GENERATIVE AI: UNITE OR SUBMIT

Using corporate data to strategically enrich AI models

Olivier Dion, Michel-Marie Maudet, Arno Pons

Mouvement des Entreprises de France

THINK-DO-TANK DIGITAL NEW DEAL

November 2024

GEN AI = WEB 2^2

SUMMARY

PREFACE

While Artificial Intelligence is not a new technology, the emergence of generative AI marks a decisive turning point: its immediate and future applications and impacts are significant. The enthusiasm generated by early trials and growing adoption within businesses is proof of this. The broad possibilities open substantial opportunities for competitiveness. Yet, like many technologies, AI is a "pharmakon"—both a solution and a problem.

For Europe to fully harness this transformation, it is essential to build AI on the enduring foundations of transparency, security, and sovereignty. These foundations are crucial, but they are meaningless without data as the primary resource. This may seem self-evident, but the real lever for innovation lies there, especially for us Europeans who possess and generate some of the highest-value data: corporate data.

We are all collectively creators of data that, like any raw material, requires extraction, refinement, and enrichment. However, data processing is easier said than done, as the necessary infrastructure and computing power are not always within our reach. Here, unity is strength: data sharing is a key mechanism to leverage our data to enrich generative AI models that can specifically address the needs of their respective sectors.

Of course, this sharing must be voluntary, within secure sector-specific 'Data Spaces'. This voluntary, collaborative approach is the strength of our strategy, offering each sector and company the opportunity to remain in control of its data while benefiting from the advantages of collective intelligence. By focusing on secure data sharing across Europe through Data Spaces, we provide companies with the means to build AI tailored to their needs. Pooling data creates powerful, sovereign ecosystems capable of competing with large tech platforms.

However, the success of this transformation is not based solely on technology. A significant challenge also lies in skills, as mastering digital and AI tools remains the cornerstone of this transition. For our companies to fully leverage generative AI's potential, we must invest substantially in ongoing training and skill development.

Finally, it is not just about building high-performing and competitive AI: these systems must also adhere to a responsible approach, addressing ethical, energy, environmental, and cybersecurity challenges. These issues are essential to ensuring a sustainable, secure, and resource-conscious digital transition. It is our collective responsibility to build trustworthy, capable environments that serve our companies' interests. By relying on voluntary data sharing and enhancing the skills of our talents, we can make this technological revolution an opportunity for all our sectors. Together, we will not simply endure this transformation, we will be its architects.

Virginie Fauvel,
Co-chair of the MEDEF's Digital and Innovation Commission.

INTRODUCTION

After publishing the "Trustworthy Cloud[1]", "Trustworthy AI[2]", and "Trustworthy Data[3]" collection in 2022, our think tank has decided to devote a report to "Trustworthy Generative AI," as this revolutionary technology is reshaping the digital ecosystem analysed in our previous white papers. This transformation is unprecedented because, unlike the industrial revolutions of railroads and electricity, which required decades to deploy physical infrastructures, this technological shift relies on an existing network: the Internet. It leaves little time for decision-makers, whether public or private, to gradually adapt to the profound changes ahead.

Generative AI is a game-changer, confronting us with a situation comparable to the arrival of Web 2.0 twenty-five years ago, raising similar questions: Will we remain passive, mere consumers of non-European technologies? Will we repeat the mistakes of the past, allowing foreign players to capture the value of our sectors through data? After the "Free Internet", are we headed for the new libertarian trap of "Free AI"—an unregulated market free from state oversight, where individual freedom and private property remain unchecked?

The answer is NO. We cannot risk Generative AI (GenAI) further amplifying the power centralization and value capture that our think tank has been fighting against for eight years. We summarise this threat in a formula: **GenAI = Web2²** (lock-in effect squared).

If we want our companies not to be further caught between BigTechs, with BigClouds (hyperscalers[4] like Azure, AWS, or GoogleCloud) on one side and BigAI (such as OpenAI, Copilot, or Gemini) on the other, we must adopt a proactive strategy grounded in recent European initiatives that provide a more favourable framework for our businesses:

- An advanced education policy creating talent for university research and private applied research labs.
- A dynamic technological ecosystem illustrated recently with notable European successes in AI (e.g., Mistral AI).
- Ambitious funding for digital programs, such as Horizon Europe (€93 billion) and national programs (such as France 2030 - €54 billion).
- A robust European regulatory framework with the DMA, DSA, GDPR, and the AI Act, the world's first AI regulation.
- An ambitious European data strategy (2020) aimed at creating a single data market through "Shared Data" and common data sharing ecosystems (the so-called "Data Spaces" discussed extensively in this report). This strategy relies on an assertive regulatory framework and comprehensive governance (DGA, DA, EDIB)[5], an operational structure (GAIA-X[6], DSSC[7], IDSA[8]), and dedicated funding at both the European and national levels (Simpl[9], ATF[10]), etc.

[1] Trustworthy Cloud, Laurence Houdeville and Arno Pons, Digital New Deal, 2021

[2] Trustworthy AI, Julien Chiaroni and Arno Pons, Digital New Deal, 2022

[3] Trustworthy Data, Olivier Dion and Arno Pons, Digital New Deal, 2022

[4] A hyperscaler refers to a company or infrastructure capable of rapidly and massively scaling its computing resources, especially in the field of cloud computing. This term is particularly used to refer to cloud giants (AWS, Azure, Google Cloud, etc.).

[5] Data Governance Act, Data Act, European Data Innovation Board

[6] https://gaia-x.eu/

[7] https://dssc.eu/

[8] https://internationaldataspaces.org/

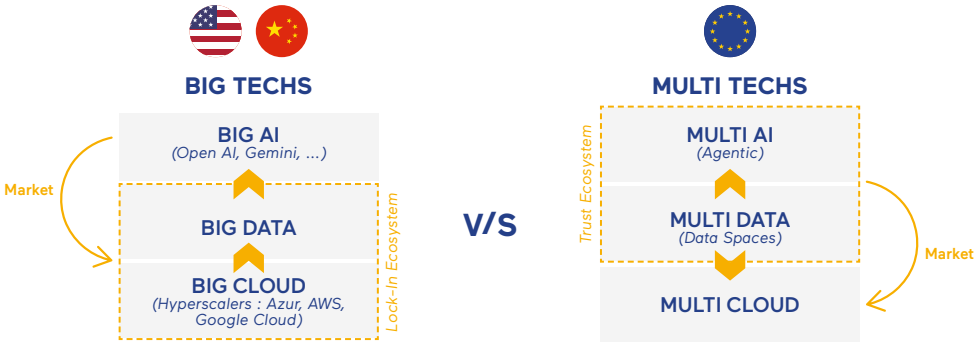
[9] Smart middleware funded with €150 million by the European Commission, developed by the Sovereign-X and InfrateX consortiums (initiated by the Digital New Deal Do Tank).

[10] *"Support and transformation of sectors,"* data sharing for industries, Bpifrance

Everything is in place, ready to be activated: a single market, harmonised governance, and Data Spaces as new pillars. Committed to technological biodiversity, Europe is now positioned to become fertile ground for an alternative to monopolistic ecosystems that lock users into closed cloud-data-AI environments.

This report details how our companies and administrations can collectively take control of their future by leveraging these new competitive advantages. Properly utilised, they can not only close the gap but also open up new paths for differentiated innovations and potential leadership.

European businesses now face a choice: unite or submit. To submit means accepting increased dependence, with our technologies, talents, and prospects captured by others, foreign to our values. To unite means building innovation that, far from being a mere response to an imposed homogenization, would be a European model of trust. Our conviction is that by joining our forces, data, and ambitions, we can meet this challenge and co-create a high-performing, trustworthy Generative AI.



> *On one side, **Big Tech** exploits the **dominant position of hyperscalers to lock in innovation** around data and AI, creating a closed market dominated by integrated solutions (cloud, data, AI) that rely on the opaque and often excessive use of data. On the other side, open and **collaborative Multi-Tech** ecosystems emerge, built on reliable data shared between stakeholders (Data Spaces), incorporating legal, ethical, and sovereignty concerns from the outset, thus **creating a market for trustworthy cloud offerings, bolstered by multi-cloud advantages.***

THE TRAVEL INDUSTRY AS AN EXAMPLE

This report provides businesses with strategic guidance and a concrete operational roadmap for leveraging generative AI technologies. **While the ideas presented in this report are applicable and replicable across all sectors, we will illustrate our recommendations using an ongoing example from the travel industry.**

The Gen4Travel project brings together various industry players working to create a shared toolkit for generative AI. This Digital Common resource will enable any interested industry player to offer an "AI Travel Assistant", or "AI Companion", to their clients to simplify the travel experience.

The Gen4Travel technology platform initiative was born and developed within the EONA-X[11] tourism and mobility Data Space (a shared data environment comprising many travel and technology industry players, including Accor, Aéroports de Paris, Marseille Provence Airport, Air France-KLM, Allianz, Amadeus, Anysolution, Apidae, Atout France, Atos, Capgemini, Compagnie des Alpes, Digital New Deal, Inria, Renault, SNCF, and more).

[11] *EONA-X Data space labeled France 2030, benefiting from €20 million in funding*

PREREQUISITE: DEFINITION OF GENERATIVE AI

Understanding Generative AI in 4 steps:

"Generative AI is a branch of Artificial Intelligence focused on creating new and original content from existing data. Rather than simply analysing or classifying data, generative AI models are capable of producing text, images, videos, audio, or even computer code."[12]

1. Data Collection:

Data **is the raw material needed to train AI.** Large datasets, which can include texts, images, videos, or other information types (depending on the supported modalities of the model), provide the foundation from which the model can learn.

2. Data Processing:

This step involves transforming and **preparing raw data to make it usable by the algorithm.** This includes cleaning, normalising, and sometimes extracting specific features from the data. This process is essential to improve data quality and maximise the model's final performance efficiency. It's also the longest and most delicate phase, as it must ensure data quality and compliance with current regulatory frameworks (such as GDPR, copyright laws, etc.).

3. Model Training:

Once the data is prepared, it is used to pre-train the model. Various generative **model architectures** exist, with most Large Language Models (LLMs) based on the **Transformer architecture**[13], unveiled in 2017 through Google's research paper, "Attention Is All You Need"[14]. Transformers have enabled unprecedented efficiency, learning from data and adjusting their parameters to understand key patterns, relationships, and structures. After pre-training, the model undergoes several critical phases:

- **Evaluation phase:** The model is tested on a separate dataset to assess its performance and ability to generalise on data it has never seen.
- **Instruction phase (fine-instruct):** The model is refined for specific tasks or domains, enhancing its performance in targeted tasks.
- **Testing phase:** Rigorous tests are conducted to assess the model's capabilities in diverse situations, verifying its robustness, coherence, and alignment with intended goals. These additional phases are essential to produce a reliable, high-performing language model tailored to users' specific needs.

[12] *Source ChatGPT 4o*

[13] *https://blogs.nvidia.com/blog/what-is-a-transformer-model/*

[14] *https://arxiv.org/abs/1706.03762*

4. Inference (Model usage):

After training, the model is put into operation to make predictions or generate new content based on new data or prompts[15]. In this phase, the model is applied in real scenarios to produce texts, images, code, or other outputs based on user inputs.

Role of LLM:

During inference, an LLM generates text or responds to prompts in real-time. Thanks to prior training, the LLM can produce content that is coherent, relevant, and contextually adapted to the user's input.

Role of AI Assistants and Conversational Bots:

The best-known example of a conversational assistant is ChatGPT by OpenAI, an application based on an LLM. Currently, ChatGPT 4.0 uses the GPT-4 model for its latest version, while the previous version used GPT-3.5. While LLMs serve as the core engine for generative AI processing, assistants like ChatGPT are the visible interface, allowing users to interact easily with AI through natural language conversations.

[15] *A prompt in the context of generative AI is a text input or instruction given to the model to generate a response. It serves to guide the content creation, whether it's text, images, or other forms of generative output.*

LET'S AVOID DEPENDENCE ON "POWERED BY OPENAI" LIKE WE HAD WITH "POWERED BY GOOGLE" 20 YEARS AGO.

I. GENERATIVE AI: A TURNING POINT FOR OUR DIGITAL SOVEREIGNTY?

LLMs (Large Language Models), including more general foundation models by extension[16], form the technological basis of generative AI, enabling the contextual creation of textual, visual, multimedia content, and computer code. They rely on vast volumes of training data, paving the way for major innovations across all sectors.

1.1 LLM : SHOULD WE BE ON A QUEST FOR POWER?

LLMs represent a major breakthrough in Artificial Intelligence, but they already raise a critical question for Europe: are our businesses ready to compete?

1.1.1 The immense challenges of LLMs

The challenge of scale

The current dominance of a few mainly American players threatens not only European competitiveness but also its digital sovereignty. This hegemony is largely due to the substantial financial resources required for:

- **Data collection:** Major players already have access to vast data sets and do not need to collect them from external sources; they also have the means to access all public data (Web, Open Data, etc.).
- **Data preparation and training:** Both time-consuming and resource-intensive.
- **Inference:** Also particularly resource-heavy in machine usage.

According to Stanford[17], developing a top-tier **foundational model is a colossal investment,** estimated between 10 and 100 million euros. Training OpenAI's GPT-4 is estimated at approximately $78 million, while Google's Gemini could cost around $191 million.

