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ARTHUR LITTLE

PRISM

BIG THINKING,
IMAGINING WHAT
IS COMING NEXT



HUMAN
AFTER ALL

THE PRISM BOARD

Shinichi Akayama

akayama.shinichi@adlitttle.com

Etienne Brumauld des Houlières

brumaulddeshoulières.etienne@adlitttle.com

Rick Eagar

eagar.richard@adlitttle.com

Dr. Raymond Khoury

khoury.raymond@adlitttle.com

Dr. Michaël Kolk

kolk.michael@adlitttle.com

Florence Carlot

carlot.florence@adlitttle.com

Michael Majster

majster.michael@adlitttle.com

Francesco Marsella

marsella.francesco@adlitttle.com

Albert Meige

meige.albert@adlitttle.com

Daniel Monzon

monzon.daniel@adlitttle.com

Andreas Schlosser

schlosser.andreas@adlitttle.com

Ben van der Schaaf

vanderschaaf.ben@adlitttle.com

ARTHUR LITTLE

Arthur D. Little has been at the forefront of innovation since 1886. We help companies continuously anticipate, innovate, and transform to achieve sustained business success in today's disruptive business environment:

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- Transform organizations, processes, and cultures to continuously adapt.

We are problem solvers and combine deep industry insight, functional skills, and entrepreneurial flair to find and deliver new solutions. With our open consulting approach we bring the best global experts to every assignment, complementing our internal strengths. We are proud to be present in the most important business centers around the world, serving the world's leading corporations and public sector organizations.

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Yumo Ito, Trung Ghi



EDITORIAL

DEAR READER

Unless you're a fan of their music, you might not know that "Human After All" is the title of the third album of electronic music duo Daft Punk. Its central message, amid a robotic beat, is that despite technological advancement, at the center we remain human beings with all our unique talents and vulnerabilities. This is something business executives are becoming increasingly aware of. Norms and expectations for staff wellbeing have been changing rapidly, and the explosion of artificial intelligence (AI) has raised big questions — and concerns — about the role of humans in the workplace, and indeed, the future of human intelligence itself. So, we wanted to devote this issue of Prism to ourselves — humans!

A good place to start is to ask the leaders of the world's biggest companies. We're pleased to bring you the results of our 2024 Global CEO Insights Study, which confirms that CEOs recognize clearly the need to focus much more on people and skills in an uncertain, AI-transformed future. Reskilling just moved to the very top of the corporate agenda.

Zeroing in on innovation and R&D, we bring you another groundbreaking ADL study into the digitally and AI-enabled lab of the future, and we have a clear conclusion: it's people centric. It's all about making people the best innovators they can possibly be. How well AI is integrated with human intelligence — rather than AI itself — will be what determines the world-beating enterprises of the future.

In 2024, people between 18 and 30 years of age, known as "Gen Z," will make up over a quarter of the global workforce. As the first digital native generation from birth, having grown up in a very different world to that of the late 20th century, they are not like the rest of us. In our third article, we explore how organizations can attract and retain this key cohort, so crucial for the future.

You might think that healthcare is, by definition, human centric, but in fact, that's not always the case. Our next article looks at how pharmaceutical companies can become more patient centric, a growing determinant of success in a highly competitive marketplace.

Our final articles look at two more important aspects of the AI future. Firstly, we look at what AI means for the future capabilities of software development organizations, whether in-house or service providers. And secondly, based on in-depth studies by ADL's future technology institute, Blue Shift, we address a topic that's often rather superficially covered: AI risk. We look at the range of AI risks, and what companies can do to make sure they properly manage their exposure.

To round things off, it's our pleasure to bring you an exclusive interview with Jeremy Nixon, CEO of one of the world's fastest-growing maritime shipping companies, Singapore-based ONE. Jeremy shares some fascinating insights about how to grow a successful and sustainable global business — with a special emphasis on "being very human."

We hope you enjoy the issue!



Rick Eagar
Chief Editor, Prism
Arthur D. Little

OPTIMISTIC GLOBAL CEOS



FOCUS ON PEOPLE
AND SKILLS IN AN
AI FUTURE

AUTHORS

Francesco Marsella, Ralf Baron, Petter Killefors,
Maximilian Scherr, Satya Easwaran

Embracing the opportunities that artificial intelligence (AI) and talent together can unlock, CEOs are looking beyond the current instability, and increasingly confident about the future prospects for their organizations and the wider economy. Two-thirds are highly positive about the global outlook over the next three to five years, a major increase from 2023. Given that global tensions have worsened over the last 12 months, with conflict in the Middle East, disruptions to Red Sea supply chains, and the continuing war in Ukraine, this optimism is dramatic and heartening. CEOs understand that they have to operate in a volatile, uncertain, complex, ambiguous world, and be agile, responsive, and resilient.

Despite the fact that we're entering an age defined by AI and automation, people remain crucial to long-term business growth. That's one of the key findings of the second global Arthur D. Little CEO Insights Study. This in-depth research among CEOs from companies with over US \$1 billion in revenues finds that as companies embrace AI, they are investing equally heavily in reskilling their people to maximize its benefits. This picture holds true across the different regions of the world and within the six sectors (telecoms, energy & utilities, manufacturing, travel & transportation, healthcare, and financial services) that the study covered.

As we'll explain in this article, they are investing for growth and aiming to develop their people internally to unlock the potential of AI and drive success. Looking to the future, they want to help shape the next generation of leaders based on attributes such as ethical behavior, sustainability, diversity, and inclusion, and focus on the customer.

CEOS SEE TECHNOLOGY AS THE PRINCIPAL GROWTH DRIVER IN AN UNCERTAIN WORLD

Technology innovation remains the most critical driver for growth, according to CEOs — a fact that has not changed since 2023. One-quarter of all CEOs listed it as one of the top two most important factors, rising to 34% in South America and 29% in North America. This was ahead of areas such as raw material/energy prices, supply chain pressures, and disruptive competitors.

About the Study

ADL's 2024 Global CEO Insights Study comprised interviews with 282 CEOs from companies with more than \$1 billion in turnover, 39% of whom led businesses with annual revenues of over \$10 billion. CEOs were equally distributed across telecoms, energy & utilities, manufacturing/automotive, travel & transportation, healthcare, and financial services, and based across Europe, Asia, the Middle East, Africa, and the Americas.

CEOs recognize that the ground rules of business have changed, and that stable markets that evolve incrementally have gone forever. They need to operate in an unstable world, with 80% of CEOs expecting to pay more management attention to volatility, uncertainty, and related topics over the next three to five years. CEOs aim to combat this volatility through greater customer focus, closer links with suppliers, scenario planning, and, most of all, technology and people. On the technology side, they are aiming to implement more sophisticated risk management tools, improve business intelligence, increase efficiency, and provide greater flexibility within operations.

"We are making investments in cutting-edge technologies that can provide us with a competitive advantage in erratic markets."

CEO, healthcare

Hearteningly, half of CEOs feel that their company has a high level of readiness to adapt to greater uncertainty, with 16% feeling that their structures are superior to those of the wider market. This shift in adaptation is led by larger organizations, of which 28% judge their capabilities as superior.

“We are going to put more effort into becoming more flexible and agile so that we can react fast to shifting market conditions. This entails implementing adaptable business strategies and encouraging an innovative culture.” **CEO, financial services**

EMPOWERING TALENT TO MEET CHANGING NEEDS

CEOs agree that the second key element for success in this environment is their people. Here they recognize a need to invest in training and reskilling to ensure their employees can support their more agile operations. On average, 92% of CEOs feel that at least some reskilling is required for success. Nearly 70% of CEOs from \$10

billion+ companies feel that they still have a strong or very strong need to reskill staff to adapt to a more volatile environment, compared to just over half of the \$1–10 billion turnover group.

HEARTENINGLY, HALF OF CEOs FEEL THAT THEIR COMPANY HAS A HIGH LEVEL OF READINESS TO ADAPT TO GREATER UNCERTAINTY, WITH 16% FEELING THAT THEIR STRUCTURES ARE SUPERIOR TO THOSE OF THE WIDER MARKET.

Agility has to be led from the top, with CEOs taking a much more hands-on approach to running their businesses. As well as driving faster change and improved strategic

decision making, the CEO Insights Study shows that they are focusing on empowering their people with the right technology, access to knowledge, and relevant skills to create truly agile organizations that are flexible and responsive to current and future market conditions.

CEOS WELCOME THE RISE OF AI AND ARE LOOKING TO TAP INTO ITS BENEFITS

The record-fast rise of generative AI, and the growing maturity of AI more generally, offers transformative possibilities (and challenges) to businesses, whatever sector they are in. As the responses of CEOs show, in many ways, progress has been swift. Almost all executives claim to have implemented an AI strategy within at least one department of their organization. Nearly half say they already have a strategic view of AI across the business.

However, turning vision into reality is more complex. Only 13% of CEOs have so far adopted a holistic, compelling, and companywide AI strategy, demonstrating that they are still on a transformation path to fully understand the impact of AI and integrate it across the organization. In many ways this is unsurprising — fully benefiting from AI requires enormous structural and workforce change, which will only be felt over time. There are major challenges in moving from a strategic view to an actual strategy and then implementing it.

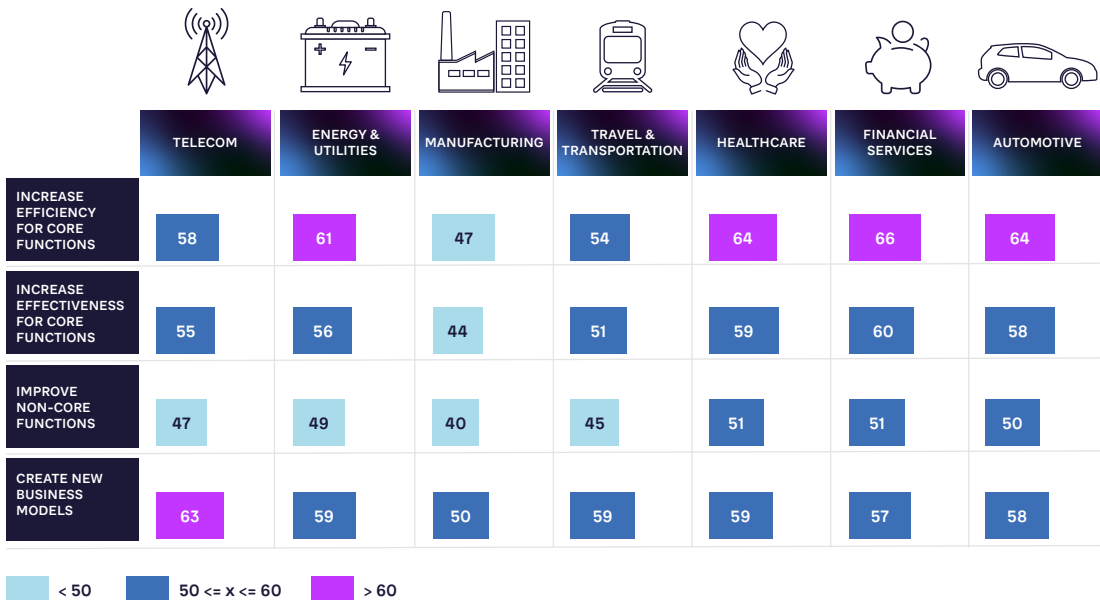
The furthest advanced in AI strategy are companies within Asia (75% having a companywide strategy or strategic view), those in financial services (79%), and \$10 billion+ organizations (67%). A clear divide is shown between organizations that feel they are leading their markets, of which 24% have a companywide strategy in place, and laggards, none of which have implemented such a compelling strategy.

WHAT ARE CEOS USING AI FOR?

