short term, edge computing is enabling advanced applications that process huge volumes of Data (e.g. self-driving cars). For the B2C market, highly responsive and better secured applications offered by Edge AI enable significantly enhanced user experiences (e.g. mobile FaceID recognition). In the long term, the convergence of AI and smart objects will bring out even more powerful capabilities by processing AI algorithms locally on smart devices, rather than taking the long route through distant clouds.

Digitising infrastructure thanks to Digital Twins

- **Timeline**: started with industrial process in 2002, now being applied to a much wider scope.
- **Definition**: digital replica of something that exists in the physical world.
- **Why is it important?**
  - Linked to the convergence of IoT with the capabilities of Big Data and AI, Digital Twins are now being democratised in all industries that have already worked with it: Aerospace & Defense, Automotive & Transportation, Machine Manufacturing, Energy and Utilities.
  - These new capacities also bring new opportunities in many new areas. In Healthcare, it allows the recreation of a simulated environment to practice procedures before applying them to real patients. In Education, some conclusive tests are now being conducted to generate AI copies of human beings, providing the opportunity, in the near future, for AI-powered teachers to broaden their impact.
  - This innovative market is expected to expand with a compound annual growth rate of 35.2% over the forecast period from 2019 to 2025.

Reaching unknown capabilities with Quantum Computing

- **Timeline**: widespread use is not to be expected before 2023 to 2025.
- **Why is it important?**
  - Unlike digital computers, quantum computers do not operate according to the laws of classical computer science, but on the basis of quantum mechanical states which allow them to find solutions that are too complex for conventional computers.
  - This computing power will be a game changer for companies. When Total acquired Pangea III, the 11th most powerful supercomputer in the world, it was already announcing challenges in the hundreds of millions of euros.
  - Gartner predicts that by 2023, 20% of organisations will be budgeting for quantum computing technology, compared to less than 1% today. States are already investing heavily, with an an aggregated global spend of about $1.75 billion USD, led by the European Union with $643 million.

Sources:
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Brain Computer Interface (BCI)

- **Timeline**: studied since the 70's, its real growth only recently emerged, directly correlated with that of AI...
- **Definition**: device that enables users to interact with computers by means of brain activity only.
- **Why is it important?**
  - Early BCI applications have targeted disabled users who have mobility or speaking issues. However, this represents only a fraction of its potential which could be leveraged in many other industries such as Neuromarketing, Education, Gaming or Security.
  - Thanks to its immense field of applications, BCI R&D investments are growing massively. The startup Neuralink, founded by Elon Musk in 2016, has already raised 158M USD, and Facebook just acquired mind control interface startup CTRL-labs for a sum that may have approached a billion dollars.
  - For the moment, results are better when using invasive systems (required surgery), but non-invasive methods are starting to show satisfying performance and some notable announcements might be made soon. It was Elon Musk who said so.

The 5G revolution is not all that close

- **Timeline**: at least 2023 for real 5G capabilities.
- **Definition**: the next fifth-generation of mobile internet connectivity promising much faster data download and upload speeds, lower latency and higher reliability.
- **Why is it important?**
  - Current Wi-Fi or GSM "one size fits all" models are no longer efficient and lack the flexibility needed to support rapidly expanding sectors (autonomous vehicles or the convergence between IoT and AI). On one hand, WIFI has proven lack of SLA and capabilities. On the other hand, current GSM networks don't have sufficient flow rate and don't include some critical features like network slicing.
  - Conversely, the 5G innovative model embarks everything these use cases need to be industrialised (lower latency, higher speed, and more objects per km^2).
  - The real breakthrough brought by 5G is not the rise in speed or flow, but the ability to create network slicing.
  - According to Antoine Ribaud, Partnerships Director at Bouygues SmartX 5G Accelerator, the 5G innovative structure will give operators the ability to instantly break down the network into slices that are independent end-to-end networks with guaranteed QoS (Quality of Service). As a consequence, each "slice" might be adapted to specific uses or the needs of a group of users.

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- For example, Automotive use cases have huge business potential; however, they also impose rigorous performance requirements for the mobile system. Network slicing could guarantee such performance.