These staggering amounts are due to the necessity of monopolising thousands of GPUs[18] for several weeks, requiring computing power that few European actors can access repeatedly as each new model requires retraining.

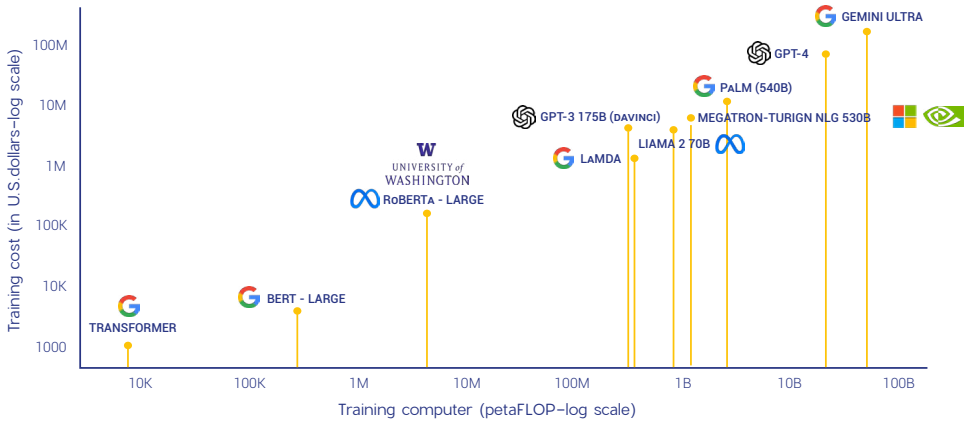
This situation imposes a dual burden: the high costs of acquiring or renting these resources, and the need to achieve critical mass, requiring either a large reserve or a GPU pool far exceeding a single actor's demand to achieve economic viability. This creates a critical threshold effect, particularly for cloud operators, making it even more challenging for Europe to compete on this front.

[16] All LLMs are foundation models, but not all foundation models are LLMs. Foundation models can cover a wider range of data types (text, image, etc.), whereas LLMs focus exclusively on language and language comprehension. For simplicity, we sometimes use the term LLM to refer to both in this report.

[17] Stanford University's HAI (Institute for Human-Centered Artificial Intelligence) in its 2024 report

[18] A GPU (Graphics Processing Unit) is a specialised electronic component originally designed for graphic processing, which excels at parallel computing. This capability makes it particularly effective for resource-intensive AI tasks, allowing for a significant acceleration in processing times compared to traditional CPUs. As a result, the number of GPUs is often used as an indicator of the computing power of AI infrastructures, reflecting an organisation's ability to train and deploy large-scale AI models.

ESTIMATED TRAINING COST AND COMPUTE OF SELECT AI MODELS
Source: Epoch, 2023 Chart: 2024 AI Index report



Already facing a shortage of training data?

LLMs are known for their considerable demand for training data, yet they are increasingly facing a shortage of high-quality data to continue improving performance. This presents a major challenge, as these models' efficiency is directly tied to the quantity and quality of their training data.

One potential solution is synthetic data, generated artificially through advanced algorithms and models, enabling the creation of vast, varied data sets without the limitations of real data availability.

The vast amount of data required for effective LLM training is substantial. The article "Scaling Laws for Neural Language Models"[19] establishes an empirical rule stating that at least 20 times the data amount of the model's target parameters is necessary for optimal training. For instance, a model with 70 billion parameters would need at least 1.4 trillion tokens. This rule underscores the scale of data collection and management challenges for advanced LLM training, partly explaining the growing appeal of synthetic data generation in AI.

However, aligning the data volume with the use scope and language quality required for each use case opens the way to specialised LLMs built on more qualified and focused data sets, catering to professional needs.

The geopolitical challenge

LLMs are currently trained and provided to the public by a limited number of actors, mainly American. This concentration raises significant concerns regarding Europe's soft power:

1.Cultural underrepresentation:
European languages, values, and cultures are often marginalised, leading to an Anglo-Saxon bias in generated content and user outputs.

2. Dependency risks:
Centralization of resources (financial, computational, and talent) risks creating a technological dependency for Europe, endangering its digital sovereignty and economic competitiveness.

3.Global vulnerability:

Excessive concentration of critical technologies makes them vulnerable to cyberattacks, potentially crippling digital economy sectors and societies on a global scale. Additionally, 90% of GPUs are produced by TSMC in Taiwan[20], posing geopolitical risks.

[19] https://arxiv.org/abs/2001.08361
[20] TSMC is making the best of a bad geopolitical situation, The Economist, January 2023

Faced with these challenges, Europe must develop its own expertise in LLMs to preserve its cultural identity and strategic autonomy, contributing to a global technological (bio)diversity and enhancing resilience against cyber risks. A few European startups, such as France's Mistral AI, are already countering this American dominance, showing the old continent's potential for innovation. Innovative companies like LightOn, Allonia, Giskard, Hugging Face, and community initiatives such as OpenLLM France[21] (by Linagora) are working on open-source generative AI commons for public interest. Government and institutional support[22] through funding, collaboration, and regulation is crucial to empower Europe as a global AI leader.

The linguistic and cognitive sovereignty challenge

If AI becomes our primary tool for accessing and generating knowledge, how will we maintain linguistic diversity and cultural richness in the face of ecosystems dominated by a few non-European players? Centralising language models within large companies also raises questions about information control and viewpoint diversity.

The energy and environmental challenge

Are we reaching the limits of this model? According to Cédric Villani[23], the current AI development model may already be unsustainable. Approaches based on giant, resource-intensive models have their limits. For instance, **training a single large language model like GPT-3 consumes** about 1,287,000 kWh of electricity[24], **equivalent to the annual consumption of 320 European households** and up to 552 tons of CO_2[25], comparable to the annual emissions of 112 cars or 205 round-trip flights between Paris and New York.

The growing competition for energy resources between data centres dedicated to AI and human needs raises increasing concerns. A Forrester report[26] highlights two alarming examples: during a drought in spring 2021, the Taiwanese government prioritised water for agriculture and human consumption over TSMC[27] factory cooling, forcing the major chip manufacturer to reduce production by 85%. In July 2022, hyperscalers shut down data centres near London due to a heat wave. Microsoft also reported a 34% increase in global water consumption between 2021 and 2022, attributed to its AI research, further raising environmental concerns.

Europe must therefore explore alternatives, such as smaller, specialised models and hybrid or shared approaches combining different technologies to reduce resource dependency while enhancing AI systems' efficiency and adaptability.

The Cybersecurity Challenge

LLMs can present exploitable security vulnerabilities, particularly regarding sensitive information protection (e.g., confidential data leaks through external LLMs). They are potential targets for cyberattacks, especially from states or malicious actors seeking to compromise European data security. Using these models could inadvertently expose sensitive company data to hacking risks.

It is essential to diversify models and suppliers to ensure resilience. Over-reliance on a limited number of models from a few companies creates significant systemic risks. If one of these dominant models fails or suffers an attack, the global impact could be severe, resulting in widespread service disruptions and large-scale data security compromises.

[21] Awarded community of the France 2030 call for projects *"Digital Commons for Generative AI"*: https://www.openllm-france.fr/

[22] *Open source software and global entrepreneurship, Science Direct, Elsevier, November 2023*

[23] Thinkerview, 8th December 2023

[24] Study conducted by researchers from the University of Copenhagen in 202, Heidi News

[25] Study "Carbon Emissions and Large Neural Network Training" by the University of California, Berkeley

[26] Forrester's State of AI Report Suggests a Wave of Disruption Is Coming, HPC Wire, February 2024

[27] Taiwan Semiconductor Manufacturing Company

Additionally, emerging risks like "prompt injections" must be prevented. Similar to SQL injection attacks for databases, these techniques could extract sensitive data from models or inject malicious commands, leading to undesirable content or actions. This highlights the importance of mastering not only the models but also the data used for training.

These cybersecurity challenges call for strengthening security infrastructure and establishing strict regulatory frameworks to ensure that LLM usage complies with European security and data protection standards.

1.1.2 Trust rather than power

Revolutionary and concerning

The unexpected launch of ChatGPT in 2022 (based on the GPT-3.5 model) propelled AI into a "mainstream" era, catching even the most seasoned experts by surprise. The technology spread rapidly (1 million users in 5 days, 100 million in 3 months), generating massive enthusiasm and disrupting the entire sector. While this global deployment was genuinely revolutionary—a term often overused, but fitting here—it was not without major issues and controversies. It reflects a characteristic U.S. approach, where speed is prioritised, sometimes at the expense of caution.

Europe, while it may struggle to match such rapidity, has the opportunity to set itself apart with a unique approach. By capitalising on its strengths rather than attempting to address its weaknesses, Europe can create AI solutions tailored to its market's specific needs, all while adhering to the highest standards of reliability and ethics. **By making "trust" the core of generative AI development, Europe can not only distinguish itself but also position itself as a global leader in this field.**

Ethics & trust

Building European AI requires designing systems that are ethically responsible and aligned with our values. This means embedding essential principles "Ethics & trust by design" such as transparency, fairness, and privacy protection. To offer a credible alternative, European AI must foster a trustworthy ecosystem by focusing on integrating specific European Union standards and regulations, including GDPR, the AI Act, DMA, DSA, intellectual property protection, and competition rules in general.

Reliability

Trust also rests on the reliability of the solutions offered, whether for businesses or individuals. The numerous "hallucinations"[28] produced by early generative AI technologies seriously undermine their credibility in professional contexts, where precision and quality are paramount.

These apparent errors, which involve generating incorrect or incoherent responses without the AI assistant realising it, pose a major reliability issue. This challenge is especially concerning because, due to their design based on deep neural networks[29], these AIs are still complex to fine-tune and make transparent. Some experts even refer to a "black box" phenomenon, highlighting the lack of understanding and explainability of the models' decision-making processes. These technical limitations, challenging to control at this stage, disqualify these technologies for many enterprise applications requiring absolute rigour, where even minor errors can have severe consequences for organisations and individuals (healthcare, finance, administration, commerce, etc.).

[28] *A hallucination in generative AI refers to a phenomenon where the model produces incorrect, non-factual, or entirely fabricated information. While it generates content that appears coherent, it may be false or misleading.*

[29] *A neural network is a computational model inspired by the human brain, consisting of multiple layers of artificial "neurons" that process information and adjust their connections (weights) based on input data. It is difficult to understand precisely how it functions because these networks, especially the more complex ones, contain thousands or millions of parameters that interact in a nonlinear way.*

Building an ecosystem

Beyond generative AI specialists like OpenAI and data collaboration tools (e.g., Snowflake, Databricks), today's dominant market players are the American hyperscalers such as Amazon, Microsoft, and Google. These global companies stand out for their ability to lock customers into integrated "all-in-one" ecosystems, offering a full range of public cloud-based Cloud-Data-AI services. Even traditional AI infrastructure players like NVIDIA are moving up the value chain by acquiring generative AI leaders for enterprise solutions[30].

Thus, Europe's challenge is not only to develop specific trustworthy AI and generative AI technologies but also to create comprehensive ecosystems, combining Cloud, Data, and AI, built on consistent value chains aligned with the principles Europe aims to promote and protect.

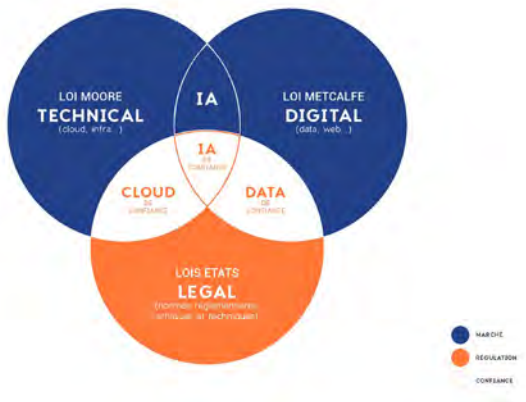


Diagram "Trustworthy Ecosystem" excerpted from the report

"Trustworthy AI: A Strategic Opportunity for Digital and Industrial Sovereignty"[31]

1.2 FROM DIGITAL REVOLUTION TO LINGUAL REVOLUTION?

The advent of LLMs marks a major turning point in the evolution of Artificial Intelligence, resembling a true linguistic revolution where human language takes precedence over machine language. While the Big Data era (2000s and 2010s) was initially characterised by data visualisation tools (dataviz) that made information visually accessible, it later evolved with analytical tools enabling data analysts and data scientists to make this data more comprehensible and usable.

Today, with LLMs, we enter a new phase: these models no longer merely make data intelligible; they make it "intelligent." AI based on LLMs allows for smooth and natural human interaction, simplifying information handling and opening new perspectives in automation and decision-making without requiring advanced technical expertise. This shift not only transforms how we interact with data but also reshapes entire business processes, facilitating access to a more intuitive and accessible form of Artificial Intelligence.

The true revolution lies in the fact that LLMs now enable human-machine interaction in natural language. Digital communication, traditionally limited to keyboard and mouse, is evolving toward a "lingual" communication style, akin to how humans have interacted with each other for millennia. This advance paves the way for a new form of collective intelligence, where humans and machines not only share data but also a common language. It promises to deeply transform our way of collaborating with machines, shifting from simple interactions with often rigid and cumbersome user interfaces to fluid, rich, and nuanced exchanges with "intelligent" entities capable of grasping complex linguistic and contextual subtleties.