Backing up the fact that organizations are early in their AI transformation, analysis shows that CEOs are predominantly focused on using AI to make core functions better by increasing efficiency and effectiveness, such as through automation. Efficiency and effectiveness are the leading use cases in the majority of sectors¹, as shown in Figure 1. The sole exceptions are telecoms, travel/ transportation, and manufacturing, which are moving beyond efficiency to use AI to create innovative new business models. Essentially, while CEOs recognize that AI is disruptive, they also understand that the real step changes in transforming their business are yet to come, and that they have work to do to harness AI at a deeper level.

“We will take advantage of technology, such as artificial intelligence and data analytics, which can give us real-time insights and support employees in making wise decisions in dynamic market environments.”

CEO, telecoms



Note: For this question automotive was split from the overall manufacturing sector, as it provided radically different results in terms of AI usage.

FIGURE 1: USE OF AI FOR DIFFERENT PERFORMANCE VECTORS PER INDUSTRY (0-100)

1. For this question automotive was split from the overall manufacturing sector, as it provided radically different results in terms of AI usage.

"We are using AI and advanced analytics to find patterns, forecast trends, and evaluate risks in volatile and complex markets." **CEO, financial services**

WHY AI INCREASES THE IMPORTANCE OF HUMANS

AI drives the transformation of the entire organization — its structures and business models and the markets it operates in. In order to harness and successfully exploit the potential of AI, CEOs understand that they require new skills across their workforce. Reskilling is therefore vital — and needs to be far reaching and transformative to match changing corporate needs. This is less about the automatic replacement of humans with AI. Rather, it is about ensuring that as roles change, employees are equipped to work with and manage AI to thrive in an unpredictable world and deliver on corporate goals.

"To create more intelligent strategies, we have combined human expertise with AI capabilities." **CEO, healthcare**

Recognizing this requirement for change, 99% of CEOs see the need for at least some reskilling, up from 88% in 2023 (see Figure 2). The scale of the issue has dramatically increased over the last 12 months thanks to the speed and wide-ranging impact of AI's rapid rise:

- Nearly 60% of CEOs now see a strong or very strong requirement to reskill their employees, up from just 13% in 2023.
- Nearly 60% of manufacturing CEOs see a strong/very strong need to reskill in 2024, compared to 5% in 2023.
- Over 60% of financial services CEOs see a strong/very strong need to retrain their people, compared to 10% in 2023.

"In today's dynamic and fast-paced business environment, the lesson is to train for adaptability." **CEO, energy & utilities**

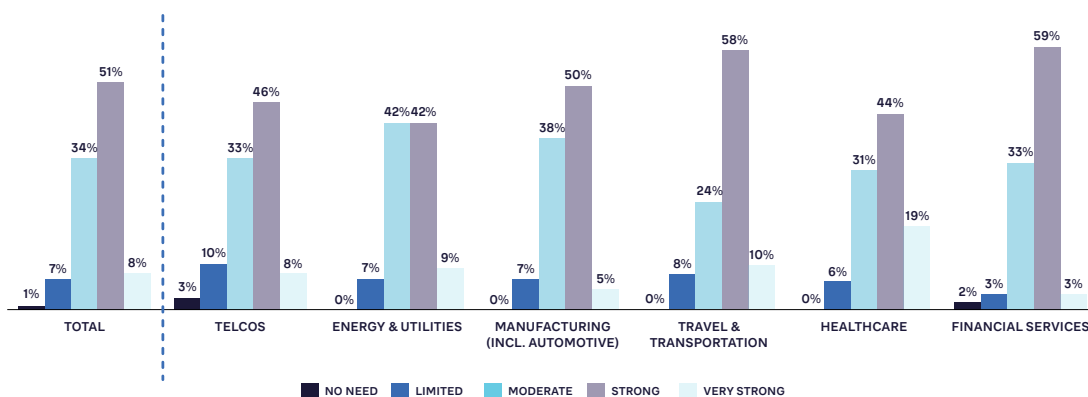


FIGURE 2: THE NEED FOR RESKILLING ACROSS SECTORS

CHANGING CULTURES TO THRIVE IN AN AI WORLD

Alongside investing in training and talent, CEOs understand that their cultures have to transform. They need to be able to attract and retain talent with the right skills, attitudes, and behaviors to successfully exploit AI. This requires change, particularly in traditional, hierarchical businesses in which promotion is linked to length of tenure rather than innate capabilities. Digital natives from Generation Z are increasingly important. The article “The Future Workforce: Recruiting and Retaining Vital Generation Z Talent,” elsewhere in this issue of *Prism*, provides more details on how to meet their specific requirements by reshaping processes, cultures, and practices.

“We will increase our investments in employee training and development, cultivate a favorable workplace atmosphere, and execute flexible workforce tactics to adjust to evolving business circumstances.”

CEO, healthcare

For global organizations, successfully managing AI and volatility through traditional, centralized structures is difficult. Instead, new levels of leaders across the business need to be empowered and trained to take make decisions in a faster, more informed way, as well as innovate based on their particular knowledge of specific areas and market conditions.

“In order to enable our staff to react swiftly to shifting market conditions, we will work to provide them greater freedom to make decisions at their level.” **CEO, financial services**

“We place a high priority on leadership development, skill enhancement, and employee training in order to produce a highly competent and flexible workforce that can successfully go through shifting market conditions and contribute to the success of the organization.” **CEO, telecoms**

GREATER FOCUS ON INTERNAL TALENT DEVELOPMENT TO BALANCE EXTERNAL RECRUITMENT

Previously, CEOs relied heavily on external sources for new capabilities and talent, primarily headhunters and cooperation with universities. However, in 2024 this focus has shifted, with the largest percentage (30%) now looking to internal academies to deliver talent and skills (see Figure 3), up from 21% in 2023.

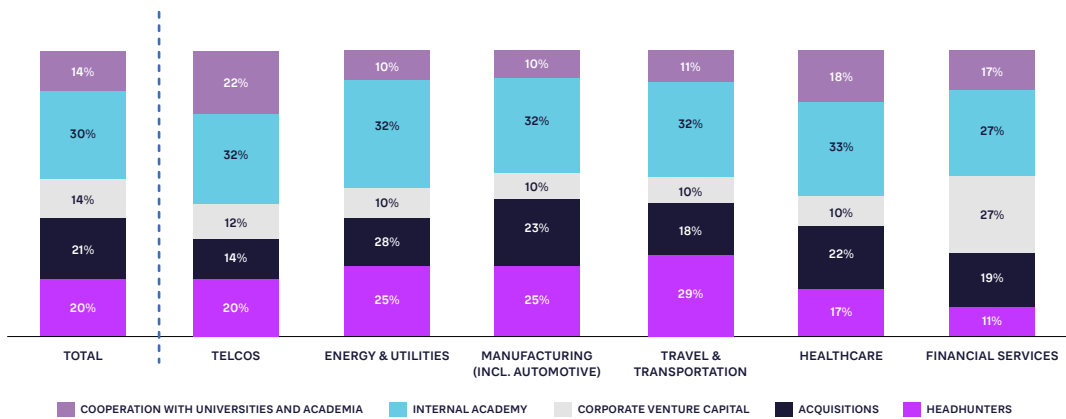


FIGURE 3: WHERE CEOs PLAN TO SOURCE NEW TALENT AND CAPABILITIES

This increasingly balanced view is driven by multiple factors, including the difficulty of finding AI talent given global skills shortages, a need to retain existing high-achieving talent and experience, and a growing realization that technical knowledge needs to be married to business understanding to deliver effective results tailored to the specific company and its objectives.

CEOs see developing their own people as delivering faster results, as new skills such as AI can be layered on their existing expertise,

CEOs SEE DEVELOPING THEIR OWN PEOPLE AS DELIVERING FASTER RESULTS, AS NEW SKILLS SUCH AS AI CAN BE LAYERED ON THEIR EXISTING EXPERTISE.

without the requirement to train new joiners on company operations from scratch. Internal academies also support the growing focus on lifelong learning that staff (particularly Generation Z or Millennials) are demanding from their employers. These employees also increasingly want to work for companies that share

their sense of purpose and values, particularly around ESG, something that CEOs recognize and are acting on.

"We are gaining the trust of our staff members by being transparent about the company's objectives, difficulties, and decision making procedures." **CEO, manufacturing**

While the majority of sectors are taking a balanced approach to future talent, variations are shown between sectors. CEOs in the telecoms, manufacturing, travel & transportation, and healthcare sectors are the most enthusiastic about internal academies, while healthcare organizations are also increasing their focus on building talent through acquisition, at the expense of traditional cooperation with universities and academia. Energy & utilities CEOs also aim to primarily source new talent via acquisition, while financial services are looking to corporate venture capital, investing in fintechs to plug their skills gaps. Travel & transportation is the only sector to increase (slightly) its reliance on headhunters, although they are seen as an integral part of the recruitment mix in most sectors.

CREATING THE NEXT GENERATION OF LEADERS

What are the skills that CEOs need for the future? To find out, CEOs were also asked for leadership advice they'd provide to younger generations, based on their own experiences and how the business world is changing. Five themes stood out:

1. Focusing on **sustainability and social issues**, including diversity and digital inclusion
2. Behaving **ethically and morally** at all times and demonstrating the company purpose, reinforced by strong governance processes
3. Being **flexible, adaptable, and entrepreneurial**, and not fearing failure
4. Putting the **customer first** and continually listening to their needs
5. Embracing **lifelong learning**, staying curious, and having a commitment to gaining new skills while supporting/mentoring the next generation

"Within your company, promote inclusion and diversity. Encourage an environment where people with different experiences, viewpoints, and backgrounds are valued at work." **CEO, utilities**

This demonstrates that today's CEOs are fully aware that they need to have a radically different vision of what success involves than those of the past. They are moving well beyond revenues and market share toward achieving a better balance between financial metrics and ethical/environmental factors, essentially aiming to leave the world (and their companies) in a better place when they move on from their roles.

"Encourage creativity and a willingness to explore novel concepts. A firm with an entrepreneurial atmosphere might be able to develop business strategies that give it an edge over competitors in volatile markets." **CEO, automotive**

INSIGHTS FOR THE EXECUTIVE

Overall, the 2024 CEO Insights Study clearly shows that senior business leaders of the world's biggest companies are optimistic about the future and focusing on AI and human skills to achieve their sustainable growth objectives.

1. EMBRACE RADICAL CHANGE THROUGH AI

CEOs have ambitious plans for technology, particularly AI. This has the potential to transform their entire business, but they need to translate their plans and strategies into concrete, companywide programs. Currently, many AI use cases focus on making existing processes more efficient and effective — CEOs need to go beyond this to deploy AI to innovate and target new opportunities to reap maximum benefit and competitive advantage. They need to embrace the transformative changes to their business models that AI enables, opening new markets, opportunities, and partnerships.

2. KEEP PACE WITH INNOVATION

The rapid rise of AI demonstrates how quickly new technologies can move from the periphery into the mainstream. CEOs must therefore

THE RAPID RISE OF AI DEMONSTRATES HOW QUICKLY NEW TECHNOLOGIES CAN MOVE FROM THE PERIPHERY INTO THE MAINSTREAM.

keep a watch on other breakthrough technologies, such as quantum computing and autonomous vehicles, monitoring progress and understanding how they might impact their business once they mature.

3. UNDERSTAND THAT AI PLUS HUMAN SKILLS MAXIMIZES RESULTS

Even the most powerful AI tools won't deliver impact if they are not adopted across the company. To democratize AI, ensure that tools are available and usable by relevant parts of the workforce. By supporting people with AI, you can improve their performance — and that of the wider company.