- According to Antoine Ribaud, 5G requires technical enablers that don't exist at this time (5G Core Networks for instance) but also significant infrastructure investments, as all 5G antennas need to be connected to the fibre-optic network. Between now and 2023, existing 5G networks won't be anything but more powerful 4G.

Virtual Reality

Λ **Timeline**: first appearance in 1962 with the Sensorama of Morton Heilig. It didn't develop as much as people were expecting over the last ten years, but experts say that the next five years will see a shift where "technology-literate people are going to be replaced by people-literate technology"*.

Λ **Definition**: a set of images and sounds, produced by a computer, that appear to represent a place or a situation that a person can take part in. It is separated into three segments: Non Immersive, Semi Immersive and Fully Immersive.

Λ **Why is it important?**

- The VR market size was valued at around 7.3 billion USD in 2018 and is forecasted to reach 120.5 billion USD by 2026 in sectors such as Health, Education, Aerospace or Entertainment.**

- Ask anybody what VR means to them, and the first thing that pops up in their minds is the Fully Immersive experience. Virtual reality is most frequently associated with entertainment and gaming, but the latest trends show that B2B applications are increasing at an exponential rate and represent the most important part of the market. In the USA, Walmart used 17,000 Oculus headsets for training employees in customer relations. The U.S. Army has been using HoloLens technology for real-time updates on field environments for soldiers.

- 5G, AI, Brain Computer Interface, and cheaper hardware products (VR headsets) will directly impact the rise of VR and create new "people centered smart-spaces" as smartphones did when they came out.

- VR Gaming could be the next big thing and see the rise of new major Tech Giants. Google, Apple, Microsoft and Facebook have already invested in VR. Alibaba already offers a VR shopping experience with "Buy+" with integrated payments.

Data Security: Protect yourself from yourself

Λ **Timeline**: two - five years

Λ **Definition**: "Data security means protecting digital data, such as those in a database, from destructive forces and from unwanted actions" (Wikipedia Data Security).

** https://www.gartner.com/smarterwithgartner/gartner-top-10-strategic-technology-trends-for-2020/*
*** https://www.fortunebusinessinsights.com/industry-reports/virtual-reality-market-101378*

Λ **Why is it important?**

- The last few years have been dedicated to building safe environments to protect Data from hackers willing to steal and sell Data on the dark web, where companies create and store Data. This way of thinking about Data Security is right but highly incomplete.

- If we had to summarise Data Security, we could say that it's comprised of three main pillars:

  - Data ingestion security
  - Data storage security
  - Data exposure security

- If most of the security issues are well known and some are being tackled, some major threats remain and most come from employees themselves (non-exhaustive list):

  - One of the most gaping and obvious breaches is due to employee laxity in setting complex passwords that could lead to intrusions into the system.
  - Another major threat is data loss which can be caused either by a lack of data recovery strategy (in case of hardware failure) or in case of poor data processing practices altering raw data and generating huge losses of valuable information.
  - Last but not least, the use of closed-source components (proprietary software for example), is also a major internal threat to security. Contrary to open source, closed-source components do not benefit from peer review and improved code thanks to checking and improving by the community (individuals or companies).

- Despite all these risks, the rise of data governance among companies is paving the way to better internal Data Security, but it will take a long time for companies to get their people to adopt internal security best practices.

The ethics of Artificial Intelligence must be defined

Λ **Timeline**: one - two years

Λ **Definition**: ethics is defined as a moral philosophy or code of morals practiced by a person or group of people.

Λ **Why is it important?**

- For most people, AI is "magic". This fundamental error in understanding how you can turn mathematics into AI is leading to AI mystification. If people want Google Home to improve and better understand what they're saying or asking, at some point, human beings will have to listen to vocal recordings to train their assistants and understand why they defaulted in understanding their queries.

- This example illustrates the privacy concerns AI will be facing in the years to come. Nevertheless, the question seems broader and can be summed up in a few words: "Is AI ethical?" The answer is in the question, as ethics is defined as a moral philosophy used by a person or a group of persons. Wondering about AI ethics is like asking ourselves about our ethics, as AI is simply a consequence of the actions of human beings...

- The direct consequence for companies and CD²Os is that AI ethics must be defined at their level. Anticipating this demand from customers by working on corporate commitments about AI ethics will probably be a competitive advantage for innovative companies.

A big thank you!

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