1.2.1 Assistants, potential new human–machine interfaces

[30] https://www.forbes.fr/technologie/nvidia-rachete-octoai-et-domine-desormais-les-solutions-dia-generative-pour-les-entreprises/

[31] Julien Chiaroni and Arno Pons, Digital New Deal - France 2030, juin 2022

HUMANS AND MACHINES NO LONGER SHARE ONLY DATA, BUT A COMMON LANGUAGE.

Conversational assistants, such as Siri, Google Assistant, and Alexa, have made significant strides since their launch, evolving from simple voice-command devices into more sophisticated systems capable of handling a wide range of queries. However, they have often fallen short in delivering genuinely useful everyday services. Asking for the time or weather via voice commands clearly hasn't captivated the masses.

To date, outside major platforms, these assistants remain relatively uncommon. They are occasionally found on websites for customer support or after-sales services but are mainly limited to these specific tasks, with performance still far from ideal. Aware of the limitations of its current model and the revolutionary potential of generative AI, Amazon recently announced layoffs in its Alexa division, highlighting the challenges of transforming the assistant into an essential tool. This restructuring aims to modernise its ageing voice assistant and adapt it to the generative AI era[32].

This shift raises the question of whether conversational assistant technology represents merely a progressive advance limited to specific uses or a true revolution in how we interact with machines. Their ability to simulate human conversations, learn from past interactions, and incorporate AI advances suggests a profound transformation in our relationship with technology. Recent progress in generative AI could finally unlock the untapped potential of these assistants, making their daily utility more tangible and meaningful.

Toward a screenless future

While current interfaces still have a solid future, conversational assistants hold the potential to become the dominant interface for accessing information and services. They provide a more seamless and natural interaction than screens, keyboards, or mice. Users could ask questions, make purchases, plan trips, schedule medical appointments, or manage daily tasks simply by conversing with their devices in natural language, especially by voice, thus making the experience more intuitive and accessible.

European businesses and government agencies must prepare for this shift by adapting their services and digital presence to be compatible with these conversational interfaces. This change will not only transform how we access information and services but also redefine how organisations design and deliver their products and services, opening new opportunities in the digital economy.

Disintermediation and market concentration

If conversational assistants become the primary interface for users, companies risk gradually losing direct contact with their customers. Why spend time navigating multiple specific websites, each with complex page structures and endless forms and clicks, when my assistant can meet all my needs directly and effortlessly? The disintermediation that these assistants bring goes far beyond what we have seen with the monopolistic platforms of the previous era.

A question arises: will we see **the emergence of a single dominant assistant monopolising the market** (like ChatGPT, Apple Intelligence/Siri, Gemini, Copilot, or others), or will assistant features be more broadly distributed and integrated into a wide range of websites and mobile apps in our daily lives?

The latter would be preferable, as it would prevent an unprecedented concentration of power. Today, search engines act as "gatekeepers" on the web, while still allowing companies

[32] *L'usine Digitale, 20th of November 2023*

ARTIFICIAL CAPABLE INTELLIGENCE : THE AGE OF AUTONOMOUS ACTIONS.

to maintain an online presence through their own websites or mobile apps. This might become much more difficult if end users could fulfil all their needs via a single assistant, relegating companies to mere 'backend' functions, invisible to the final customer and fully dependent on the assistant. Whatever happens, the internet as we know it is likely on the cusp of a profound transformation.

DEMOCRATISING AI ASSISTANTS FOR THE ENTIRE TRAVEL SECTOR

The main goal of the Gen4Travel project is to make generative AI technology accessible to every player in the travel sector: airlines, rail companies, train stations, ports, airports, taxi and bus companies, public transportation, museums, amusement parks, various tourist sites, tourism offices, and more. Across Europe, this sector comprises a few major private and public entities alongside a multitude of smaller players (over 95%[33]).

For years, the industry has been largely disintermediated by a handful of large platforms (Booking, Google, Airbnb, Tripadvisor, Uber, etc.). If AI assistants become the standard for interaction between travellers and their travel services, and if a monopolistic player becomes the single AI Travel Assistant for all travellers (with a high probability that this player will not be European), disintermediation could become nearly total, cutting off travel players from direct relationships with their customers. In such a scenario, these players would merely serve as 'back-end' data providers for the dominant Travel Assistant.

The objective of the Gen4Travel project is to make generative AI technology available to the entire industry under fair governance led by the sector itself through the EONA-X Data Space, rather than a monopolistic tech player. It is crucial that all actors in the sector can participate, including smaller ones, who are often less digitalized and more vulnerable to disintermediation. Even those who lack the financial and human resources to develop and operate an AI assistant on their own should be able to offer their services within this new environment, without being subject to the hefty commissions imposed by today's major platforms[34].

[33] *Tourism Data Space Blueprint - https://www.tourismdataspace-csa.eu/wp-content/uploads/2024/01/DRAFT-BLUEPRINT-Tourism-Data-Space-v3.3_final.pdf*

[34] *Major intermediary platforms (OTAs) like Booking.com, representing around 40% of global transactions, apply average commissions of 15%, which can reach up to 30% for hotels. Source: White Papers "Data Sharing and Tourism," Bpifrance Le Lab and Digital New Deal, June 2020*

1.2.2 Agentification, the new frontier of generative AI

Many notable figures, such as historian Yuval Noah Harari and entrepreneur Elon Musk, foresaw the evolution of generative AI from a mere content generation tool to a true autonomous agent. In his recent book, The Coming Wave (2023), Mustafa Suleyman, co-founder of Google DeepMind and now head of Microsoft AI, unveils his vision for the next major leap in Artificial Intelligence. He introduces the concept of "Artificial Capable Intelligence" (ACI), an AI not only able to engage in natural language dialogue with humans but also capable of independently performing complex tasks with minimal supervision.

According to Suleyman, this ACI, equipped with memory and highly interactive, will be able to understand a user's specific context and amplify their capabilities by carrying out real-world actions on their behalf (e.g., booking, organising, completing tasks). Companies could leverage these capabilities to automate internal processes or complex operations, such as supply chain management, customer relations, administrative, and financial processes.

By enhancing current conversational assistants with memory, integration with company and public administration Information Systems, and advanced "chains of thoughts" reasoning capabilities, these tools could evolve into true intelligent agents. They would be capable of assisting individuals in all interactions, whether personal (citizens, consumers) or professional (employees, executives). This development promises unprecedented productivity gains while prompting a reevaluation of our relationship with technology as the line between human and machine continues to blur.

Generative AI has already transformed how we interact with technology, allowing conversational assistants to communicate smoothly and naturally. However, an even more significant revolution is on the horizon: the shift from Large Language Models (LLMs) to Large Action Models (LAMs)[35]. We explore this evolution in detail later in this report, specifically in the section dedicated to LAMs (§2.3).

[35] *Large Action Models (LAM) are an evolution of current language models, designed not only to understand and generate text but also to autonomously execute concrete actions.*

A TRUE TRAVEL AGENCY IN YOUR POCKET

An AI travel assistant can offer a wide range of features. Some are limited to displaying text or multimedia content with varying degrees of contextualization, for which current LLMs are sufficient. Other features, however, require the assistant to act directly on the traveller's behalf, with their authorization but minimal supervision—this falls into the realm of agentification.

With **Gen4Travel**, AI travel assistants could provide the following functionalities:

Travel Planning and Booking:

Search for flights, trains, hotels, and various tourist activities
Price comparison
Personalised itineraries based on tastes and preferences
Real-time or scheduled automatic booking

Travel Management:

Real-time updates in case of disruptions, delays, or cancellations
Notifications, reminders, and formalities to complete
Baggage tracking
Administrative tasks and documentation (passport, boarding pass, etc.)

Personalization and Recommendations:

Customised suggestions and recommendations
Local guides

Travel Assistance:

Trip reorganisation in case of disruptions or cancellations
Real-time multimedia translations
Multimodal navigation and local transport ticketing access

Customer Support and Immediate Assistance:

24/7 customer service across multiple services
Dispute resolution and connections to insurance providers
Safety assistance and emergencies (medical services, embassies, etc.)

User Preference Management:

History and preferences (budget, dietary needs, accessibility, tastes, etc.)
Loyalty accounts and benefits

Post-Travel Experience:

Archiving and souvenirs
Customer reviews

1.3 WHAT ARE THE DESIRABLE SCENARIOS FOR OUR INDUSTRIES?

The race for power in LLM development is a global phenomenon, driven mainly by companies with vast resources. These models, taking advantage of massive amounts of data and impressive computing infrastructures, are achieving remarkable performance. However, the question for European players is: should they join this frantic race? Joining this competition requires substantial investment in technology, data and human resources. It is essential to weigh up the potential benefits in terms of competitiveness and innovation against the costs and risks involved.

1.3.1 The LLM battle: between adoption and adaptation

LLMs are already products

As Yann LeCun, Chief AI Scientist at Meta, highlighted in a recent interview for GDIY[36], the development of Large Language Models (LLMs) is no longer solely within the purview of R&D teams. LLMs are now considered full-fledged products, quickly integrated into the service suites of major tech giants (GAMAM)[37]. These models are finding their place at record speed across various domains: internet search with Google's Gemini, social interactions at Meta, and office productivity with Microsoft's Copilot. LLMs are thus becoming key components of these companies' service offerings, rapidly transforming many aspects of technology and daily life.

Useful but limited LLMs

LeCun also notes that LLMs ultimately just predict the "next token"[38] (semantic prediction) without truly understanding the problem posed or the underlying concepts. LLMs lack the ability to comprehend image content, possess no common sense to interpret the world around them, and are currently incapable of constructing complex, explainable reasoning. According to him, while LLMs can continue to play a significant role, their potential alone is already limited. LeCun suggests that they be used as components of larger, more versatile AI systems where other architectures and algorithms extend their capabilities. He calls on research and R&D communities to explore new architectures to go beyond the current limitations of LLMs.

The ChatGPT-o1 assistant, launched by OpenAI in September 2024, may represent real progress in the direction LeCun advocates by offering significantly improved reasoning capabilities. This model differs from its predecessors by allowing longer response times, enabling a deeper analysis before providing an answer. ChatGPT-o1 can break down its reasoning into multiple steps ("chains of thought"), verify its answers before submitting them, and provide the user with a detailed report of the steps taken to reach a conclusion (explainability), thereby enhancing decision-making accuracy and transparency.

Create, adopt, or adapt

In the race for generative AI, there are three possible approaches for European companies:

1. CréationCreation: The company develops and trains its own model, perfectly tailored to its context and that of its clients.

2. Adoption: The company directly integrates an existing general-purpose model (e.g., GPT-4, LLaMA 2, Claude 2, Mistral 7B, etc.).

[36] *Génération Do It Yourself, 5th of june 2024*

[37] GAMAM : Google, Apple, Meta, Amazon, Microsoft

[38] A token is a basic unit for analyzing and processing text. Generally, a token represents a word, punctuation, or another language element, depending on the context and purpose of the analysis.

3. Adaptation: The company customises an existing generic model for its specific context or clients (model specialisation) using techniques such as fine-tuning or RAG (see §2.2).

At this point, developing an entirely new model for each company is neither economically nor ecologically viable.

Choosing general-purpose LLMs offered by major tech players—"powered by..."—provides quick and proven solutions for each company but can lead to technological dependency and a loss of control. These third-party-designed models may not reflect local values or be tailored to specific languages or cultural and industry needs.

Adapting these models to local and sectoral contexts allows for better alignment with the specific needs of European industries while respecting the unique aspects of each sector and preserving a degree of technological sovereignty. Although this specialisation may involve additional costs, sometimes significant, it optimises existing models for targeted applications, ensuring a balance between performance and suitability for local realities.

1.3.2 Adapting LLMs for an industry

For each industry, the benefits and applications of LLMs can be highly specific:

- **In education,** these models can be used to create personalised and interactive learning environments.
- **In healthcare,** they can enhance diagnostics and patient monitoring by providing quick and accurate analyses of medical data, as well as facilitate processes for both healthcare staff and patients.
- **In mobility and tourism,** LLMs enable the creation of traveller assistants or companions that understand travellers' preferences and needs, providing personalised services and itineraries.

Each sector has the opportunity to take an alternative approach by organising to collaborate and pool resources, allowing for the often costly adaptation and specialisation of LLMs at an industry-wide level rather than at each company individually.

This collaborative approach helps share the costs and optimization efforts while ensuring the models are better suited to the industry's specific needs. By joining forces, companies within the same sector can not only benefit from economies of scale but also develop more coherent and effective solutions, strengthening their technological independence.

If the industry/sector unites, the idea of creating its own model (or models) becomes realistic, as costs and ecological impacts are widely distributed.

This approach also fosters collective innovation, providing all stakeholders with access to advanced technologies while reducing the dispersion of efforts and investments. By pooling resources, the industry creates a cooperative dynamic that accelerates AI adoption while enhancing its competitiveness against international players, particularly American ones.

LLMS FOR AND BY THE TRAVEL INDUSTRY

As part of the Gen4Travel project, industry stakeholders, under the governance of the EONA-X Data Space, have committed to jointly developing a multi-LLM platform tailored to the specific needs of their sector.

This project encourages cost-sharing, experience exchange, and shared training data, thus reducing individual expenses while enhancing overall efficiency through the participation of multiple contributors.