4. CONCENTRATE ON INTERNAL PEOPLE, SKILLS, AND CAPABILITIES

Ensure that companies have the right internal skills and capabilities to deliver an ambidextrous, agile learning organization. This relies on fundamental reskilling of the workforce to ensure they have

THE SKILLS AND ATTRIBUTES OF A SUCCESSFUL CEO HAVE SHIFTED — WITH A NEED TO BALANCE PROFITABILITY AND FINANCIAL SUCCESS WITH ETHICAL, SUSTAINABLE BEHAVIOR.

the correct talent mix to drive the business forward. CEOs must therefore focus heavily on ensuring they have access to these skills across the business through internal programs/academies, cultural change to support the shift to lifelong learning, and communication/change management to inform,

educate, and engage staff at a time of disruption. Given skills shortages around AI, attracting talent and reskilling may require unconventional approaches, from creating standalone AI subsidiaries to companywide AI training programs.

5. CREATE THE NEXT GENERATION OF LEADERS

The skills and attributes of a successful CEO have shifted — with a need to balance profitability and financial success with ethical, sustainable behavior. Today's CEOs should look to nurture the next generation of leaders, providing them with support and mentorship to develop their talents for the future.

FRANCESCO MARSELLA

is a Managing Partner in Arthur D. Little's Rome office and responsible for leading the company's Growth and Transformation practices worldwide.

RALF BARON

is a Partner in Arthur D. Little's Frankfurt office and a member of the Transformation practice.

PETTER KILEFORS

is a Managing Partner in Arthur D. Little's Stockholm office, leading the company in the Nordics, and a member of the Growth practice.

MAXIMILIAN SCHERR

is a Partner in Arthur D. Little's Vienna office, where he leads the Growth and Performance practices.

SATYA EASWARAN

is a Partner in Arthur D. Little's India office and a member of the Growth practice.

THE PEOPLE-CENTRIC LAB OF THE FUTURE

A futuristic digital environment. In the center, a large, glowing digital face is composed of many small, blue, rectangular fragments. The face has blue eyes and a neutral expression. In the lower-left foreground, a person with short brown hair, wearing a light blue long-sleeved shirt and dark pants, stands with their back to the camera, looking towards the digital face. The floor is a dark blue grid with glowing orange lines. The background is a light blue, hazy space with vertical lines of light and some faint, glowing rectangular panels.

**AI-SUPPORTED INNOVATION
TO MEET TOMORROW'S NEEDS**

AUTHORS

Dr. Michaël Kolk, Marten Zieris, Dr. Michael Eiden

As the world grapples with global mega-challenges, innovation¹ has never been more necessary. We need breakthrough innovation to solve pressing issues around energy, the environment, and social and health challenges. At the same time, and equally importantly, companies have to deal with a business world typified by increased complexity and accelerated time frames. Together these mean innovation must deliver more breakthroughs, rather than only incremental improvements, with more flexibility and responsiveness and at greater speed.

However, these breakthrough innovations require new approaches that go beyond traditional ways of working. Our research in the Global Innovation Excellence Benchmark² shows that more than 80% of companies are unsatisfied with their return on breakthrough innovation investments. Many CEOs and CTOs that we speak to say their innovation pipeline isn't nearly enough to support their company's growth ambitions.

In "The Laboratory of the Future,"³ our 2020 Prism article, we argued for the need to take a new, people-centric approach to digitalized R&D (by "lab," we mean the entire "delivery engine" of R&D). We made the point that to meet the challenges of increasing convergence, as well as the need for more and more rapid breakthroughs, the lab had to be designed around people, rather than technologies or systems.

1. In this article we will use the words "innovation" and "R&D" more or less interchangeably. With the former we imply a broader concept of which R&D can be considered an integral part

2. 9th Arthur D. Little Global Innovation Excellence Benchmark, June 2023
<https://www.adlittle.com/uk-en/insights/report/good-great-enhancing-innovation-performance-through-effective-management-processes>

3. "The Laboratory of the Future," Prism S1 2020
<https://www.adlittle.com/uk-en/insights/prism/laboratory-future>

Since then, the sudden acceleration of artificial intelligence (AI) has started to transform how we do business, with innovation and R&D being no exception. Hardly a week goes by without the announcement of yet another fascinating AI use case — one example is “Coscientist,” an AI-driven approach that combines different GPT-4 models and is capable of designing, planning, and executing experiments in the context of chemical research⁴. A second, equally fascinating example is “FunSearch,” an AI approach that combines a large language model (LLM) with an evaluator module in the search for novel solutions to open problems in the world of mathematics⁵.

While these two examples are fairly specialist and mostly driven by academic research groups, the broader potential of AI to transform innovation and R&D is huge. We can already see the effect that

IT WILL TAKE YEARS OR EVEN DECADES BEFORE COMPANIES AND INDUSTRY STANDARDS WILL HAVE CONVERGED TOWARD ANY SINGLE “BEST PRACTICE” IN ITS USE.

generative AI is having on access to and democratization of knowledge. AI is rapidly becoming a general-purpose technology with enormous potential impact, akin to the advent of electricity and the internet in the 19th and

20th centuries, respectively, when entire business sectors were transformed forever and fortunes were made by early vendors and adopters.

However, it will take years or even decades before companies and industry standards will have converged toward any single “best practice” in its use. Such future standards will also need to address concerns such as (cyber)security, accuracy, and “explainability.” These are not the main topic of this article, but certainly important to consider⁶.

In the meantime, the companies that are most adept at identifying, accessing, and broadly deploying leading AI technology and use cases within R&D will see enormous benefits. This article considers the “big ticket” potential of AI to innovate how innovation is done. In particular, we will explore the importance of putting people at the heart of AI-augmented innovation, supporting them with the structures, organizational models, and optimal conditions to enable them to become perfect innovators, uniquely placed to bring the breakthrough innovations that the world is waiting for.

4. <https://www.nature.com/articles/s41586-023-06792-0>

5. <https://www.nature.com/articles/s41586-023-06924-6>

6. See “Be Careful Out There — Understanding the Risks of Deploying Artificial Intelligence” elsewhere in this issue.

HOW AI CAN HELP INNOVATE HOW INNOVATION IS DONE

The list of challenges to creating a steady stream of breakthrough innovations is long and potentially dispiriting. Success rates are low, with lead times often excruciatingly long and the ability of companies to realize the full potential of successful technology breakthroughs low.

So how could AI change this picture? Examples of successful AI applications in R&D are already plentiful. Uses range from ideation and literature-based discovery; through novel concept creation and in silico design and experimentation, rapid candidate screening in drug discovery, trend analysis, and pattern recognition; to prototype development, design optimization, and testing support. Multiple LLMs can be bundled and/or combined with other systems and APIs to support almost any task a human researcher would undertake. AI use is greatly bolstered by the fact that it is able to “read” almost any type of unstructured information in a multimodal fashion, such as complex tables, charts, and drawings.

Progress will not stop there. Based on generative AI’s seven archetypes of human intelligence⁷, we expect innovation teams to primarily benefit from using AI in these typical roles:

- **Scribe:** generating content across all media, based on specific prompts
- **Librarian:** answering questions, lookup, and search
- **Analyst:** summarizing data series and underpinning pattern recognition and extrapolation
- **Engineer:** aiding task definition, analysis, and optimization for problem solving
- **Scientist:** causal inference of general laws based on empirical observation and counterfactual reasoning
- **Craftsman:** directing and manipulating physical tools and objects in uncontrolled environments
- **Artist:** aiding ideation and design, bringing together diverse influences and perspectives to help innovators create original ideas and concepts

While it is easy to see how these AI applications could increase innovation productivity and efficiency, if they are simply plugged into a “traditional” lab setting, they won’t in themselves bring about the transformation needed to meet today’s and tomorrow’s needs. For the foreseeable future at least, AI will be a copilot or assistant to the human beings running the lab. To get the most out of AI, innovation and R&D organizations need to focus on people.

BUILDING THE LABORATORY OF THE FUTURE — PEOPLE BEFORE TECHNOLOGY

The lab of the future is the target destination for any large organization aspiring to break out of the traditional R&D mold. At its core, it aims to make people into “perfect innovators” to realize strategic objectives, akin to automatic driving aids aiming to make people into “perfect drivers.” This is about much more than offering technology and hoping for the best. Instead, it means re-engineering a fully people-centric lab approach, enabled by AI and other digital tools, based around three key components: democratization, collaboration, and ambidexterity (see Figure 1).

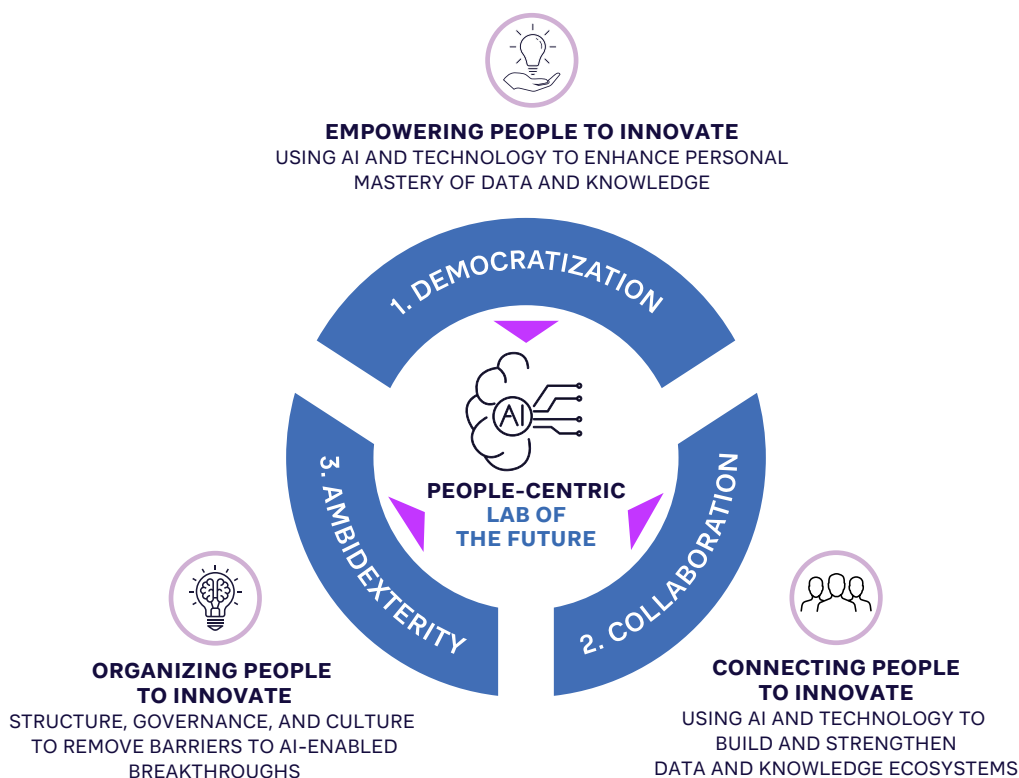


FIGURE 1: THE AI-ENABLED, PEOPLE-CENTRIC LAB OF THE FUTURE

In essence, the concept is straightforward:

- **Democratization** involves making AI available, customized for everyone and adopted as a natural way of working, closing the gap between AI users and AI providers.
- **Collaboration** involves using AI and other digital tools to help supercharge the sharing of data and knowledge, forming a virtuous circle unconstrained by the limitations of current data management.
- **Ambidexterity** involves setting the organizational context to facilitate and encourage AI-supported breakthrough innovation and exploration, at the same time as maintaining R&D efficiency and productivity.

While these three components can be considered separately, they are connected and mutually reinforcing: democratization requires pervasive sharing of data and knowledge, which, in turn, requires organizational ambidexterity, and so on.

DEMOCRATIZATION

In 2023, access to and interaction with powerful AI systems such as LLMs became democratized. For example, advances in reinforcement learning through human feedback (RLHF) have enabled easy conversational access to these very powerful models for everyone. AI usage is no longer exclusive to very large companies, but has become available to the wider world. The fact that Open AI's ChatGPT model managed to attract more than 175 million users in one year is a clear testament to this.

When considering AI's potential through a people-centric lens, it helps to start by defining what makes people, and innovators in particular, truly good at their job. The T-shape (see Figure 2) has often been used as a model to represent a person's specific areas of expertise (vertical), as well as more interdisciplinary collaboration skills (horizontal). The same model can be applied to the AI models and bots required to support people in their daily jobs (as highlighted in a previous Prism article⁸).

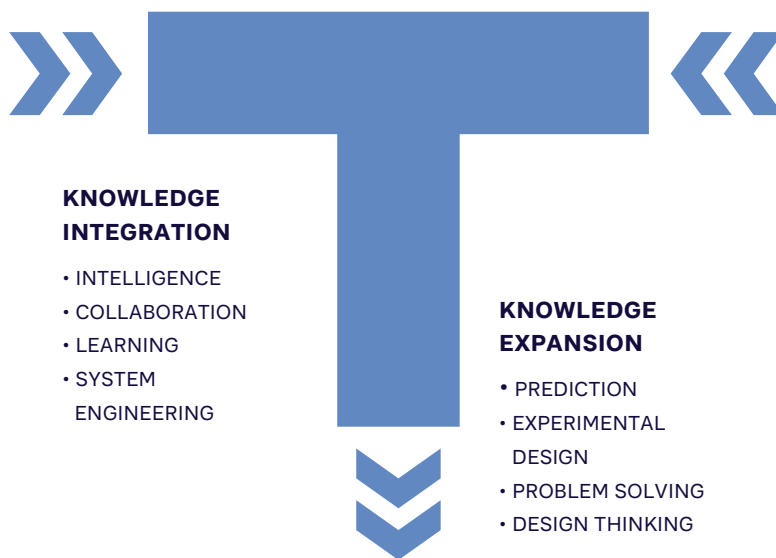


FIGURE 2: THE T-SHAPED POWER OF AI-EMPOWERED R&D

AI, when integrated into researchers' natural ways of working, can unlock the promise of complete knowledge integration, in combination with step changes in the pace and reach of knowledge expansion. This is key to developing broader technology portfolios, greater technology advances, more breakthrough and business model innovations, shorter time to market, and the ability to address larger markets.

AI can be applied to enhance **knowledge integration** in several ways, for example:

- **Accelerating solution engineering:** Thanks to AI, the ability to access and synthesize sources for insights becomes potentially limitless. Transversal solution design skills determine the ultimate impact of solution engineering. For example, General Motors reports that it is combining generative AI, working mainly in the craftsman role, with additive manufacturing to drastically extend the design space to be explored for novel parts and components.
- **Enabling co-creation:** AI can fulfill the role of analyst and engineer in co-creation with humans, especially in systems engineering, which requires the involvement of multiple stakeholders, many of which are non-technical, such as in model-based systems engineering. Smart cities are one example of this type of application.
- **Blending of formal and informal knowledge streams:** AI can help spark ideation and increase problem solving by integrating formal and informal knowledge streams. While formal knowledge is already encoded in data (being structured or unstructured in nature), informal/tacit knowledge can be inferred through interaction patterns. For example, this could be facilitated through transcription of brainstorming sessions or using a generative AI model as a “sparring partner” in ideation processes. The greater knowledge transparency provided through AI helps with innovation decision making: for example, direction setting (where to look), priority setting (where to go deeper), and opportunity validation (where to develop).

Turning to **knowledge expansion**, AI can also help in multiple ways, for example:

- **Hyperspecialized learning:** Creating specialized and highly personalized AI models (working as scribe and librarian) will accelerate learning on subject matter expertise, increasing the scale and spread of critical knowledge pockets. The almost personal nature of these LLMs will most likely mean that they will be able to run on end user devices and be readily available whenever a user wishes to interact with them. A recent paper published by researchers from

**THE GREATER KNOWLEDGE
TRANSPARENCY PROVIDED
THROUGH AI HELPS WITH
INNOVATION DECISION
MAKING.**

Apple⁹ highlights a novel approach to running LLMs for inference on low-powered edge devices. This will most likely mean we will have a personal GPT available on our iPhones in the near future.

- **Augmentation of project teams:** AI’s predictive capabilities greatly improve the effectiveness and speed of experimentation. Generative AI routinely fulfills the role of engineer and scientist, augmenting increasingly complex human tasks. This evolution toward hybrid ecosystems (of subject matter experts and bots) will require dedicated leadership, as well as continuous development and maintenance, to remain effective. The “Coscientist” approach recently published by researchers at Carnegie Mellon University is a great example of this. They have combined several LLMs for problem solving, code generation, and experimental design, with the ultimate goal of accelerating R&D in chemical research.
- **Fluidity of problem solving approaches:** Librarian-like AI will vastly increase the visibility of alternative approaches and technologies to overcome technical hurdles, for instance, by finding solutions to similar problems in unrelated industries. This will have significant implications for project team composition and mentality. The application of generative AI approaches to well-established problem solving frameworks, such as TRIZ, could create significant productivity gains in this domain.

Across both dimensions, the **design and interface of AI tools** is vital if they are to achieve widespread user adoption, and thus deliver benefits. They have to be integrated within existing ways of working that staff are comfortable with and augment their capabilities. For instance, one of our clients (a large chemical player) has developed a transversal LLM team to support both “horizontal” and “vertical” initiatives across its vast R&D community.

COLLABORATION

The limitations of current collaborative data sharing and knowledge management systems have been amply described. Put simply, critical knowledge and data are often not accessed and used because they:

- Are not properly codified/tagged
- Sit in inaccessible locations
- Exist in different file formats and/or different languages
- Are “tacit” (i.e., part of people’s professional experience)
- Are spread across multiple different ecosystem players
- Are not being sought or shared by individuals for a variety of reasons

These obstacles are significant for deploying AI to help create perfect innovators because AI needs data by the truckload and people need new knowledge and insights to make new discoveries. Fortunately, AI and other digital tools are also part of the solution, for example:

- **Advanced knowledge search:** LLMs can be combined with knowledge graphs and vector databases to create new solutions that combine natural language processing with content and contextual search. ADL has recently deployed this type of tool for its own internal use.
- **Intelligent triggers:** AI tools can be applied to provide prompts to initiate the transfer of information or catalyze learning activities. Examples include predicting users' future needs and prompting action, providing tailored knowledge debrief protocols at key milestones, and automating translation and tagging to generate quick reference lists for specific topics.
- **Knowledge management aids:** AI can support documentation, search, transfer, and learning. For example, generative AI can suggest non-obvious and/or lateral information in searches and generate new content from unstructured data (such as text/video/audio) for knowledge capture. Graph data technology makes it simpler to identify previously hidden relationships within vast amounts of textual data within repositories.
- **User experience enhancement:** New tools can be deployed to make interfaces easier to use than not to use. For example, adoption engineering can be employed to make sure knowledge management and learning solutions “go viral” and deliver behavioral change with seekers, while gamification encourages owners to share information. Within repositories, powerful data visualization interfaces make understanding and prioritizing information easier.

AMBIDEXTERITY

While simply applying AI technology and tools to an existing lab structure has already had benefits, it is unlikely to result in any major breakthroughs (or even smaller ones) unless necessary changes are also made to the wider organizational context and operating model. After all, why would AI-enabled breakthroughs sail by well-known obstacles that plague other types of breakthrough innovations, such as inept decision making and misaligned incentives?

The lab of the future needs to embrace ambidexterity, balancing optimal exploitation of today's innovation space and exploration of tomorrow's growth domains — indeed, this why the T-profile of knowledge integration and knowledge expansion is essential.

R&D organizations that are geared toward exploitation tend to apply standardized formal structures and processes, supported by a performance-driven culture with KPIs focused on efficiency, cost reduction, scale, and productivity.

Those that are focused on exploration tend to have more lateral and fluid structures to allow greater responsiveness (for example, based on communities of expertise or guilds). Processes follow agile thinking and focus on iteration, rapid validation of ideas/sparks, and

ADL'S "AMBIDEXTROUS ORGANIZATION ASSESSMENT DATABASE" FINDS THAT ONLY 15% OF COMPANIES ARE FULLY AMBIDEXTROUS, WITH THE MAJORITY (55%) OPTIMIZED FOR EXPLOITATION (SCALE AND PRODUCTIVITY).

more freedom to follow "big bet" projects. Steering and incentives are more rooted in purpose and direction setting than individual project control.

Most R&D organizations, in practice, lean toward one of these archetypes or the other. ADL's "Ambidextrous Organization Assessment database" finds that only 15% of companies are fully ambidextrous, with the

majority (55%) optimized for exploitation (scale and productivity). A large majority of industrial R&D organizations still need to achieve ambidexterity, yet without it, the full potential of AI is unlikely to be realized.

So, what are the key features of ambidexterity in practice? Apple provides some useful pointers.

LESSONS LEARNED FROM APPLE IN AMBIDEXTERITY

Apple is a longstanding innovation leader. We recently benchmarked Apple's R&D function through interviews and desk analysis, confirming the importance of ambidexterity to its success. Notable features of its practices include the following:

- **Ambidexterity in decision making and performance management:** Decision making depends on the type of project: more belief-based for design initiatives versus hard data to drive technical hardware specs. The steering of individual projects is much more closely linked to the ambitions and expectations of leaders (see next point) than dedicated KPIs, with team reputation seen as a more effective "control mechanism" than fixed indicators. R&D employee incentives are usually based on overall company performance rather than individual projects/products.
- **Ambidexterity in people management:** Leaders are required to balance deep expertise and immersion in details with willingness to collaborate, with staff continuously assessed on these criteria. Apple follows the "experts lead experts" rule, requiring leaders to constantly learn in new areas as they become relevant to their area of responsibility. Clear distinctions have been made between topics to own, delegate, learn, and teach.

- **Ambidexterity in structure:** Despite its size, Apple is purposely following a functional, rather than project-based, organizational model. In combination with other practices, it uses an expertise-driven approach and reduces the number of executives involved in decision making. While it still adopts project-driven ways of working, rather than fully formalizing this through organizational structures, it places much emphasis on a few selected project leadership roles, which are taken very seriously.

Comparing Apple R&D to a typical industrial company shows major differences in the ambidexterity balance (see Figure 3).