For now, the option to rely on a single LLM has not been adopted, allowing each player to select and use the model that best suits their needs, including more generic or non-European models.

However, for those interested, training or retraining models can be collectively managed at the industry level, under the governance of the Data Space.

KEYS TAKEWAY

THE ADOPTION OF LLMS BY VARIOUS SECTORS CAN FOLLOW THREE SCENARIOS:

1. "Powered by others" (using an existing generalist proprietary or open-source model):

Companies operate independently, directly adopting existing models.

→ *Ensures quick implementation but limits customization to industry-specific needs and risks recreating dependencies similar to the "powered by Google" model that prevailed 20 years ago.*

2. "Do It Yourself" (new customised model developed by and for each player):

Companies operate independently, creating a specific model or adapting an existing one to meet their needs.

→ *Allows for precise adaptation to business context, but requires each player to bear the high costs of creating or slightly lower costs of customising a model.*

3. "Join Forces" (new customised model developed by and for an industry/ sector):

Companies join together in a consortium (such as a 'Data Space'), within an industry, to collaboratively develop or adapt models.

→ *Enables model adaptation to industry context while pooling and reducing costs for each participant. Also strengthens the sovereignty of the involved sectors.*

BY PUTTING ‘TRUST’
AT THE HEART OF
GENERATIVE IA,
EUROPE CAN STAND OUT
AND BECOME A WORLD
LEADER.

II. CO-PRODUCING TRUSTWORTHY GENERATIVE AI

2.1 FACILITATING COOPERATION THROUGH OPEN SOURCE

2.1.1 A differentiating Open Source strategy for Europe

The Open Source strategy presents Europe with a genuine opportunity to distinguish itself rather than follow dominant technological trends. **By truly investing in Open Source for AI, Europe could position itself as a champion of transparency, cooperation, and open innovation,** enabling industries to co-invest in technological infrastructures that meet shared needs.

This Open Source foundation would also allow Europe to uphold its values, enforce its regulations, and set its standards to steer the future development of GenAI and AI more broadly. Such an approach would bolster Europe's technological autonomy in the face of foreign tech giants while ensuring that its companies remain competitive globally. This vision aligns with the call from the President of France in his August 2024 statement for a "shared, approved AI solution based on Open Source, to avoid dependence on non-European solutions and standards."

This choice is also pragmatic, given the vast resources behind proprietary models. Meta's Llama model perfectly illustrates the potential of **this challenger strategy, which can be highly effective**. **Llama 3.1 now rivals GPT-4** in technical performance and has rapidly gained adoption among LLMs, surpassing **OpenAI** and **Microsoft** in AI-related expenditures thanks to its Open Source approach. This underscores the effectiveness of Open Source strategies to compete with proprietary models while reinforcing technological autonomy—a path Europe could follow.

2.1.2 Open Weights' models vs. full Open Source models

It is essential **to clarify what "truly Open Source" means** in the AI context, as the term is often misused. Many players, particularly the GAMAM companies, distort this concept by offering so-called "Open Weights" models, where only specific parameters or information, such as language data distribution, are disclosed, without the training data itself. The Open Source Initiative (OSI)[39] has launched a collaborative and open process to establish a precise definition of Open Source AI (OSAID)[40]. This definition, expected to be published by the end of 2024, will set strict criteria for using the term "Open Source" in AI. According to the proposed OSAID rules, models like Meta's Llama will no longer be able to claim Open Source status. Although OSAID does not require publishing training datasets, this new definition provides a necessary level of clarity in a field where transparency is crucial.

If Europe and its industries aim to be genuinely Open Source, this includes:

- **A truly open and unrestricted licence:** permitting unrestricted use, modification, and redistribution, including for commercial purposes, without limitations on specific sectors and/or computational power (for example, Meta's Llama models).
- **The model's source code:** including pre-training scripts and tools alongside evaluation and testing methodologies.
- **Training, evaluation, and alignment datasets** available under a free license, allowing for model re-training.

[39] https://opensource.org/

[40] https://opensource.org/deepdive

- **Open and collaborative governance:** a development model that actively encourages the participation of a distributed open community.

OPENAI VS IA OPEN SOURCE

Despite what its name might suggest, OpenAI has gradually moved away from its original open science model towards a closed, proprietary and commercial approach. Under the leadership of Sam Altman, the company now limits access to its most advanced models, which have become proprietary and opaque.

In contrast, genuinely Open Source initiatives such as OpenLLM France[41] promote transparency, collaboration and accessibility while remaining true to the values they espouse.

[41] https://www.openllm-france.fr/

2.1.3 Development and business models: towards a distinctive European approach

In the quest for European digital sovereignty in generative AI, it is essential to carefully examine the development and commercialization models adopted by various players. Although companies like Mistral AI or Aleph Alpha emerge as strong European contenders, their approach does not always align with European values and the public-interest goals that political ambitions have set. Mistral AI presents a credible European industrial alternative to American dominance. However, its model—based on massive funding rounds and a global ambition—closely resembles that of large American companies, offering generic solutions aimed at a global market rather than tailored to Europe's and its industries' specific needs.

In contrast, an Open Source approach, potentially incorporating Mistral AI's open models, could better meet the needs of Europe's industries and member states, offering an alternative more aligned with Europe's ambitions:

- **Technological Independence:** With full access to code, tools, and data, European companies and institutions can maintain complete control over their AI solutions without relying on non-European entities.
- **Collaboration and Innovation:** Open Source fosters collaboration among companies, universities, and public institutions, creating a dynamic ecosystem for innovation at a European level.
- **Cultural Adaptability:** Models can more easily be adapted to the diverse languages and cultural contexts in Europe, thereby preserving the diversity that enriches Europe.
- **Transparency and Trust:** The transparency inherent in the Open Source approach strengthens user and regulator trust—critical in Europe's context of data protection and individual rights.

For European companies, investing in Open Source is not only an ethical choice but also a pragmatic strategy that lowers entry barriers by enabling cost-sharing to "level the playing field":

- Using Open Source software eliminates the licensing fees imposed by proprietary AI solutions.
- Companies can share development costs and risks with other members of the Open Source community, making large-scale projects more feasible and less risky while fostering the creation of digital commons.

- **Open Source LLMs are generally lighter, requiring more efficient inference infrastructures with longer lifespans and even allowing the reuse of recycled GPU farms.**
- Pre-trained LLMs on European languages help reduce inference costs, particularly in the tokenization operation, which converts user prompts into word fractions represented by numbers used by the LLM. Initial experience indicates that models from OpenAI (ChatGPT 4) or Llama (trained predominantly in English) incur around a 30% higher cost for the same request when used in French compared to English.[42]

2.1.4 Pioneering work in Europe

Open ecosystems already exist

Following the path paved by the BigScience project, which led to the creation of the Bloom[43] LLM, new initiatives in France, like Kyutai[44] and OpenLLM, demonstrate that a genuinely Open approach is possible.

These projects go beyond simply publishing code; they create complete ecosystems around their models and training data, all shared under Open Source licences, promoting reusability and encouraging collaborative, transparent innovation.

In this regard, OpenLLM France, with over 850 members (as of October 2024), is the largest French-speaking space dedicated to exchange and sharing in the field of generative AI.

Replicability and scalability: Keys to European success

To accelerate the adoption and development of Open Source generative AI solutions in Europe, several actions are necessary:

- **Enhanced Institutional Support:** Increased funding programs and policies that explicitly favour truly Open Source AI projects.
- **Cross-Sector Collaboration:** Promote partnerships among academia, industry, and the public sector around open, shared initiatives.
- **Education and Awareness:** Develop Open Source AI skills in AI programs and raise decision-makers' awareness of its benefits.
- **Standards and Certifications:** Establish European standards for Open Source AI (Open Source Act) to ensure quality and interoperability.
- **Exchange Platform:** Create a European platform for sharing and collaboration on Open Source AI projects to bring together initiatives already launched by Member States.

KEY TAKEAWAYS

As with any decision, choosing Open Source comes with both advantages and disadvantages. It is therefore essential for companies to carefully assess their needs, internal skills, and capacity to manage these technologies over the long term. This helps avoid potential drawbacks, such as increased complexity in LLM integration (requiring more specialised expertise) or reliance on the community for maintenance, security vulnerability management, and incident responsiveness.

On the other hand, a clear choice for Open Source allows for cost-sharing—potentially at an industry/sector level—increased transparency, reduced dependencies and lock-in effects, and greatly facilitates cooperation among stakeholders.

[42] English, as the primary language in training data, optimises text-to-token conversion with a ratio of approximately 0.75 words per token. In French, this ratio is 0.57, requiring up to 30% more tokens, thereby increasing costs (source: OpenAI Developer Forum).

[43] https://bigscience.huggingface.co/blog/bloom

[44] https://kyutai.org/

2.2 SPECIALISING WITHOUT RETRAINING? (RAG VS. FINE-TUNING)

2.2.1 Model specialisation: what are the options?

Cooperation enabled by Open Source is a necessary, but not sufficient, condition for a sustainable European path in generative AI. To remain competitive, industries/sectors must also be able to specialise (customise/adapt) generative AI technologies, particularly models/LLMs, to meet very specific needs in sectors such as healthcare, education, mobility, or industry.

But should we customise the models themselves by retraining them, or simply personalise the user experience without modifying the model? Specialisation can be achieved through several techniques, with the two most common approaches being:

- **fine-tuning:** This approach involves adjusting a pre-existing generic model by retraining it with domain-specific data.

For example, a French bank might want to adapt a virtual assistant to the nuances of French banking law. By retraining the model on a corpus of legal texts and practical cases, the assistant can provide precise responses about complex financial products while adhering to European regulations.

- **Retrieval-Augmented Generation (RAG):** This approach combines text generation via an LLM with the retrieval of external information from specific databases or documents within a company's Information System. Third-party data is used to "feed and enrich" prompts (prompt engineering) or enhance responses, refining the model's use without requiring specific retraining of the model itself.

Increasingly applied in recent experiments, particularly for customer support chatbots, this method enables the AI assistant to access real-time client data, company-specific contracts and terms, the latest regulatory updates, and interaction histories, resulting in personalised and relevant responses.

RAG & FINE TUNING

You want to use a generic language model like GPT-4 (pre-trained on a vast amount of internet data) to answer specific questions related to a company's customer service.

FINE-TUNING APPROACH:

Collect Specific Data: Gather a set of real customer conversation examples covering frequent questions, such as "Where is my order?", "How do I return a product?", or "What is your refund policy?".

Model Retraining: Use this data to adjust the model (fine-tuning), which involves retraining the model to understand and respond accurately to typical customer service inquiries while adopting the company's tone and style.

Outcome: After this process, the model can provide highly relevant responses when deployed in a customer service chatbot or automated response system. It can, for instance, detect subtle nuances in refund or return requests and respond according to the company's precise policies.

RAG APPROACH:

En optant pour une approche RAG plutôt que pour le fine-tuning, le modèle conserve sa nature générique, tandis que les prompts utilisés pour répondre aux clients sont enrichis en temps réel par des informations et documents récupérés dans les bases de données internes de l'entreprise.

Cette approche permet d'assurer que les réponses s'appuient sur les données les plus récentes et les plus fiables, sans nécessiter un réentraînement spécifique (et coûteux) pour ce domaine particulier.

KEY POINTS:

Fine-tuning enables a model to become an expert in a specific area, such as a company's customer service, by retraining it on company data.

RAG provides context-specific responses for a domain or company without retraining, simply by reusing the company's data in real-time to enhance prompt generation.

2.2.2 Prefer RAG to fine-tuning

Our various discussions with major companies across different sectors generally lead us to favour the RAG approach over fine-tuning, not only due to cost considerations but also for reasons of performance and trust.

For businesses, RAG offers significant advantages compared to fine-tuning. With RAG, there is no need to input sensitive data related to intellectual property, business knowledge, confidentiality, or customer privacy directly into the AI model.

This approach enables the LLM to focus on its natural language interaction capabilities with users, which is already incredibly valuable, without requiring it to assimilate internal information about the company's operations or its customers' personal data. Specifically, the benefits are as follows:

- **Cost:** RAG is often less expensive than fine-tuning because it doesn't require a complete model retraining. It uses a generic pre-trained model that can access databases (both structured and unstructured) within the company's existing IT systems to retrieve necessary information and enhance prompt generation.
- **Flexibility and Real-Time Updates:** RAG enables companies to use real-time data to improve the model's responses. For example, a RAG model can access a constantly

updated database, ensuring responses are always based on the latest information—a critical asset in sectors where data changes rapidly. This real-time update capability is currently not possible with fine-tuning.

- **Bias Reduction**: By relying on data from a company's IT systems, RAG helps reduce the biases in pre-trained models. This approach allows companies to select and control data sources for response generation, drawing from reliable and verified databases, thus minimising the risk of biases from uncontrolled or low-quality external sources.
- **Reliability:** RAG limits LLM hallucinations by constraining responses to specific data sets from the company's IT system, rather than relying on uncontrolled or low-quality external sources.
- **Regulatory Compliance:** RAG helps companies comply with regulations (such as the AI Act, GDPR, etc.) by keeping sensitive data (personal data, data protected by intellectual property, professional confidentiality, etc.) within internal IT systems rather than exposing them directly in a model, which may be difficult to control in usage.
- **Maintenance:** RAG simplifies data management and updating, as data can be refreshed independently of the model. This enhances scalability by eliminating the need to retrain the model for each update, and it allows for the addition of new data sources, including in real time, or expansion to other application areas without modifying the existing model.