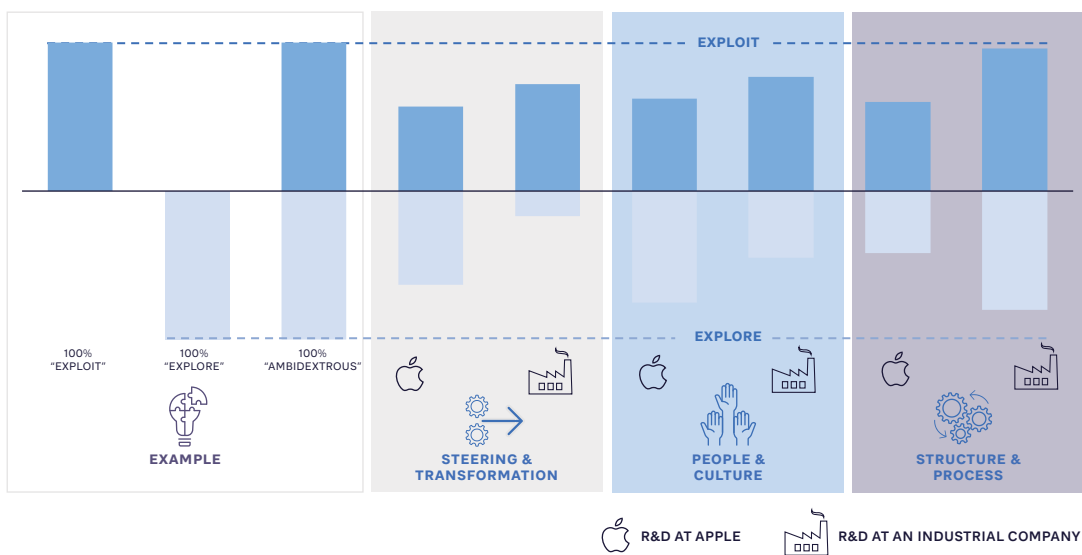


FIGURE 3: AMBIDEXTERITY COMPARISON OF R&D ORGANIZATIONS AT APPLE AND A TYPICAL INDUSTRIAL COMPANY (ADL CLIENT BENCHMARK)

Two findings stick out from the comparison. First, whereas Apple R&D has embedded both “explore” and “exploit” in all organizational dimensions, industrial companies tend to optimize for “exploit” following predictable and well-controlled practices. Second, many industrial R&D organizations have dedicated units, and sometimes locations, designed for breakthrough innovation (“explore”), but this does not seem to be Apple’s formula for breakthrough success, which instead resides more in its whole approach to steering and transformation and managing people and culture.

Finally, Apple also exhibits the other key characteristics of the people-centric lab of the future, which we have already discussed. AI democratization and leadership are fully embedded within its functional organization as key guiding principles:

- **Democratization:** A distributed (democratized) approach to AI classifies it as a crucial skill and requires the broader leadership to reach critical skill levels. It has no separation between “innovating with AI” (for example, increasing R&D productivity) and “innovations with AI” (such as improving the Siri functionality of iPhones).
- **Collaboration:** Apple embraces its knowledge ecosystem, with high permeability in terms of AI experts moving in and out of the company routinely. It relies heavily on a managed ecosystem of high tech and software companies, academia, and startups.

INSIGHTS FOR THE EXECUTIVE

The scope and potential of the AI-driven, people-centric lab of the future is enormous. Resources are always limited and often spread thinly, which makes prioritizing (what is most important) and phasing (what do we do first) according to what matters most for the company’s strategic objectives crucial.

The guiding principle is “build for advantage, buy for parity”: focus efforts on must-win innovation battles based on superior technical capabilities, while adopting proven best practices and commercially available solutions for less important topics. For example, a pharmaceutical company may decide to deploy AI mainly to supercharge its core R&D activity of new drug discovery, while a food ingredient company might focus on AI-enhanced digital services around personalized nutrition and formulation. The principle is the same, but the focus is different.

These strategic innovation priorities can then be mapped to the T-shape model presented in this article: what are the implications to AI-driven knowledge integration and expansion? Do not get bogged down in technologies at this stage, but instead concentrate on what would need to happen along these two dimensions to make your people into “perfect innovators.”

This will give you the solution promises of AI that are specific to your company, which, in turn, will define the blueprint for your people-centric lab of the future. Focus on developing the three key components:

1. DEMOCRATIZATION

- Identify and prioritize AI use cases and adoption, integrated across the R&D and innovation cycle, with defined AI skill-level targets and competences.
- Focus on end-to-end processes so technical experts can seamlessly adopt AI into their working routines.
- Ensure no separation between “innovating with AI” and “innovations with AI.”

2. COLLABORATION

- Develop and build out future requirements in terms of data architecture and engineering, as well as user experience.
- Strengthen and diversify the wider innovation ecosystem and increase permeability between roles, teams, and the company at large.
- Redefine the skills and expertise that are needed and use this to drive hiring, training, and team composition.

3. AMBIDEXTERITY

- Strengthen the role and caliber of project leadership and solution engineering and increase the iteration steps in end-to-end innovation with more frequent optimization.
- Focus on optimized decision making — reduce hierarchies and redesign governance to differentiate between types of decisions.
- Foster an innovation culture that is familiar and comfortable with uncertainty and ambiguity — essential for being able to experiment and learn along the AI adoption journey.

AI is often portrayed in the popular media as a threat to people, threatening to take over their jobs and make them surplus to requirements. While the far future is impossible to predict, in the coming years at least, AI is paradoxically one of the most powerful tools we have to put people back at the center of industrial enterprise, where they belong.

DR. MICHAËL KOLK

is a Managing Partner in Arthur D. Little's Amsterdam office and responsible for leading the company's Innovation practice worldwide.

MARTEN ZIERIS

is a Partner in Arthur D. Little's Frankfurt office and a member of the Transformation practice.

DR. MICHAEL EIDEN

is a Partner in Arthur D. Little's London office and a member of the Innovation practice.

THE FUTURE WORKFORCE

A woman with long blonde hair, wearing a white long-sleeved shirt and blue jeans, stands in profile looking upwards. She is surrounded by a dense field of golden, curved light rays that create a tunnel-like effect, arching over her head and converging towards the top of the frame. The background is dark, making the golden light stand out.

RECRUITING AND RETAINING
VITAL GENERATION Z TALENT

AUTHORS

Lokesh Dadhich, Marten Zieris, Sara Nasaif, Henri Lehmann, Jérémy Lamri

Generation Z (widely known as Gen Z), encompassing those born between 1997 and 2012, is anticipated to make up over one-quarter of the global workforce by 2025, according to the World Economic Forum. As the first digitally native and globally connected generation, Gen Z brings distinctive skills and capabilities to organizations, making their recruitment and retention essential for sustained business success in the era of digital transformation and artificial intelligence (AI). This is especially significant for companies within traditional industrial sectors grappling with the challenges of digitization, striving to achieve ambidexterity by balancing agility and innovation with existing strengths in scale and productivity.

Nevertheless, the growing presence of Gen Z in the workforce comes with its own set of challenges. Gen Z as a whole possesses unique needs, expectations, and motivations, diverging from their immediate predecessors in Generation Y, commonly known as Millennials. Surprisingly, our research shows that only 26% of Gen Z individuals feel that current jobs align with their values. Effecting a transition toward Gen Z compatibility within organizations, without estranging current employees, demands transformative change and reconfiguration of management styles and structures.

Based on surveys of Gen Zers in North America, Europe, Southeast Asia, and the Middle East, as well as interviews with Global HR directors, this article outlines the essential measures organizations must undertake in terms of mission, structure, and culture to effectively harness the invaluable skills of their newest recruits.

UNDERSTANDING GENERATION Z

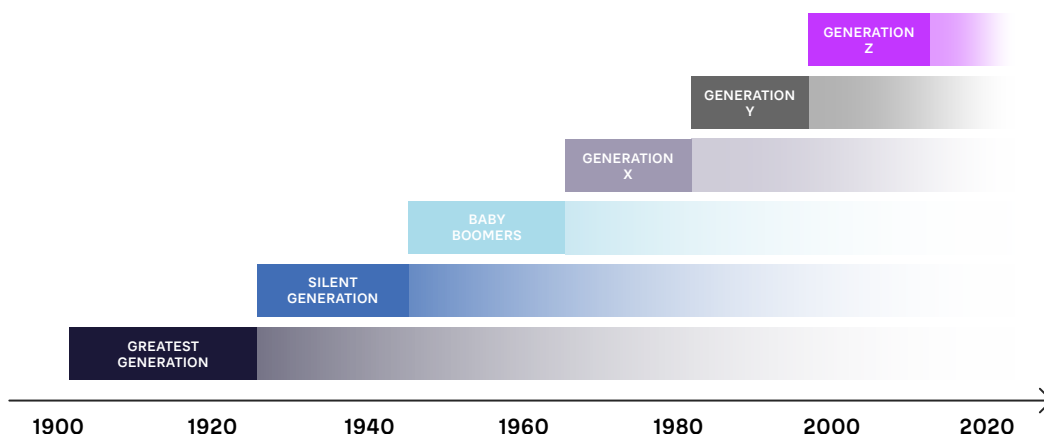


FIGURE 1: GENERATIONS BY YEAR OF BIRTH

Gen Z stands out as the first generation to grow up entirely in the digital era, devoid of any recollection of a world before the internet (see Figure 1). Unlike their Millennial counterparts, who embraced the internet later, in their developmental years, Gen Z members are genuine digital natives, having been immersed in technology since birth.

WHAT SETS GEN Z APART?

While acknowledging the risks associated with generalizations, we note several key traits and characteristics commonly observed among Gen Z individuals:

- **Tech prowess:** Proficient in the use of technology, they perceive it as an inherent aspect of their surroundings, rather than a skill to be acquired.
- **Global perspective:** The omnipresence of social media has significantly shaped Gen Z's worldview. Exposure to a constant influx of information around the clock via platforms such as Instagram and X (formerly Twitter) has not only made them globally aware, but also influenced their perceptions of life, environmental issues, ethics, and standards of work and work-life balance. Social media serves as a powerful lens through which they interpret and engage with the world.
- **Challenging socioeconomic experiences:** Many Gen Z individuals have witnessed the repercussions of the 2008 recession on their families, faced disruptions in education and early career steps because of the COVID-19 pandemic, and are currently contending

with soaring housing costs. These issues are adversely affecting their mental health, with 42% diagnosed with specific conditions. For some Gen Zers, this has led to loss of trust in established political and institutional structures.

- **Diversity:** Gen Z exemplifies a rich tapestry of backgrounds, with nearly half of its members in the US representing racial or ethnic minorities, as indicated by census data. This demographic intricacy is a testament to the profound impact of globalization, which has shaped Gen Z as products of increasingly heterogeneous societies or melting pots. Additionally, their heightened inclination toward pursuing higher education distinguishes them from preceding generations.

These factors all contribute to the formation of values that Gen Z holds dear. Their advocacy for inclusivity, diversity, and social responsibility stems from their unique experiences, coupled with a profound need for purpose in both personal and professional spheres. The omnipresence of social media leads to amplification of their opinions on a wide array of subjects, as well as greater active engagement. Consequently, this can create an impression of heightened knowledge and maturity, even among the youngest members of this cohort.

Comparing Generations in the Workplace

Organizations today boast diverse workforces spanning multiple generations, each characterized by unique attributes and distinct expectations:

- **Baby Boomers (1946–1964):** Anchored in a desire for security, Baby Boomers favor hierarchical structures and often subscribe to a “live to work” ethos. Many have devoted their entire professional lives to a single employer.
- **Generation X (1965–1980):** Thriving in collaborative environments, Generation X appreciates teamwork while maintaining a self-effacing demeanor. Respect for their work is paramount, and they prefer autonomy without the constraints of micromanagement.
- **Generation Y (1981–1996):** Driven by a quest for purpose, Generation Y (Millennials) seek meaning in the organizations they align with. They actively seek continuous feedback on their performance, emphasizing a dynamic exchange in the workplace.
- **Generation Z (1997–2012):** Prioritizing mental health support, Generation Z shares with Millennials a desire to work for companies infused with a sense of purpose and the flexibility to adapt to varying work arrangements. Notably, financial rewards hold greater significance for Generation Z than their Millennial counterparts.

PERSPECTIVES FROM THE WORKPLACE

The oldest members of Gen Z have already entered the workforce, accumulating four to five years of experience and providing valuable insights into their impact on business. Simultaneously, the demand for their digital native skills has exponentially increased, underscoring the importance of comprehending and meeting their unique requirements. While differences persist between individuals, Gen Z characteristics can be generally distilled into four main areas:

1. HIGH KNOWLEDGE COUPLED WITH A HIGH DEMAND FOR PURPOSE

Thanks to the internet, a majority of Gen Zers (52% in our research) possess preconceived notions about the world of work, forming strong opinions about specific companies and industries based on observed actions — mostly through the internet. They exhibit higher expectations than previous generations and, akin to Gen Y, seek employment with organizations that align with their values and purpose. Notably, financial motivation ranks higher for Gen Z, with 30% prioritizing fair wages.

2. DISLIKE OF CONFLICT AND A PREFERENCE TO AVOID CONFRONTATION

Raised in the online realm, Gen Zers may question existing norms and prove less adept in face-to-face situations. For instance, they may challenge set working hours, preferring flexibility to complete tasks efficiently. However, this lack of adherence to traditional

GEN Z PLACES A PREMIUM ON ACHIEVING A SATISFACTORY WORK/LIFE BALANCE, WITH 57% OF THOSE IN OUR SURVEY CONSIDERING IT CENTRAL TO A SUCCESSFUL CAREER.

norms may be perceived as unprofessional by older generations. Additionally, their digital upbringing may result in a lack of teamwork experience, which would make them more comfortable working independently.

Conflict avoidance is a notable trait, and if they feel undervalued or unheard, Gen Z individuals are inclined to leave rather than engage in disputes, which underscores the pivotal role of managers in their retention.

3. FOCUS ON WORK/LIFE BALANCE AND JOB FLEXIBILITY

Gen Z places a premium on achieving a satisfactory work/life balance, with 57% of those in our survey considering it central to a successful career. Motivated by the desire to safeguard their mental and physical wellbeing, they seek employer support, including access to wellbeing services, as standard. Notably, they exhibit a propensity to switch jobs regularly, especially if they feel unchallenged or underdeveloped.

Retaining them beyond the initial learning and productivity phase is critical for organizations to realize the return on investment from their recruitment.

4. DYNAMIC WORK ETHIC WITH CROSS-FUNCTIONAL ENGAGEMENT

Although Gen Z may challenge the need for set working hours, their work ethic remains strong when they are engaged properly, which leads them to exceed expectations — contrary to what some might believe.

“In fact, Gen Z’s level of engagement is high when they feel connected to a task. Sometimes, when they are too excited, they tend to go overboard, and actually even put in 150% of their personal attention and effort. Yet, when they are not excited, it’s difficult to engage them.”

Hareth Alsahan, CHRO, Tawal

Given their wider interests and multidimensional digital skillsets, Gen Z often does not feel confined by the boundaries of a specific function, instead expecting to work across departments and areas. This creates challenges for traditional organizational structures put in place to deliver clear responsibilities and accountability.

Figure 2 shows that Gen Z has strong requirements across several areas. When asked to choose the three most important aspects of a successful career, nearly two-thirds of participants listed earning a high salary as one of the factors. They also aspire to achieve work/life balance while seeking managerial roles and constantly developing new skills.

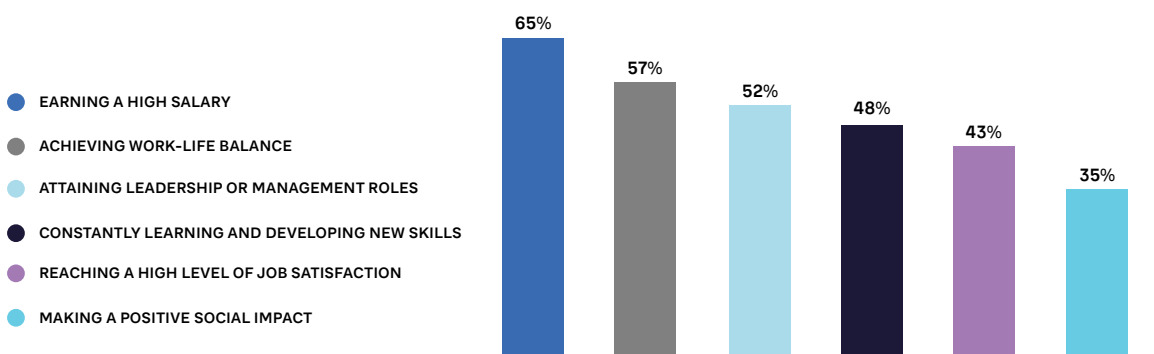


FIGURE 2: SUCCESSFUL CAREER FACTORS OF GENERATION Z

UNLOCKING GEN Z'S IMPACT

Businesses are grappling with global scarcity of digital skills — even more so today with the advent of AI. This lack of digital tech talent poses an existential threat to business growth and innovation, with nearly 60% of employers reporting that not having enough skilled

***GEN Z CONTRIBUTES
SPEED AND CREATIVITY
TO ORGANIZATIONS,
COMPLEMENTING EXISTING
STRENGTHS IN PROCESS
AND PERFORMANCE.***

employees has a major or moderate impact on their operations. HR expert and co-author of this article Jérémy Lamri terms this challenge the “Talent Bomb,” which signals the looming threat of a skills gap jeopardizing organizational success. Gen Z emerges as a crucial force in

defusing this bomb, offering essential digitalization and innovation skills. Notably, 74% of Gen Z individuals in our survey express positivity toward technology and AI, with none strongly opposing their rapid adoption.

Gen Z contributes speed and creativity to organizations, complementing existing strengths in process and performance. Their key skills and attitudes span:

- **Technology proficiency:** As digital natives, Gen Z is positioned to assist companies in navigating dynamic technology and AI-driven markets.
- **Commitment to learning:** Gen Zers, raised with easy access to online courses, YouTube, blogs, Wikipedia, and now generative AI, actively develop their skills, propelling organizational advancement through continuous learning.
- **Entrepreneurial mindset:** Embracing failure and avoiding blind loyalty to methods, Gen Z exhibits openness to cultural change and a boundaryless approach to functions and teams.
- **Inclusive thinking:** Advocating for empowerment and meritocracy, Gen Z prioritizes skills over gender or color, challenging traditional hierarchies.
- **Focus on purpose:** Aligning with broader trends, Gen Z seeks organizations that have a clear sense of purpose, integrating values such as sustainability and ethical practices alongside financial performance.

TAILORING THE WORKPLACE FOR GEN Z: STRATEGIC RECOMMENDATIONS FOR EMPLOYERS

Building a Gen Z-compatible organization, while meeting the needs of other generations and creating ambidextrous structures, requires in-depth change management, focusing on five areas:

1. ESTABLISHING A VALID SENSE OF PURPOSE

Gen Zers are looking to work for organizations that share their sense of purpose, and already have strong opinions about many companies and industries based on their expansive networks and extensive internet exposure. Companies therefore need to transform and embrace this sense of purpose in everything they do, aligning it with their values to change their organizational DNA and working culture.

When asked to describe their ideal work culture, Gen Z responses included:

- “An environment in which I am able to continue to learn and develop my skills, while also being able to maintain a healthy lifestyle outside of work.”
- “A place where everyone is supportive, and I wake up excited to go to work.”
- “Hybrid, challenging, aligned to my job aspirations, no corporate politics.”

Based on the earlier work of psychologist Kurt Lewin, transformations generally fit into one of two models:

1. Type I transformation: Adopting certain values (such as sustainability), but not embedding them within the organization’s economic model. Companies adopting this transformation assume their responsibilities (such as to the environment) without radically modifying their activities to align with that responsibility. In other words, the dominant nature of economic performance is not questioned, but rather, reconfigured to integrate ecological challenges. The primary business motive remains profit, but with the aim of “doing less harm.”

2. Type II transformation: Undergoing deep structural changes when adopting a value (such as sustainability) and integrating it at every level of the organization’s operations. This type of transformation requires emotional intelligence, open-mindedness, and a holistic vision. Type II transformation is a mutation, a profound change that requires courageous questioning of the status quo, intense awareness, and a strategic vision.

While Type I transformations may be a first step toward adopting important ecological values, they won't meet the expectations of Gen Zers who look for an employer that "walks the talk." Gen Zers may view it as window dressing, which can be counterproductive to attraction and retention efforts.

2. CHANGING MANAGEMENT AND LEADERSHIP BEHAVIORS

Managers, particularly from older generations, must adapt behaviors to accommodate Gen Z's aversion to criticism, strong opinions, and desire for independence. This requires patience and open-mindedness to new perspectives from managers. Transformative leadership styles, emphasizing empathy and encouraging creativity, resonate well with Gen Z. For example, rather than a simple presentation at their annual performance review, a Gen Z employee may go further and propose creating a video displaying their achievements. Managers need to give Gen Z the space to experiment in these ways.

Gen Zers highlighted some of the challenges they face within the workplace, citing, for example:

- "Not being taken seriously, with a negative outlook on our capabilities, being underestimated."
- "Unspoken rules that are outdated."
- "Gaining trust/respect from older employees is not easy, especially in leadership positions."

3. CREATING A TAILORED EMPLOYEE JOURNEY

The sense of purpose and concern for Gen Z values has to extend across the employee journey from initial talent attraction and the hiring process, to developing their skills, all the way to their departure and staying in touch. Essentially, the double helix of organizational DNA (purpose and identity) has to be present at every step of the employee journey (see Figure 3).

Purpose and identity must permeate every step of the employee journey, which necessitates an organization-wide commitment. Employee journey thinking benefits the organization by creating specific personas and tailored touchpoints for each cohort, which can be used to deliver value, as well as attract and retain Gen Z employees.

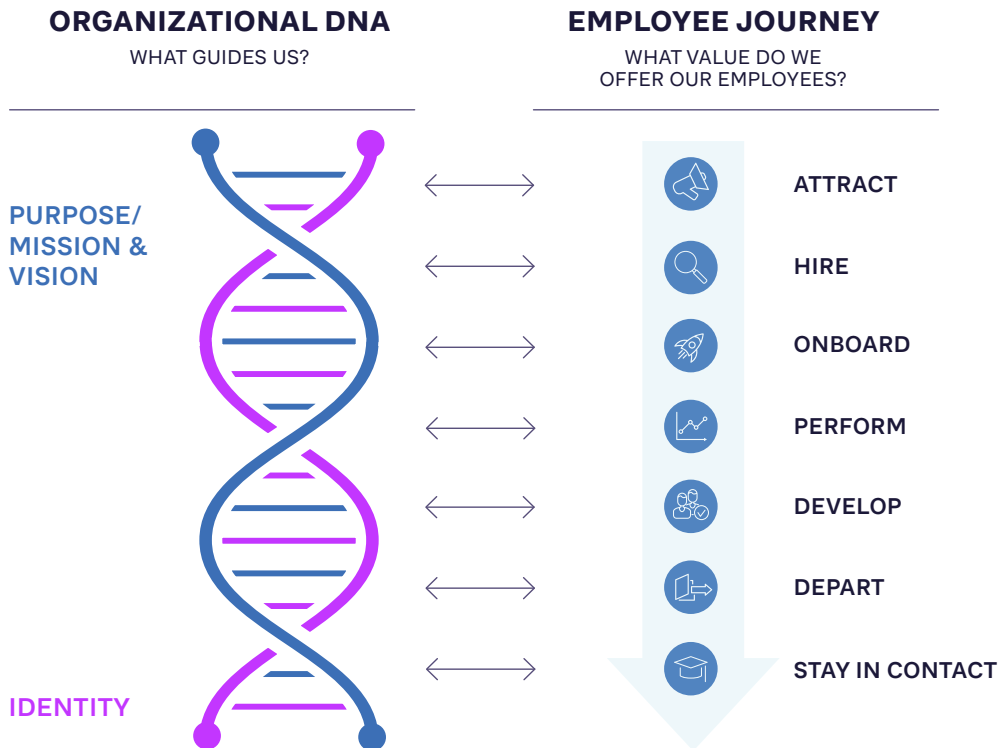


FIGURE 3: ORGANIZATIONAL DNA (PURPOSE AND IDENTITY) IN RELATION TO THE EMPLOYEE JOURNEY

4. TRANSFORMING STRUCTURES AND WAYS OF WORKING

Flexible, creative organizations require agile ways of working that replace bureaucracy and hierarchy with a lateral, competence-based approach. Gen Z employees thrive in this environment and

culture, which brings creativity to existing structures and creates ambidextrous organizations. This transformation benefits overall business performance, creating a holacracy¹ that focuses on skills, capabilities, and ideas, rather than seniority.