Our discussions also revealed that large models like Mistral AI, Llama, or GPT are already highly effective when used in very specific business contexts, eliminating the need for retraining for many tasks.

While retraining and fine-tuning are established methods for model specialisation and will inevitably be adopted by some, in this report, we simply encourage those considering this approach to carefully assess the cost-benefit ratio of retraining, especially with regard to the risks associated with sensitive data (personal data and intellectual property-related information). Additionally, new approaches and architectures are already combining the advantages of RAG and fine-tuning, such as RAFT[45] (Retrieval Augmented Fine-Tuning), which reportedly outperforms RAG with an equivalent model. We anticipate that the coming months and years will bring forth many new approaches and methods for model specialisation, but the key question will remain whether sensitive data and business processes should be directly integrated into the model or handled separately.

KEY TAKEAWAY

LEVERAGE RAG

For companies, RAG enables the full utilisation of LLM capabilities while providing significant advantages over fine-tuning, particularly in terms of trust, regulatory compliance, cost reduction, performance, flexibility, and maintenance.

RAG also allows for the compartmentalization of confidential and sensitive company data, such as customer personal data, by handling it in a "data layer" rather than in an "AI layer," which is more opaque and harder to control.

[45] https://techcommunity.microsoft.com/t5/ai-ai-platform-blog/raft-a-new-way-to-teach-llms-to-be-better-at-rag/ba-p/4084674

GENERALIST LLMS 'ALREADY SPEAK TOURISM'.

An international company in the travel sector that we interviewed found, after a year of developing its «Specialized Assistant» based on LLMs—including several months in production—that most of the models function perfectly without requiring specific fine-tuning, even for highly specialised tasks such as booking. According to this company, the only notable difference occasionally lies in managing toxicity, but this is well handled through prompt engineering. Current generalist LLMs already «speak the specific language of tourism» well enough, making retraining not really necessary.

More surprisingly, companies we interviewed that have applied fine-tuning for specialised tasks, such as rate construction or loyalty program rules, found this method can sometimes be counterproductive. **Fine-tuning appears to generate more hallucinations compared to the RAG approach, which, by relying on up-to-date internal data, reduces these errors and thereby enhances the reliability of the experience offered to the end customer.**

2.3 THE GAMBLE ON LAM AND AGENTIFICATION

2.3.1 What are the possible bets?

To become a leader in Artificial Intelligence, Europe cannot settle for merely catching up in generative AI and LLMs. This requires bold positioning and embracing the recommendations from Mario Draghi's report[46], which emphasises the importance of making strategic choices in technological investment. Without taking risks and making unique choices, Europe will struggle to compete with powerhouses like the United States and China, which readily invest heavily in AI.

Beyond current model specialisation approaches like fine-tuning or RAG, European generative AI must anticipate future trends and propose groundbreaking innovations:

- **Smaller (from LLMs to SLMs):** In response to the issues of gigantism and lack of adaptability to specific problems in LLMs, the market is already producing SLMs (Small Language Models). LLMs are large-scale models, often composed of billions of parameters, requiring significant computational, memory, and storage resources. SLMs, on the other hand, are smaller models with fewer parameters, generally ranging from hundreds of millions to a few billion parameters, such as Microsoft's phi-2 and Meta's Llama 3.2 1B and 3B. These models are lighter and less resource-intensive, making them easier to deploy on devices or infrastructure with limited resources.
- **More action (from LLMs to LAMs):** While LLMs have mastered generating various types of content from natural language (text2text, text2image, voice2text, etc.), LAMs (Large Action Models) focus on decision-making and action-taking in physical or simulated environments, based on natural language prompts (text2action, voice2action). They often involve tasks related to automated control or action execution.

[46] https://commission.europa.eu/document/97e481fd-2dc3-412d-be4c-f152a8232961_en

The "small is beautiful" approach, especially in terms of efficiency and adaptability to specific needs, makes SLMs less resource-intensive than LLMs. However, our extensive discussions with industry players across sectors who aim to harness the full potential of LLMs lead us to believe that Large Action Models (LAMs), or even Small Action Models (SAMs), with their new ability to interact with the real world (through our companies' Information Systems), represent an even more promising development path with broader implications.

2.3.2 From LLM to LAM

LAMs (Large Action Models) represent a natural evolution in generative AI[47], moving from simple content generation via natural language to direct interaction with enterprise Information Systems. LAMs enable the automated execution of complex actions initiated by end-user commands in natural language.

The adoption and development of LAMs are strategically beneficial for Europe. By investing in this emerging technology, Europe can position itself at the forefront of AI innovation, offering more sophisticated solutions tailored to the complex needs of businesses, governments, and individuals.

With LAMs, the next generation of AI assistants can convert user or customer requests into tangible, multi-step actions, such as organising, booking, scheduling, information dissemination, or completing administrative tasks. Thus, LAMs transform AI assistants into powerful productivity tools.

How do LAMs work?

- **A LAM breaks down the user's natural language request into a sequence of complex sub-tasks**, which it then executes through dedicated programs capable of accessing enterprise Information Systems (for example, a reservation/booking system in the transport sector).
- **These programs, which enable access to and interaction with enterprise Information Systems, are called agents.** A LAM can activate a series of agents offered by one or more companies. The sequence of actions is generated automatically by the LAM, which adapts dynamically, proposing
- Like a LLM, a LAM can improve over time by learning from a large number of user interactions and examples, becoming increasingly effective.
- The end-user initiates the action and maintains control, but with minimal oversight: **the machine executes the entire action, along with its associated sub-tasks, on behalf of and for the user (the "delegation of action" principle).**

[47] https://medium.com/version-1/the-rise-of-large-action-models-lams-how-ai-can-understand-and-execute-human-intentions-f59c8e78bc09

EXAMPLE OF LARGE ACTION MODELS (LAM) USAGE

Large Action Models (LAMs) are an AI breakthrough designed to transform text or voice commands into real actions in digital environments. They go beyond language comprehension to execute complex tasks across various applications.

With a LAM, you could express a desire in an integrated and complex way, such as, "Organise a movie night with a good film, order pizza for 8 PM, and set up the living room lighting." The LAM would analyse this intricate request, understand the multiple actions required, and execute them sequentially or simultaneously across different applications and devices. The model could select a movie based on your past preferences, place an order on your favourite pizzeria's website using secure payment information, and adjust the lighting via a smart home interface—all in one smooth operation.

EXAMPLES OF LAMS

The best-known example is Microsoft Copilot, integrated directly into Microsoft 365 applications, which helps users accomplish complex tasks such as generating reports, scheduling meetings, and automating business processes.

Another promising example is the Rabbit R1 demonstration, which handles complex commands like browsing the web to book a flight or purchasing products online based on simple verbal instructions from the user.

Open Source communities like CrewAi[48] also offer highly sophisticated toolkits that enable complex agent-based reasoning processes to be implemented.

[48] https://www.crewai.com/

CREATING A TRAVEL LAM FOR ALL TRAVEL ASSISTANTS

The Gen4Travel project has already identified several Travel Assistant features that will rely on a LAM, such as booking (trains, flights, hotels, tourist activities, etc.).

The action delegation enabled by LAMs will allow a traveller, for instance, to verbally request their assistant to book a trip to a specific destination for the following Saturday. Considering the traveller's personal information, the assistant can analyse the various available options (e.g., multimodal routes) and align them with the traveller's specific needs (schedule, budget preferences, status as a Person with Reduced Mobility, loyalty cards, etc.). The assistant will then be able to make the necessary reservations with the traveller's consent, without requiring detailed oversight.

LET'S BECOME LEADERS IN LAM RATHER THAN MERE CONSUMERS OF LLM.

2.3.3 Agentic AI as a natural ally for LAMs

Actions initiated by LAMs are executed by programs known as "agents." Agentic AI is a recent industry evolution based on an architecture where multiple autonomous agents interact in a network, enhancing system flexibility and its capacity to address even more complex requirements and actions.

Each autonomous agent specialises in a particular task or function. This architecture can be organised in two ways:

- **Centralised:** A central orchestrator receives the initial request from the end user (in natural language), then activates and supervises the network of agents. If an agent provides unexpected or unforeseen information, the orchestrator adjusts the actions accordingly, dynamically modifying processes to better meet evolving needs.
- **Decentralised:** Without an orchestrator, agents collaborate directly, calling each other based on user requirements. Agentic AI supports handoffs between agents, enabling the seamless execution of complex processes while maintaining high transparency and granular control over tool usage and contexts.

The LAM directly supports this agent network. In a centralised system, it assists the orchestrator in determining the optimal agent sequence to activate. In a decentralised environment, the LAM can also aid the agents themselves, enhancing their coordination and responsiveness.

In summary, Agentic AI combined with LAMs allows for more autonomous, adaptive, and robust systems capable of managing complex interactions while maintaining high levels of control and flexibility.

Although far from fully mature, the Agentic AI approach is already central to the strategies of major generative AI players. OpenAI, for example, launched an Open Source tool called Swarm[49] in 2024. Swarm is a multi-agent framework that manages a constellation of autonomous agents linked to the LLM and coordinates them. Notably, Open Source projects such as CrewAI offer similarly promising approaches.

[49] *OpenAI Introduces Swarm : a Framework for Building Multi-Agent Systems*

PROVIDING DECISION AUTONOMY TO ASSISTANTS

By integrating the Agentic AI approach (with multiple agents performing various functions and an orchestrator selecting the appropriate agents based on the situation), Gen4Travel assistants will become more agile and able to adapt to dynamic and complex contexts.

A relevant example is managing a disruption during an already booked trip. If a traveler's flight is canceled, the assistant will be autonomous enough to reschedule another flight, book a hotel for the night, cancel the car rental at the destination, and adjust other elements of the itinerary. It will coordinate actions and negotiate with different providers, requiring only intermediate or final approvals from the user without needing direct intervention throughout the process. The assistant will adjust its response based on feedback from various stakeholders.

The constellation of agents involved will include multiple agents: listing flight/train/hotel offers, booking tools for transportation/hotel rooms, analyzing pricing (and disruption management) conditions of each actor, retrieving the user's personal context (identity data, preferences, purchase history, loyalty programs, etc.), matching the user's context with available offers, etc.

According to the Agentic AI approach, each agent could be made available to Gen4Travel by the respective companies (airlines/trains, hotels, car rental companies, taxi/ride-sharing companies, etc.) and have a high level of autonomy. With Agentic AI, it is not just the AI assistant meeting the traveler's needs; the entire sector is coordinating to offer a tailored solution to a complex problem.

This example clearly illustrates the strategic advantage of leveraging business data: the sector can provide exceptionally valuable services that players like OpenAI cannot currently offer—unless, of course, travel industry companies deliberately choose to open their Information Systems to OpenAI, thereby risking a new and dangerous dependence on tech giants.

2.3.4 A LAM for the industry/sector?

We therefore suggest that LAMs, along with the Agentic AI architecture, be developed at an industry-wide level or within an extended consortium.

A cooperative LAM development approach by industry would not only reduce costs but also enable **the creation of new assistant services capable of helping end users comprehensively across** all aspects of their daily tasks.

Collaboration in LAM development would further allow European actors to **address significant collective and societal needs, such as those related to the environment**, healthcare, energy efficiency, mobility, tourism, and employment

SINGLE LAM FOR THE TRAVEL INDUSTRY/SECTOR?

Gen4Travel's ambition is to enable tourism stakeholders to create multiple assistants, thus avoiding a monopoly.

However, to provide an optimal user experience, **each assistant must be integrated into a rich, open ecosystem** (if each assistant can only book services from a single company, the user experience will fall short).

Drawing from a vast network of partners and providers allows access to a wide range of services and enables personalised solutions for each traveller.

The goal is for any assistant to be capable of booking, organising, or reorganising an entire trip, including various services (transportation, accommodation, activities). To achieve this, **it is crucial to develop a unified LAM for the entire industry/sector, integrated into a shared digital infrastructure, enabling assistants to perform multiple, interconnected actions.**

KEY TAKEAWAY

LET'S BECOME LEADERS IN LAMS RATHER THAN MERE CONSUMERS OF LLMS.

By focusing on reliable and trustworthy technologies, and moving from theory to action with Large Action Models, **Europe can establish itself as a global leader in generative AI that serves its businesses**, ensuring that this technological revolution benefits all its enterprises and citizens.

PRIVATE DATA IS
THE NEW OIL.

2.4. POOLING AND SHARING DATA FROM OUR COMPANIES

2.4.1 Moving from Open Data to Shared Data

Moving beyond the naivety of pure "Open Data"

The Open Data era has promoted transparency and innovation through the release of public data. However, it is now time to shift to "Shared Data," which advocates for the strategic, controlled sharing of data from both public institutions and private enterprises. This approach values collective benefits while respecting confidentiality and intellectual property. By creating secure, controlled sharing ecosystems, Europe can drive innovation while safeguarding everyone's interests, establishing itself as an alternative to American and Chinese Big Data dominance.

Enthusiasm for Open Data was sometimes naive, with the belief that releasing public data alone would be enough to foster innovation. In reality, not all data holds the same value, and indiscriminate sharing without a business model can lead to confidentiality and security issues, or fail to meet real market needs. On the other hand, "Shared Data" — where data holders maintain control and may even monetize their data — enables structured sharing, ensuring control remains with the data owners, maximising impact while minimising risks.

"Shared Data": Europe's answer to "Big Data"

The emergence of Big Data in the 2000s and 2010s, along with the expansion of the internet and digital connectivity (3G+, 4G, 5G, fibre), generated an immense quantity of data (texts, images, sounds), essential for training advanced AI models. Information from the internet, social networks, and smartphones offered unprecedented insights into human behaviour, making AI more relevant and applicable to various real-world situations.

However, Europe has already lost the data race: only American and Chinese tech giants have effectively leveraged network effects (Metcalfe's Law)[50]. While the race to connect 8 billion people is behind us, connecting businesses is a challenge we must take on — and one where Europe has the necessary strengths. This requires **creating a single data market, achieving critical mass to rival the Big Data of Big Tech.** This is not a market open to exploitation but a space where data sharing is regulated and controlled, where sharing occurs among trustworthy peers, following our own rules and values.

2.4.2 Companies' private data: our common treasure

Private Data Sharing: the key to success for Generative AI

To establish itself as a leader in the generative AI era, and more so in the age of agentification, Europe must adopt a bold, innovative strategy combining:

- **Pan-European cooperation rooted in Open Source**, fostering collective innovation and transparency.
- **Specialisation of LLMs with minimal or no retraining.**
- **Language Action Models (LAM) technologies paired with multi-agent networks (Agentic AI)**, enabling smooth interaction between AI agents and enterprise Information Systems, paving the way for intelligent automation and optimised autonomous decision-making.

[50] *Metcalfe's Law is a principle stating that the value of a communication network (such as a social network or a computer network) is proportional to the square of the number of users connected to it. In other words, the more participants in a network, the more the value or utility of the network grows exponentially.*

But are these three pillars enough to stand out against today's giants? Unfortunately, no:

- Open Source provides transparency and cooperation, but proprietary and semi-proprietary models (open weights) still often lead in pure performance and adoption (Meta).
- Specialisation is already possible and effective with existing technologies (RAG is already the preferred approach for many companies in Europe and the U.S.).
- LAM and Agentic AI are already at the core of the strategies of several major market players, including among American giants (Open AI, Microsoft, etc.).

Therefore, it is essential for European industries and sectors to go beyond these three approaches to truly stand out and gain an edge. But what remains?

What remains are our data: private data from our companies, administrations, citizens, and industries! Given the colossal financial resources and massive investments of the American giants, it is reasonable to think they already have access to all publicly available data (web, Open Data, etc.) or will eventually access it. Thus, private data holds the true sovereignty lever, allowing us to differentiate ourselves and maintain control.

If Europe wishes to differentiate itself, it must leverage and protect the private data (personal and non-personal) of its companies, administrations, and industries. By pooling and sharing private data in a controlled manner at both sectoral and intersectoral levels, European players can create a sovereign, rich, and diverse data ecosystem, thereby amplifying the power and relevance of generative AI systems.

In short, our collective wealth of private data is far more than a resource for individual use; it is the foundation on which we can jointly build a new form of generative AI. By nurturing this continuum—from shared Data Spaces to RAG to LAM—we chart a new path toward trustworthy, efficient, and ethically responsible generative AI. This collaborative approach, based on large-scale data sharing, not only significantly enhances model performance but also preserves collective sovereignty levers, strengthening Europe's position in the global AI landscape.

Enhanced assistants powered by Shared Private Data

The shift to Shared Data also opens the door to creating augmented assistants that can utilise shared private data (from our companies' and administrations' Information Systems) to provide more sophisticated and personalised services. These assistants, whether used in healthcare, education, travel, or industry, can analyse massive volumes of data to provide precise advice, anticipate needs, and optimise processes.

Thanks to Shared Data, assistants can go a step further by acting on and executing actions within our companies' Information Systems (reserving, scheduling, organising, etc.). We can develop assistants that not only respond to users' questions but also proactively offer customised, automated solutions.

KEY TAKEAWAY

"If we don't share our data, others will centralise it"
Either we share data among ourselves, or it will be handed over to Big AI.

"Private data is the new oil"
Big Tech, despite its unparalleled technological and financial resources, does not have access to the most valuable data: that of our companies[51]. Let's make private data a competitive advantage for our industries.

"Shared data is the new Open data"
By moving past the naivety of full "Open Data" and recognizing the value of companies' private data as a collective asset, we can create an ecosystem where data is shared strategically and securely. This approach not only protects stakeholder interests but also drives innovation and competitiveness through enhanced assistants and other advanced applications.

[51] *This statement disregards the issue of the Cloud Act and assumes that American hyperscalers hosting the data of European companies fully comply with our regulations. QED.*

SHARED PRIVATE DATA AND TRAVEL ASSISTANTS

Shared Data will enable Gen4Travel assistants to leverage numerous private data sources in a controlled manner:

Personal Data (requiring explicit GDPR consent from the user):

- Identification information (government-issued and non-government-issued)
- Travel preferences
- Payment information
- Travel history
- Health data (e.g., PRM status, allergies, etc.)
- Loyalty cards and reward programs
- Personal preferences
- Agenda and calendars
- Biometric data
- Geolocation data

Non-Personal Data (from company Information Systems):

- Service schedules and availability
- Data on service offers and events with pricing conditions
- Promotional offers and discounts
- Destination information
- Entry and exit policies
- Service reviews and ratings
- Real-time notifications (disruptions and delays)

EITHER WE SHARE THE DATA AMONG OURSELVES, OR WE HAND IT TO OVER TO BIG AI.

2.5. CAPITALISE ON DATA SPACES

2.5.1 Data Spaces at the heart of the EU's data strategy

The sharing of private data, or "Shared Data," is a complex issue requiring cooperation between European companies and administrations, along with the creation of ecosystems based on common standards of interoperability and trust. Shared Data is precisely the goal of the European data strategy launched in 2020. This strategy aims to create a single data market with fair and transparent access rules while respecting confidentiality, data protection, and competition laws.

The regulatory framework, primarily comprising the Data Governance Act (DGA) and the Data Act (DA), introduces the concept of "Common European Data Spaces" or Data Spaces[53]. The European Commission is investing nearly €10 billion (2022-2026) through the Digital Europe program to develop these Data Spaces and ensure their coordination across the continent. This project represents an unprecedented standardisation effort across roughly fifteen sectors, including health, finance, agriculture, industry, energy, culture, the Green Deal, mobility, public administration, skills, and many more. While data sharing and actor coordination are not new concepts, the scale and ambition of this project are, however, historical.

DATA SPACE INVESTMENTS & SUBSIDIES

Source	Programme	€	Comment
Germany	National Funding	421 M	Data Ecosystems: Gaia-X Funding Competition (11 Projects), Manufacturing-X, Catena-X, Gaia-X 4 Future Mobility, EuProGigant, Energy data-X.
Spain	National Funding	150 M	Industrial Data Spaces Open Call
	National Funding	50 M	Tourism Data Spaces Open Call
France	National Funding	110 M	40 M Data4industry-X, 70 M€ for new call for tender
Luxembourg	National Funding	20 M	
Denmark	National Funding	4,8 M	
Finland	Sitra	2,6 M	Sitra invested 2,6 mil. of which EUR 625,000 was used to co-finance 5 pilot projects related to data spaces. The co-financing rate covered by Sitra per project was 70%, the rest 30% was covered by project consortia members.
EU	Digital Europe Work Programme 2021-2022	206 M	For topics deploying the sectorial data spaces and the related support activities, including the High Value Data Sets. This set of calls includes the DSSC (14M).
EU	Digital Europe Work Programme 2023-2024	151 M	For topics deploying the sectorial data spaces and the related support activities including actions on Digital Product Passport.
EU	EU4Health	280 M	Implementation of European Health Data Space
EU	Horizon Europe	100 M	Energy data spaces and R&I projects
EU	Digital Europe Work Programme 2021-2022	150 M	Destination Earth initiative
EU	Digital Europe Work Programme 2023-2024	90 M	Destination Earth initiative
TOTAL		**1,735.4**	

Investments already made in Data Spaces (Gaia-X)

[53] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en

WHAT ARE DATA SPACES?

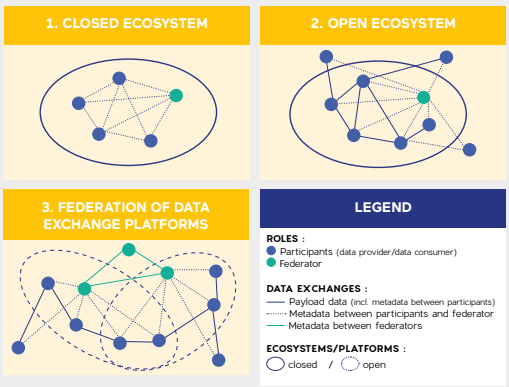
A Data Space is an ecosystem of organisations that voluntarily share data (both personal and non-personal) in a decentralised, controlled, standardised, and regulated way. It is based on a common governance structure that collaboratively establishes the sharing rules among participants. Once these rules are defined, a shared technical infrastructure for data sharing is implemented in line with the principles of this governance.

The adoption of common standards ensures interoperability and strengthens trust between participants within a Data Space, as well as among multiple Data Spaces, creating a broad, multi-sectoral network effect: a 'network of networks'.

Each Data Space applies cross-sectoral standards and labels for data sharing (such as the identity of organisations and individuals, data-sharing contracts, sharing and governance rules, etc.). These common standards are collectively established through support organisations like Gaia-X. Within a sector, Data Spaces agree on semantic standards specific to their field of activity, following the principle of subsidiarity (for example, Data Spaces related to mobility define their own sectoral standards).

Data Spaces can be created in two ways: through a top-down approach, initiated at the sectoral and European levels (such as the EMDS, the European Mobility Data Space), or a bottom-up approach, where consortia of local actors take the lead (for example, EONA-X, developed by French and Spanish industry players, or the German Mobility Data Space, designed by German stakeholders). A global urbanisation approach enables the integration of these various levels (for instance, both EONA-X and the German Mobility Data Space are part of the EMDS).

The collection of European Data Spaces thus forms a federated, open, interoperable, and trustworthy data-sharing ecosystem.



FROM CLOSED ECOSYSTEMS TO DATA SPACES

Blueprint Common Energy Data Space[52]

[52] https://enershare.eu/wp-content/uploads/Blueprint_CEEDS_v2.pdf

The European strategy based on Data Spaces introduces an unprecedented standardisation in data sharing, aiming to break down silos among companies across the 27 EU countries and foster transnational and cross-sector collaboration. Data Spaces represent a new form of data sovereignty, providing an alternative to cloud, data, and AI solutions dominated by non-European actors. Designed for the European market, they are crucial to creating a truly unified digital space that supports the European cloud ecosystem while supplying the essential raw material for training and operating AI.

By pooling data in a decentralised manner, Data Spaces enhance interoperability and trust, thus stimulating innovation through cross-sector collaborations. They allow generative AIs to access, securely and in a controlled manner, to the data of companies and administrations, under the supervision of the data owners, thereby ensuring Europe's digital sovereignty and protecting local actors from disintermediation.

Finally Harnessing the Network Effect with a Single Data Market

One of the main strengths of Data Spaces is their ability to generate a powerful network effect through a single data market. By connecting multiple data sources, organisations gain access to a wealth of information previously out of reach. This not only diversifies insights but also significantly improves decision-making, operational efficiency, user experience, and product innovation. European companies can thus collaborate more closely, develop shared solutions, and open up to broader and more diverse markets.

2.5.2 Data Spaces for capable and responsible AI

Data Spaces play a crucial role in creating interoperable and trustworthy ecosystems, foundational for the development of Artificial Intelligence. By ensuring that shared data is high-quality, controlled by its holders, secure, standardised, and compliant with data protection regulations, these ecosystems enable AI technologies to operate optimally and ethically. It is indeed "important that users of these services have a complete and transparent view of the entire chain." This allows companies to develop more accurate and reliable AI models and assistants, based on verified data from multiple sources, thereby strengthening user and partner trust. This is particularly important as 60% to 80% of AI projects fail to meet their goals due to a lack of data access[54].

As outlined in this report, Data Spaces will provide AI assistants, notably via RAG, with data from companies' Information Systems, enabling advanced specialisation and sophisticated interactions. They will also offer a comprehensive view of the AI Assistant user's context with data from various companies, all while preserving strong control for data owners and producers[55].

Sector Consortia for Data Sharing and Pooling

To maximise the benefits of Data Spaces, the formation of industry/sector consortia is essential. These groups of companies and organisations within the same industry or sector can share and pool their data in a structured and secure way. By working together, these consortia can identify industry trends, optimise their value chains, and co-develop innovations that benefit the entire sector. This inter-company collaboration helps overcome data silos and accelerates the digital transformation of entire industries.

[54] *"The One Practice That Is Separating The AI Successes From The Failures" Ron Schmelzer, Forbes, 2022*

[55] *Value of Gaia-X in the development of the European economy using AI solutions, Hub France Gaia-X, May 2024*

A Competitive Edge in Data Harmonization

Unlike in the United States, where a need is emerging for harmonised data layers[56] essential for generative AI development, Europe has already gained an advantage through its Data Spaces initiatives. Data Spaces are critical in developing applications based on multiple collaborative agents that require a harmonised data layer to function effectively. In Europe, this harmonisation is largely facilitated by Data Spaces, allowing European companies to focus more on innovation (generative AI, LAM, Agentic AI, etc.) and specialisation, rather than on building fundamental data sharing infrastructures. AI agents orchestrated via these Data Spaces can collaborate intelligently by leveraging LLM/LAM capabilities to process data within an adaptive and semi-autonomous ecosystem. These agents use available Data Space data to synchronise their actions with company and user goals, enhancing business process coherence and efficiency.