FLEXIBLE, CREATIVE ORGANIZATIONS REQUIRE AGILE WAYS OF WORKING THAT REPLACE BUREAUCRACY AND HIERARCHY WITH A LATERAL, COMPETENCE-BASED APPROACH.

1. Holacracy is a system of self-management in which leadership roles are not subject to a traditional hierarchy of command.

Omantel — Embracing Gen Z

Telecom company Omantel has transformed how it operates to benefit from Gen Z skills. It has built a pipeline of talent to select potential candidates from schools, and partners with leading universities to develop their skills through undergraduate courses. Once they enter the firm, they are positioned as experts from the beginning, with promotions and opportunities based on ideas and results, rather than length of tenure. Examples include:

- Its leadership program, which allows Gen Z employees to shadow the executive team, both on a day-to-day basis and through a shadow board. They tackle and discuss the same agenda as the main board, providing their own insights and ideas, thus enriching the decision making process.
- Its “No Boundaries” program enables employees to explore initiatives in any functional area, regardless of their role, breaking down barriers and providing new perspectives.
- Its in-house innovation program, “fikra,” enables employees to submit ideas and develop them via sabbaticals into viable businesses. Successes include OMPay, a payment service provider, and Sayyad, an app to link fishermen to markets.

*“It is very hard to retain Gen Z and its skills, requiring transformation in how we operate. The days of top-down decision making are long gone, meaning we’ve put in place the programs to get the best from Gen Z to transform the organization.” **Chief People Officer, telecoms provider***

5. EMPOWERING EMPLOYEES WITH SUPPORT AND TOOLS

Gen Z employees are eager to develop and fast learners. Over three-quarters (78%) say a company’s commitment to providing ongoing career development opportunities influences their job choices. Therefore, providing them with the opportunities to grow is essential for their retention. This could be done within their current role, or, given their desire for change, through other roles within the organization, such as via rotation programs.

As digital natives, Gen Zers expect to have access to relevant technology within their roles. Empowering them with the right technology and tools (such as AI) will enable them to use their digital knowledge to lead and drive wider digital transformation within the organization. Not only will this benefit the business overall, but it will also enable employees to act as ambassadors for technology adoption, working with older generations to explain its benefits and motivate others to adopt it.

By 2035, Gen Z will be the largest generation in the workforce, taking up more management roles, reshaping the workplace, and refocusing organizations. Successful companies will focus on life-long learning, openness, and transformative leadership. This will enable them to meet the changing needs of markets that are also increasingly dominated by Gen Z consumers. Recognizing and aligning with the motivations and preferences of Gen Z is crucial for shaping HR strategies, underlining the significance of a nuanced approach that avoids broad generalizations and respects the distinct individuality of each employee. Furthermore, establishing an agile and lateral organizational structure that allows Gen Z to thrive within a diverse, multigenerational workforce is pivotal for positioning organizations favorably in the ever-evolving future.

INSIGHTS FOR THE EXECUTIVE

As organizations set sail into the Gen Z-driven future, HR professionals and CEOs must chart a strategic course to attract and retain this unique talent pool. Here are some first steps to integrate Gen Z into the workforce:

- 1. Cultivate open dialogue, collaboration, and understanding:** Establish channels for transparent communication between leadership and Gen Z employees, while encouraging cross-generation dialogue to actively address challenges and opportunities.
- 2. Reassess current employee journey approaches:** Examine current practices in recruitment, engagement, and retention to align with the unique needs of Gen Z. Consider adjustments in areas such as compensation, evaluation metrics, and working hours to attract and retain Gen Z talent. In doing this, companies should adopt a personalized approach, meeting individuals on their terms, and offer a diverse “portfolio of rewards” that allows employees to select options aligned with their preferences and motivations, rather than adopting a one-size-fits-all strategy.
- 3. Implement initiatives with Gen Z needs in mind:** Co-develop strategic company initiatives around diversity, equity, and inclusion (DEI), as well as professional development, alongside Gen Z employees, ensuring alignment with their needs.
- 4. Establish continuous feedback and adaptation mechanisms:** Implement robust systems for receiving feedback from Gen Z employees and the broader workforce regarding the effectiveness of initiatives, and adapt strategies accordingly.

LOKESH DADHICH

is a Partner in Arthur D. Little's Dubai office and a member of the Telecommunications, Information Technology, Media & Electronics (TIME) and Performance practices.

MARTEN ZIERIS

is a Partner in Arthur D. Little's Frankfurt office and a member of the Transformation practice.

SARA NASAIF


is a Business Analyst in Arthur D. Little's Manama office and a member of the Transformation practice.

HENRI LEHMANN

is a Business Analyst in Arthur D. Little's Frankfurt office and a member of the Performance practice.

JÉRÉMY LAMRI

is an HR expert and author.



**WHY
PATIENT
CENTRICITY**



IS KEY TO LONG-TERM PHARMA COMPANY SUCCESS

AUTHORS

Ben van der Schaaf, Ben Enejo, Emmanuel Aisabokhae,
Shreya Modi, Vivien Fergusson

Patient centricity seems to be an obvious focus for pharmaceutical companies. After all, their core business is to develop drugs and treatments to meet specific patient needs.

Yet, patient centricity is not evident across the end-to-end pharma value chain, from identifying unmet patient needs through drug discovery and development to product availability and treatment. For example, on average, 30% of patients leave clinical trials before their scheduled treatment completion date, often because of the high burden of the trials on their lives.

Poor patient centricity has a direct impact on company success — not listening to the “Voice of the Patient” or failure to communicate with them effectively can cause delays in clinical trial completion. This may then lead to loss of commercial opportunities due to delayed regulatory approval. On the post-approval side, misalignment with patient needs may lead to poor uptake of the medicines and missed financial targets.

True patient centricity is therefore increasingly becoming a key determinant of success for pharmaceutical businesses. Advances in technology such as AI support this, for example, enabling companies to find patients much more efficiently. The real winners will be companies that are prepared to see patients as the cornerstone around whom the entire process is built, from drug discovery to commercialization, and invest the right amounts of money, time, and resources to understand patient needs. In this environment, only companies that truly understand what drives their target patient population and adjust their practices to become more patient centric will stand any chance of success.

With focus on the end-to-end value chain, this article explains how pharma companies can become truly patient centric. Many of the insights can also be applied more broadly across other industries where customer centricity is increasingly critical to success.

THE GROWING NEED TO PUT THE PATIENT AT THE CENTER OF DRUG DEVELOPMENT

As in other industries, pharmaceutical companies must become more customer centric and compete by providing the products that patients require, when and where they need them. This is increasingly important because patients are becoming more informed and expect treatments to meet their needs. In addition, patient advocacy groups are more active and vocal about considering patients' needs in the drug development and commercialization process. Patient centricity

AS IN OTHER INDUSTRIES, PHARMACEUTICAL COMPANIES MUST BECOME MORE CUSTOMER CENTRIC AND COMPETE BY PROVIDING THE PRODUCTS THAT PATIENTS REQUIRE, WHEN AND WHERE THEY NEED THEM.

therefore must be a key factor at every stage of the pharmaceutical value chain to maximize the significant investment (see Figure 1) required for success with an innovative drug.

Clearly, designing and launching a blockbuster drug won't deliver benefits if supply chain issues mean it is unavailable to potential

customers. A current, very clear example of this is Wegovy from Novo Nordisk. Initially intended for diabetes patients, this drug has been found to help weight loss, which has dramatically accelerated its demand. Although the company is working hard to expand capacity, access to Wegovy is now restricted in a number of countries, to the point of restrictions on exports and prescriptions for non-diabetics.

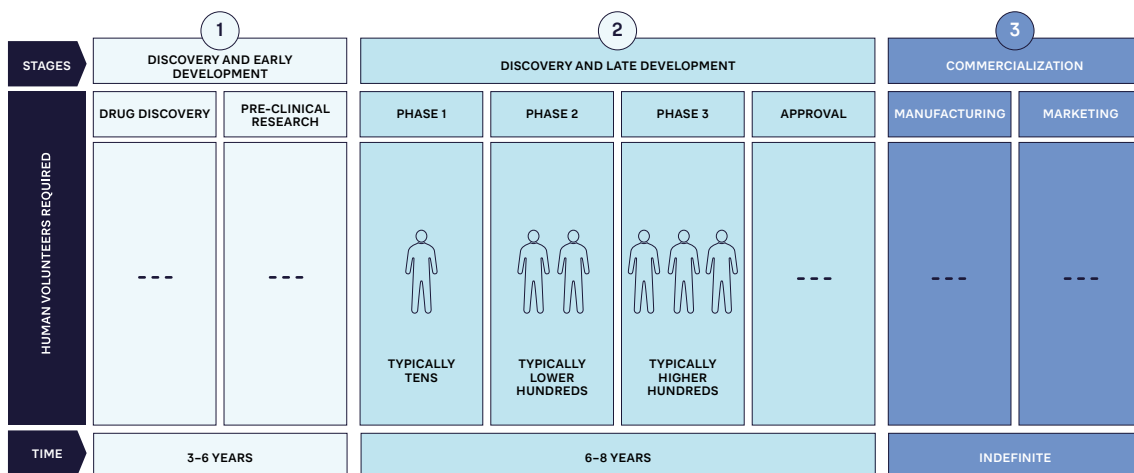


FIGURE 1: THE PHARMACEUTICAL VALUE CHAIN

We focus on three key areas of the value chain where patient centricity should be central — understanding unmet needs in discovery and early development, clinical trials in late development, and the post-approval/commercialization phase.

What is Patient Centricity?

While some companies describe their approach as patient centric, few put the patient at the heart of how they design and deliver their activities. We define patient centricity as: putting the patient first in an open, sustained engagement of the patient to respectfully and compassionately achieve the best experience and outcome for that person and their family.

UNDERSTANDING UNMET NEEDS IN DISCOVERY (EARLY DEVELOPMENT PHASE)

The drug development process first focuses on patients when companies identify an unmet need or one that can be met more successfully through new approaches in order to create a target product profile (TPP). While this may appear simple, multiple factors are involved. For example, the need must be commercially viable, whether in terms of the size of the patient population or access to funding for drugs. This calculation has meant developing drugs for common diseases or new antibiotics in poorer, developing countries has been curtailed by lack of a commercial market. However, new approaches, such as funding from governments, charities, and NGOs, potentially change this equation, as shown by the recent introduction of GSK's RTS,S vaccine against malaria, which is funded by Gavi (whose members include pharmaceutical companies); the Vaccine Alliance; the Global Fund to Fight AIDS, Tuberculosis and Malaria; and Unitaid.

PATIENT CENTRICITY IN CLINICAL TRIALS (LATE DEVELOPMENT PHASE)

Clinical trials take up a significant share of effort and resources invested in the drug development process. The main factor that distinguishes them from other stages is the direct involvement of consenting humans as subjects. Clinical trials have evolved over time — early drugs were tested with a lot less regulation than is presently in place. In some cases, drugs were tested on prisoners or other people without consent. Events such as the thalidomide scandal led to regulatory changes, which have contributed significantly to the evolution of clinical trials.