Interoperability and Trust Standards

The success of Data Spaces relies on establishing interoperability and trust standards. These standards ensure that data can be easily shared across different systems and organisations while maintaining its integrity and security. Clear, widely adopted standards reduce friction and the costs associated with data sharing, while increasing reliability and transparency in stakeholder interactions. By adopting these standards, Europe can create a more coherent and effective data environment, laying the foundation for Capable and Responsible Artificial Intelligence.

KEY TAKEAWAYS

1. **The "Data Space solution" appears to have found its "problem" with generative AI. Without these trustworthy ecosystems, the battle for generative AI would likely be unwinnable.**
2. **One for all, all for one: cooperate by making Data Spaces the trustworthy ecosystems to create sector-specific models and sovereign AI assistants.**

DATA SPACE FOR THE TRAVEL INDUSTRY

As previously mentioned, the Data Space behind the Gen4Travel project is called EONA-X.
This Data Space, dedicated to the travel industry (mobility-transport-tourism), aims to bring together industry players by offering a shared governance framework and a mutual, standardised infrastructure for sharing both personal and non-personal data.
Since the Gen4Travel project and the travel assistants it will enable are being developed within the EONA-X Data Space, the governance of the AI infrastructure (GenAI, LAM, Agentic AI) is strictly regulated and controlled by all stakeholders within the industry/sector.

[56] "From LLMs to SLMs to SAMs, how agents are redefining AI", Dave Vellante, Scott Hebner and George Gilbert, septembre 2024

2.5.3 Take part in a trustworthy Data Space

Joining a Data Space offers an unprecedented opportunity for companies and institutions to collaborate on data valorization, including generative AI topics. A Data Space is a secure, regulated environment (under European frameworks such as the DGA and DA) where organisations can share and exchange data, thereby stimulating innovation and competitiveness.

Joining a Data Space offers an unprecedented opportunity for companies and institutions to collaborate on data valorization, including generative AI topics. A Data Space is a secure, regulated environment (under European frameworks such as the DGA and DA) where organisations can share and exchange data, thereby stimulating innovation and competitiveness.

By joining a Data Space, you can access diverse informational resources, benefit from sector insights provided by your partners, and co-develop solutions that address your industry's specific challenges.

Participate in your sector's governance

Taking part in your sector's governance within a Data Space is essential to influence strategic directions and ensure that the specific needs of your field are met. By being involved in the decision-making process, you can help establish standards, security protocols, and sharing mechanisms that foster efficient and fair collaboration. Your participation in governance ensures that the interests of your organisation and sector are represented and safeguarded.

Collaborate for funding opportunities

Obtaining funding for Data Space initiatives can be made easier through a collective approach. By forming sectoral consortia with other players in your industry, you can "hunt as a pack" to access larger funds and secure stronger support from financial institutions and grant programs. This collaborative approach enables you to present more robust projects with greater potential impact, thereby increasing your chances of success in project applications and funding requests[57].

Join an existing Data Space

Joining an established Data Space provides numerous benefits, including immediate access to an existing infrastructure and a network of partners ready to collaborate. This approach saves time and allows you to leverage the experience and resources already available within the Data Space. Many sectors have already initiated Data Spaces, offering ready-made opportunities for companies seeking secure and regulated data-sharing solutions (for example, Agdatahub for agriculture, Omega-X for energy, Prometheus-X for education, Catena-X for automotive, EONA-X for mobility and tourism, etc.).

Initiate a Data Space if your sector doesn't have one

If your sector doesn't yet have a Data Space, it might be worth starting one. However, it's crucial to avoid an excessive proliferation of Data Spaces. It's better to create large, comprehensive Data Spaces that broadly address the sector's challenges, allowing for the development of various use cases involving different stakeholders. This approach maximises the network effect and avoids fragmentation, which could reduce the effectiveness and impact of data-sharing initiatives. Simply put, "It's the same logic as with physical infrastructure: we don't build multiple roads or sewer networks with the same objectives in parallel".[58]

[57] Digital New Deal has created a "Do Tank" aimed at structuring this approach: building a trustworthy Cloud-Data-AI ecosystem such as Data Spaces, launching consortiums to respond to European tenders (for example, InfrateX, co-winner of the €150 million Simpl call), etc.

[58] Excerpt from the report "Public Data-Sharing Infrastructures," Laura Létourneau, Digital New Deal - Terra Nova, September 2024

DEVELOPING A DATA SPACE CULTURE

Creating Data Spaces is a complex process that requires not only advanced technical skills in architecture, engineering, and cybersecurity but also capabilities in project management, change management, and legal compliance. The scarcity of talent in these fields, compounded by global competition for digital skills, represents a major challenge.

It is essential for companies to adopt a data culture that goes beyond simply using tools, moving toward understanding the value of shared data and its strategic use, including at a industry/sectoral level. This is why these transformations also require a revision of corporate training programs, rigorous planning, adequate training for employees, and an adapted HR strategy.

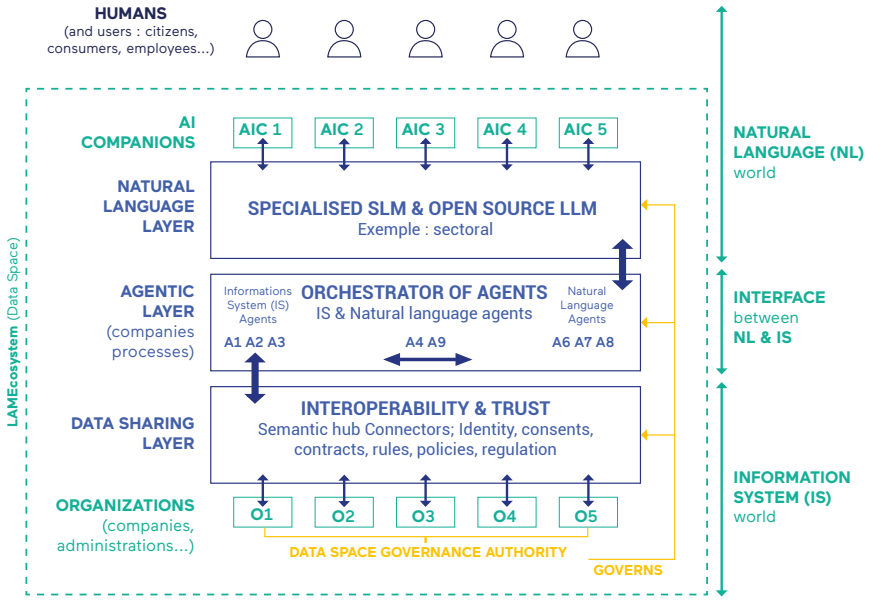
However, by joining a Data Space, companies can leverage the skills already available in these spaces, reducing the need for specific hires. The main challenge remains to build a strong enough data culture to effectively leverage these resources and the potential afforded by pooling resources and expertise within the Data Space.

KEY TAKEAWAYS

1. **Data Space as the Framework for Digital Cooperation: :** Build a sector-specific trustworthy ecosystem around data sharing (e.g., EONA-X for transport-mobility-tourism).
2. **Trustworthy Data as the Foundation for Trustworthy AI:** Use this governed data infrastructure to enable sector-based generative AI via RAG on enterprise data (e.g., Gen4Travel from EONA-X).
3. **Truly Open Source AI Models:** Gain independence from GAMAM while fostering innovation through open collaboration and a combination of public and private research (e.g., Gen4Travel with Open LLM).
4. **Agentification, the "Data-AI Climax":** Develop sovereign "AI companions" or "AI assistants" through LAM and sector-specific agents.

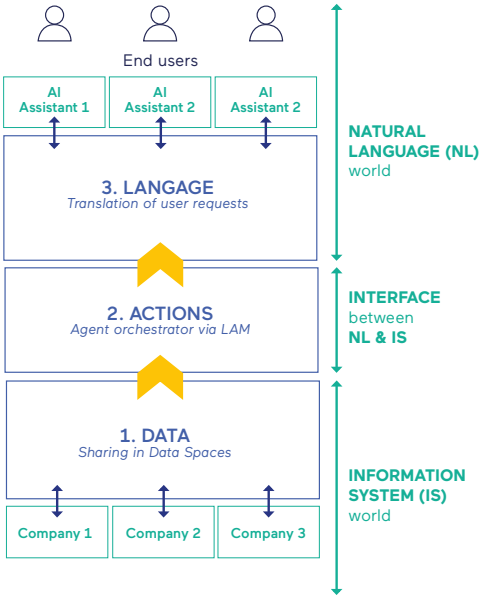
TRUSTWORTHY DATA, THE FOUNDATION OF TRUSTWORTHY AI.

III. CREATING A NEW ARCHITECTURE FOR CAPABLE AND RESPONSIBLE AI



The overarching architecture we propose for developing a Capable and Responsible AI — a truly differentiating strategy for Europe — is based on a new model of cooperation: Data Spaces. These Data Spaces enable optimised sectoral governance for data sharing and integration of high-value services, such as generative AI.

We suggest calling this model DUCAI (Data Union for Capable AI).



While current Data Spaces are primarily focused on data sharing, we propose a more comprehensive Data Space architecture to meet the evolving needs of AI, structured into three distinct layers.

1. **Data**
2. **Actions**
3. **Langage**

Layer 1 - Data: This foundational layer encompasses all the software tools allowing Data Space participants (often within a specific sector) to share data among themselves and potentially with other Data Spaces later on. It ensures interoperability and trust among participants, aligning with European regulations and standards. This layer handles elements like identity management, contracts, consent, and semantic connectors. Rooted in enterprise IT systems, it guarantees that each data point (structured or unstructured) has a clear rights holder (organisation or individual), governed by strict usage and purpose policies.

Layer 2 - Actions: This layer enables the exploitation of shared data within the Data Space to carry out various actions upon the end user's request, with a variable degree of autonomy for each agent (LAM and Agentic AI approach). It includes a network/constellation of agents (services or programs) capable of performing specific tasks such as listing offers, matching offers with user profiles, booking or rescheduling services, etc. This layer also has an orchestrator that coordinates agents to execute complex tasks involving multiple agents. Some agents may be provided by the Data Space itself (e.g., language translation agents), while others are supplied by specific participants (e.g., a hotel provider may offer a room booking agent). Additionally, the Actions layer includes a sector-specific Large Action Model (LAM), which enhances orchestrator intelligence and optimises interactions between agents based on end-user needs. RAG agents are also embedded here to bridge the Actions and Language layers, using complex, multi-RAG approaches (e.g., combining document-based searches with knowledge graph queries) to ensure reliable responses to complex user requests that trigger actions across multiple Data Space systems.

Layer 3 - Language: This layer focuses on human interaction and interpreting users' natural language requests. Connected to the Actions layer through RAG agents, it translates human requests into actionable tasks. It includes multiple interoperable Large Language Models (LLMs), directly accessed by the AI assistants that rely on the Data Space.

Importance of Layer Separation

- **Data Preprocessing for the Language Layer**
  LLMs in Layer 3 may be created from scratch or fine-tuned from generic models as needed. However, according to the layer separation principle, raw data from Layer 1 should never be directly used by these models; they must pass through Layer 2 (Actions). This approach ensures that raw data is processed intelligently, preserving sensitive information and safeguarding business expertise. Preprocessing measures, like anonymization for personal data, are required before they reach Layer 3.

- **Central Role of the Actions Layer (Agents)**
  The core system intelligence — defined as the ability to develop and apply complex reasoning to business processes — resides within Layer 2 (Agents). This is the system's nucleus, where sophisticated analyses and decision-making occur.

- **Specific Function of the Language Layer**
  Layer 3 acts primarily as a natural language processing interface, focusing on language comprehension and generation, linking users to the system without directly engaging in advanced reasoning and business intelligence.

Governance of the DUCAI System

While system data originates from participants and agents may be operated by them,

the Data Space itself assumes governance responsibilities for all three layers. **Data Space governance (meaning the sector/industry) ensures layer separation and the consistent application of shared rules across each layer.**

GEN4TRAVEL'S DUCAI ARCHITECTURE

In terms of our Data Union for Capable AI (DUCAI) layered architecture, it is naturally the EONA-X Data Space that governs the entire Gen4Travel project.

EONA-X already has layer 1 (Data). The Gen4Travel project therefore aims to enhance Gen4Travel with layers 2 (Agents) and 3 (Language), to enable the consortium's industry and technology players to develop their Travel Assistants.

BEHIND THE QUESTION OF GENERATIVE IA, THE QUESTION OF GENERAL AI.

CONCLUSION

If history has taught us anything, it's that the greatness of a civilization rests on its ability to unite its strengths. This is precisely what Europe must achieve to become a leader in the development of Capable and Responsible generative AI.

In the face of monopolies, Europe must decisively choose cooperation by making Data Spaces the beating heart of this unified digital market we aspire to build.

This vision carries a scent of renaissance: a Europe reinventing itself, not by closing in, but by constructing an intelligent collaboration between humans and machines, jointly shaping a future that is chosen, not imposed.

By integrating Data Spaces, European companies are not merely securing their data; they are laying the groundwork for a Europe capable of setting its own rules, aligned with its values of ethics and transparency. This new digital architecture is an opportunity to position Europe as a global AI leader. It is crucial for companies to unite around these shared spaces, as in the travel industry/sector, to create the Gen4Legal, Gen4Finance, or Gen4Health of tomorrow.

This holds even greater strategic importance as, behind the issue of generative AI, lies the broader challenge of general AI. The race toward AGI (Artificial General Intelligence), capable of surpassing human capabilities in numerous domains, is already shaping the American market, fueled by massive investments aimed at realising a libertarian vision of technology.

Adopting a uniquely European strategy in generative AI would not only preserve our autonomy but also prevent a handful of American billionaires from once again dictating their vision of the future. Europe neither has the resources nor the interest to engage in another race for technological and financial gigantism. Instead, it should approach AI through the lens of digital urbanisation and the creation of trust-based ecosystems, to remain central to the global digital architecture.

If Europe can leverage private data to harness generative AI, it may be better prepared to face the challenges of general AI.

Ethical, human-centred artificial intelligence, built on a network of urbanised AI agents, powered by trustworthy private data — this is the European ideal we propose.

OLIVIER DION

Olivier Dion, telecommunications engineer and Open Data pioneer, is a renowned expert in data sharing across Europe. As a consultant and educator in data and artificial intelligence, he founded the startup Onecub in 2011, specialising in GDPR data portability and sharing of personal data. He collaborates with key stakeholders in the Data Spaces ecosystem, engaging with various actors in the European data community. Olivier contributed to the development of GDPR (notably the right to portability) with the CNIL, as well as the DGA on data intermediary issues, and the European data strategy with the European Commission. He plays a pivotal role in creating Data Spaces in multiple sectors (tourism, mobility, space, legal, energy, education, etc.). Additionally, he co-authored the report "Data de confiance: data sharing as a key to our strategic autonomy" for the Digital New Deal think tank and coordinates Data-AI consortiums, such as InfrateX, Gen4Travel, and Themis-X, initiated by the Do Tank - Digital New Deal.

MICHEL-MARIE MAUDET

Passionate about Linux's potential since the 1990s, Michel-Marie co-founded LINAGORA in 2000 and has been dedicated to promoting open standards and technologies, foreseeing the crucial role of Open Source in today's tech landscape. In response to GAFAM's dominance in AI, he launched LinTO, an entirely Open Source personal assistant, in 2016, embodying his vision of accessible, inclusive, and transparent technology. In June 2023, he founded OpenLLM France, a community focused on developing truly sovereign, Open Source digital commons based on public data and transparent algorithms. Believing that France and Europe's digital future relies on code and algorithms, Michel-Marie advocates for sovereign AI as a driver of economic growth and industrial competitiveness. He champions a third digital path, combining openness, ethics, and responsibility, to balance the American and Chinese stronghold in AI.

ARNO PONS

As General Secretary of the Digital New Deal think tank, Arno Pons co-authored four reports on trustworthy digital infrastructure (Trustworthy Cloud; Trustworthy Digital Infrastructure; Trustworthy Data; and Trustworthy AI for France 2030). He founded the Do Tank - Digital New Deal, focusing on collaborative solutions to support businesses in structuring industries into trust-based ecosystems through technological alliances. Since 2022, the Do Tank has launched several digital initiatives: SCOVERY - The European Cyber Scoring Agency; INFRATEX - a European consortium selected by the European Commission for SIMPL; THEMIS-X, which later merged with EONA-X to create a unique data space; and GEN4TRAVEL, a consortium dedicated to generative AI for the travel sector. He has also taught at Sciences Po on digital sovereignty issues related to Big Tech's centralization of power and previously founded several startups (Checkfood - food waste, Medicimo - Canadian search engine, CityLuxe - premium online tourism).

SUMMARY OF PROPOSALS

KEY FOCUS AREAS FOR GENAI STRATEGY:

- Prioritise trust (ethics and reliability) over raw power.
- Adopt an integrated Cloud-Data-AI ecosystem approach rather than isolated AI solutions.
- Anticipate the rise of AI assistants as new interfaces for human interaction with businesses and administrations.
- Position as a pioneer in the next revolution of agentification and Large Action Models (LAM).
- Leverage the sharing and access to private data as a competitive and strategic asset for sovereignty.

STEPS FOR ACTION:

Unite efforts within each industry/sector.

1. Build common generative AI foundations based on Open Source to foster sectoral cooperation.
2. Adapt and customise generative AI models to meet each sector's specific needs.
3. Favour the RAG (Retrieval-Augmented Generation) approach, which doesn't require retraining, to tailor models instead of relying on fine-tuning.
4. Create sector-specific LAMs (Large Action Models) alongside a multi-agent architecture (Agentic AI) to transform conversational assistants into fully intelligent agents.
5. Enable LAMs to access private data from corporate information systems through Shared Data.
6. Develop these sector-specific initiatives within dedicated Data Spaces.
7. Implement a DUCAI (Data Union for Capable AI) architecture in three distinct layers (Data, Actions, Language) within the Data Space.

IN SUMMARY:

Let's collaboratively build "capable" and "responsible" AI.

- Seize the opportunity of Data Spaces to propel key sectors (health, mobility, education, etc.) to the forefront of generative AI.
- Make private data sharing among businesses the core of our value and our primary lever of sovereignty.
- Move beyond LLMs and focus now on LAMs to create new real-world interaction capabilities that will transform conversational assistants into all-purpose, daily-use agents.

OUR RECOMMENDATION IN ONE FORMULA FOR A TRUSTWORTHY,
AUTONOMOUS GENERATIVE AI:

OPEN SOURCE LLM + RAG FROM SHARED ENTERPRISE DATA =
TRUSTWORTHY LAM = LAM DE CONFIANCE

EXEMPLE AVEC FILIÈRE TOURISME

ONE-PAGE SUMMARY

This report proposes a strategy for European companies in response to the rise of Generative Artificial Intelligence (GenAI).

Avoiding past mistakes

The goal is to avoid the same naïveté that accompanied the emergence of Web2 twenty-five years ago, which cost us heavily in terms of competitiveness and sovereignty. We must prevent what we call "squared lock in" (GenAI = Web2²). If we do not act, our companies risk becoming even more entrenched under BigTech influence, caught between BigClouds (hyperscalers like Azure, AWS, or GoogleCloud) on one side and BigAI (like OpenAI or Gemini) on the other.

A pragmatic approach to gigantism

We need to be realistic and focus our efforts on achievable goals. The race to accumulate data for LLMs is over (Large Language Models are already standard products, as Yann LeCun points out). There is no point in scraping all data from the web as the giants do. Not only does this raise ethical and legal questions, but it also misguides us. Europe should focus on a category of data that holds the most value and is the only data BigTech does not yet control: the data from our enterprises.

Leveraging private and collaborative data

We propose capitalising on this private data by leveraging the European Data Strategy, which encourages data sharing among companies to create a single data market comparable to those in the U.S. and China and finally benefit from network effects. Practically, this requires participating in Data Spaces, trustworthy ecosystems that offer the right scale and governance to create generative AI tailored to each sector. This is the best solution to avoid dependency on "Powered by …" or the counterproductive pursuit of a single-company model.

An industrial focus on Large Action Models (LAM)

In line with the Draghi report, which urges bold technological bets, we propose focusing on Large Action Models (LAM). Rather than solely concentrating on language models (LLM), we believe Data Spaces should help create generative AI dedicated to the autonomous execution of actions (agentification). These innovative models provide a strategic advantage to Europe through access to enterprise data—a domain where Data Spaces are particularly suitable.

Following the example of the EONA-X Data Space for Transport and Tourism with Gen4Travel

EONA-X has launched the Gen4Travel consortium to develop a LAM dedicated to the travel sector. This model will enable member companies' "Travel conversational assistants" to become autonomous intelligent agents capable of automating complex tasks, such as booking or cancelling flights and hotels in case of issues (including payment handling). This approach will help the tourism sector avoid an additional layer of disintermediation, preventing a "Booking or TripAdvisor agent" from dominating the space.

ACKNOWLEDGEMENTS

FOR THEIR CONTRIBUTIONS:

Arno Amabile — rapporteur général de la Commission IA

Guillaume Avrin — coordonnateur national pour l'intelligence artificielle (DGE)

Julien Chiaroni — ex-directeur Grand Défi Intelligence Artificielle (SGPI-France 2030)

Maxence Demerlé — directrice du numérique, MEDEF

Frédéric Josué — fondateur 18M.i.o, enseignant à Sciences Po

Francis Jutand — ex directeur général de l'Institut Mines Télécom (IMT)

Alexis Kasbarian — responsable du pôle transition et innovation, MEDEF

David Krieff — président EONA-X, directeur des systèmes d'information des Aéroports de Paris (ADP), administrateur du Cigref

Yann Lechelle — co-founder CEO :Probabl, co-fondateur France Digitale, entrepreneur in residence INSEAD et Inria

Yves Nicolas — deputy group CTO, AI group program director, Sopra Steria

FOR THEIR ASSISTANCE:

ChatGPT (Open AI), **Le Chat** (Mistral AI) and **Perplexity,** who helped the authors draft this report.

[64] Any factual, grammatical or syntactical errors in this report remain the sole responsibility of the authors...

DIGITAL NEW DEAL
THINK-DO-TANK

Digital New Deal supports private and public decision-makers in creating a European and Humanistic Digital Enlightenment. We believe in offering a third digital path by aiming for a dual objective: defending our values by establishing a framework of trust through regulation (think-tank) and defending our interests by creating trusted ecosystems through cooperation (do-tank).

Our publication activity aims to shed the most comprehensive light possible on the ongoing developments in the field of "digital sovereignty," in the broadest sense of the term, and to develop concrete action plans for economic and political organizations.

Olivier Sichel (founding president) and Arno Pons (general delegate) steer the think-tank's strategic directions under the regular oversight of the board of directors (composition below).

SÉBASTIEN BAZIN
PDG AccorHotels

NATHALIE COLLIN
General Manager, Consumer and Digital Division La Poste Group

NICOLAS DUFOURCQ
DG of Bpifrance

AXELLE LEMAIRE
Former Secretary of State for Digital Technology and Innovation

ALAIN MINC
President AM Conseil

DENIS OLIVENNES
DG Libération

ODILE GAUTHIER
DG de de l'Institut Mines-Telecom

ARNO PONS
General Delegate of the Digital New Deal think tank

JUDITH ROCHFELD
Associate Professor of Law, Panthéon Sorbonne

OLIVIER SICHEL
President Digital New Deal
DGA Caisse des Dépôts

BRUNO SPORTISSE
PDG Inria

ROBERT ZARADER
PDG Bona fidé

Digital New Deal

OUR PUBLICATIONS

Infrastructures publiques de partage des données : les grandes oubliées I Laura Létourneau - *September 2024*

Strengthening pan-european democracy in the era of AI I Axel Dauchez, Hendrik Nahar - *April 2024*

Digital for a sustainable future I Véronique Blum, Maxime Mathon - *June 2023*

Trustworthy AI: a strategic opportunity for industrial and digital sovereignty | Julien Chiaroni, Arno Pons - *June 2022*

Trustworthy data: data sharing, key to our strategic autonomy | Olivier Dion, Arno Pons - *September 2022*

Cybersecurity: safeguarding our strategic autonomy | Arnaud Martin, Didier Gras - *June 2022*

GDPR, ACT II. Collective control of our data as an imperative | Julia Roussoulières, Jean Rérolle – *May 2022*

Digital taxation, the return leg | Vincent Renoux - *September 2021*

Defending the rule of law in the age of platforms | Denis Olivennes et Gilles Le Chatelier - *June 2021*

Cloud de confiance : un enjeu d'autonomie stratégique pour l'Europe | Laurence Houdeville et Arno Pons - *May 2021*

Livres blancs : partage des données & tourisme | Fabernovel et Digital New Deal - *April 2021*

Partage de données personnelles : changer la donne par la gouvernance | Matthias de Bièvre et Olivier Dion - *September 2020*

Reflections in the perspective of the European Digital Services Act | Liza Bellulo - *March 2020*

Préserver notre souveraineté éducative : soutenir l'EdTech française | Marie-Christine Levet - *November 2019*

Big Tech Regulation: Empowering the many by regulating a few | Sébastien Soriano - *September 2019*

Sortir du syndrome de Stockholm numérique | Jean-Romain Lhomme - *October 2018*

Le Service Public Citoyen | Paul Duan - *June 2018*

L'âge du web décentralisé | Clément Jeanneau - *April 2018*

Fiscalité réelle pour un monde virtuel | Vincent Renoux - *September 2017*

Réguler le « numérique » | Joëlle Toledano - *May 2017*

Appel aux candidats à l'élection présidentielle pour un #PacteNumérique | *January 2017*

La santé face au tsunami des NBIC et aux plateformistes | Laurent Alexandre - *June 2016*

Quelle politique en matière de données personnelles ? | Judith Rochfeld - *September 2015*

Etat des lieux du numérique en Europe | Olivier Sichel - *July 2015*

November 2024

www.thedigitalnewdeal.org