The Clinical Trial Process and Informed Consent

One of the first clinical trials took place in 1796, when English physician Edward Jenner tested his theory that exposure to cowpox could prevent patients from developing smallpox. Using some cowpox material, he inoculated his gardener’s nine-year-old son. His theory was validated, as the “subject” gained protection against smallpox.

The process for testing treatment ideas and technology has become much more sophisticated over the years. A clear regulatory requirement states that patients in a trial must provide their informed consent, which demonstrates the need for patient centricity. Unlike in Jenner’s case, this means providing participants with adequate information, making it as simple, direct, and honest as possible to ensure it is understood, as well as giving the participants sufficient time to ask questions and think it all through. As in other industries, this is essential customer communication, but in many cases in the pharmaceutical industry, it is overcomplicated and not standardized.

Recruiting and enrolling patients in trials has always been a challenge for the pharmaceutical industry. However, it is becoming more difficult for a number of reasons, which is driving a need for greater patient centricity to encourage increased patient involvement:

- For many conditions, approved, effective drugs are already available, which lowers the incentive for patients to take part in a new trial with unknown benefits. The number of new trials is also increasing overall, as shown in Figure 2.

CLINICAL TRIALS REGISTERED ON CT.GOV PER YEAR (IN 000s)

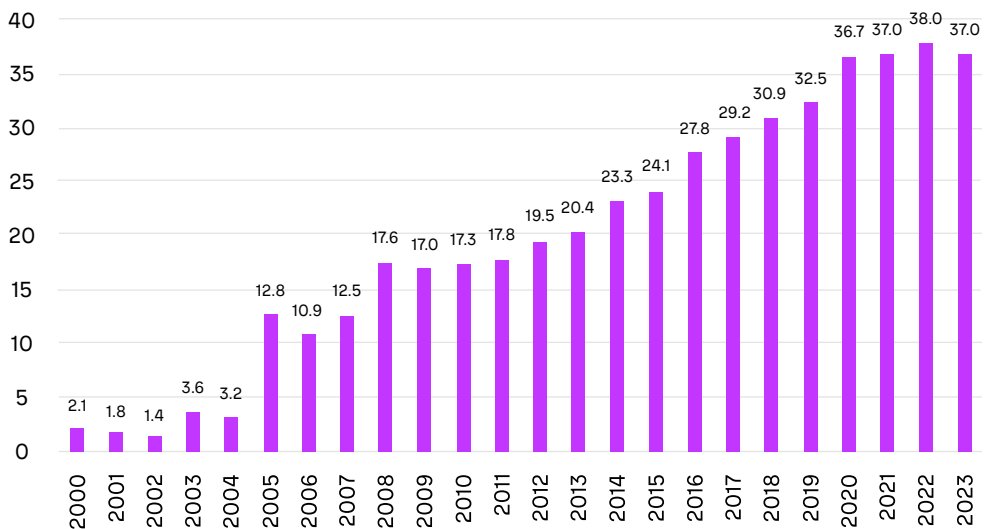


FIGURE 2: INCREASES IN CLINICAL TRIALS SINCE 2000

- An increasing number of trials are for drugs targeting rarer diseases, with consequently smaller available patient populations.
- Relevant patients may have particular challenges with taking part in trials because of their location and personal circumstances. For example, if a drug targets a condition prevalent in patients in their 70s with mobility and technology challenges, it needs to use non-digital channels to communicate and ensure that trial sites are easily accessible.
- Patients may have difficulty finding the right trial for their specific condition, for example, if they suffer from a particular rare type of cancer. However, specialist organizations now exist to match patients to trials. Finding patients for trials and trials for patients has become its own industry, driven by large amounts of data (such as through X [formerly known as Twitter], Facebook, and specialist electronic health record [EHR] companies, with many startups developing their own algorithms to match patients and trials).

Clinical trial retention is also an issue, particularly as patients, like all customers, now have higher expectations for how they will be treated. Patients may drop out of clinical trials for several reasons, such as:

- They don't see an impact from the trial, particularly if given a placebo.
- They suffer from minor and/or major side effects.
- They move far away from the trial site (which is particularly an issue for centralized trials).
- They are unable to continue a commitment to longer-term trials because of changing circumstances, such as those where they are tested weekly for many months.

Making trials attractive to patients requires focus on three key areas:

1. TRIAL DESIGN

Trials need to be built on an understanding of the needs of the patient, rather than solely the requirements of the regulator and trial sponsor. These needs must be considered holistically — not just the patient's medical condition and how it impacts their life, but also the impact of the trial on their jobs, their family situation, and their care providers.

2. PATIENT BURDEN

Given the choice, patients will naturally choose trials in which they have to do as little as possible and will gain as much as possible. Applying this understanding to trial design is therefore vital: minimizing the patient burden and eliminating barriers to participation, such as shortening their length, organizing home visits, or arranging transport to trial sites.

3. PATIENT BENEFIT

Patients join trials with the hope that it will improve their condition or treat their disease. Many are therefore disappointed, and may drop out, if they see no impact. Consequently, a growing number of trials are changing the ratio of active drugs to placebos from the traditional 50/50 to 66/33, as this increases the chances of patients seeing an improvement.

PATIENT CENTRICITY AFTER APPROVAL (COMMERCIALIZATION PHASE)

Once a drug is moving toward regulatory approval, pharma companies need to ensure that insurers and public health systems are willing to pay for it, particularly with highly priced drugs. This requires engagement with key opinion leaders (generally leading doctors or academics, or both), insurers, government bodies (such as NICE in the UK), and pharmacy benefit managers to demonstrate the advantages against those of any existing alternatives.

As well as focusing on reimbursement, pharma companies must ensure a sufficient supply to scale to meet market needs — such as by licensing production to third parties, as shown by the rollout of

COVID-19 vaccines. Creating demand and then not fulfilling it quickly enough will impact patient relationships and lead them to switch to alternatives, even if technically inferior, or even purchase counterfeit versions of popular drugs via the internet, creating risks to their health, as well as the company's reputation and revenues. As the Wegovy weight loss example

ONCE A DRUG IS MOVING TOWARD REGULATORY APPROVAL, PHARMA COMPANIES NEED TO ENSURE THAT INSURERS AND PUBLIC HEALTH SYSTEMS ARE WILLING TO PAY FOR IT, PARTICULARLY WITH HIGHLY PRICED DRUGS.

demonstrates, doctors can prescribe drugs for conditions beyond their original target, potentially making planning of production volumes difficult. While the need for sales does mean companies have increased focus on patient centricity, they must also understand that patient expectations are changing and continually improve commercial operations accordingly.

From the patient viewpoint, the ease with which the treatment can be taken is also important. For example, pills, which can be self-administered, are simpler to deal with than infusions or treatments, which require visits to hospitals or clinics. Improving the drug, such as by changing its form or how it needs to be taken, makes treatment easier for patients — while also extending patent lifecycles and thus increasing revenues.

Any ongoing monitoring needs to be straightforward, rather than relying on complex medical devices or lengthy repeat appointments. Pharma companies have learned from other industries — for example, Novartis' first CAR-T cancer treatment was logistically complex, high cost (around US \$500,000 per treatment), and a process taking weeks. To help patient adoption, Novartis adapted techniques from service industries, providing a “white glove” service to patients to walk them through the entire process.

LISTENING TO THE VOICE OF THE PATIENT — DIRECTLY AND INDIRECTLY

Pharmaceutical companies need to focus on becoming patient centric across everything they do. They should consider how they talk about patients internally and how they engage and communicate with

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them. In many cases, pharma companies now hold open days on their campuses, bringing patients on site. This not only educates patients themselves on development activities, but more importantly, gives staff direct, real world experience of patients with specific conditions. This aims to embed patient centricity

in the working lives and behaviors of staff by connecting them to patients and their needs.

Technology is also a significant tool here, which can be used to learn what patients or their carers are saying or thinking, or to directly interact with them through apps that support the therapy, for example.

In the case of rare diseases, which have smaller patient populations, companies can engage directly with known individuals and nurture relationships. However, in areas where multiple drugs are being developed, competition for patient time can be fierce — only those companies that deliver on their expectations and needs will build viable, long-term relationships.

As well as direct connections with patients, pharma companies need to work closely with patient advocacy groups — organizations created to represent and support patients and their families living with a specific condition. Often, but not always, focused on rare diseases, these groups provide a focal point for interactions with patient communities, as well as a source of potential clinical trial participants. They also may offer support for regulatory approval as regulators increasingly look to patients for their views. Consequently, pharma companies often support, fund, or sponsor patient advocacy groups and their events and initiatives.

PRACTICAL WAYS TO BECOME MORE PATIENT CENTRIC

Radical change is needed to improve the experience of patients across the value chain. Of course, patient centricity can also increase complexity and cost. However, new approaches, often driven by technology, can help make this easier to manage, as well as maximize the resulting benefits. To successfully put the patient at the heart of the drug development and commercialization value chain, pharma companies need to focus on four key areas — putting patients first, incentivizing participation, leveraging technology, and improving communication/care.

1. PUT THE PATIENT FIRST

Patients should sit at the center of pharma company thinking, from identifying needs through clinical trial design and delivery to commercialization. The burden on patients should be kept to a minimum, and communication should be tailored and personalized to meet their needs. Data is at the heart of delivering a scalable, patient-first approach. Building online and offline communities, either directly or via patient advocacy groups, nurtures strong relationships and enables pharma companies to communicate and engage patients globally and at scale.

As part of this, companies should look to collect as much data as possible during trials, while remaining patient centric. This should help minimize the need to carry out multiple trials. For example, patient follow-up data can be used more productively by contributing it to a central repository, where a large, anonymized data set is held to build a better picture of a disease across drug companies and healthcare systems.

2. INCENTIVIZE PARTICIPATION AND MAKE PRESCRIBING AND PURCHASING EASIER

Patients are not paid to engage with pharmaceutical companies or take part in trials, although clearly they stand to benefit from improved treatments down the line. Yet they provide a critical component of developing an approved drug — without the pharma company identifying their needs and running successful trials, even the most promising drug will not reach the market.

Consequently, while pharma companies covering trial-related expenses for patients has been common practice for many years, they can potentially go further, such as by issuing a trial completion bonus to acknowledge and reward patient commitment. In addition, sponsors can share the proceeds of success with patients if the drug achieves successful regulatory approval. This risk-reward sharing approach will encourage retention of patients and demonstrate a positive patient-centric shift for pharmaceutical companies.

To increase access to drugs, companies are aiming to make buying and prescribing simpler. For example, in the US, new legislation aims to make access to insulin much more affordable for diabetes patients, while pharma companies reimburse commercial patients for out-of-pocket costs (copay). This process involves many more players in the healthcare system than just the pharma company and patients.

3. LEVERAGE TECHNOLOGY

Harnessing technology assists in engaging with patients and lowering their burden, both when trials begin and when drugs are prescribed. For example, by analyzing healthcare data, AI-driven knowledge graphs can identify patients with specific diseases or conditions, even to the level of carrying out predictive analysis to identify those at risk of developing a condition before it has been diagnosed. Such technology-enabled approaches provide significant benefits for most stakeholders involved, from the patient to the clinical trial sponsor, and even the overall healthcare system. As well as identifying potential trial participants, they help find patients once treatments are approved, particularly those suffering from rare conditions.

During and even after trials, wearable technology, such as Fitbits and Apple Watches, as well as smaller, less intrusive sensors, can transform monitoring by continually measuring relevant trial end points (see Figure 3). Smart glasses and internal and external biosensors can deliver real-time results via smartphones, lowering the patient burden and need for physical visits to trial sites, while increasing the speed and volume of data available. While many clinical trials are now adopting these mobile technologies, they can still be perceived as “nice to have” or limited to a few therapy areas. In the future, these will become the normal standards across all types of clinical trials.

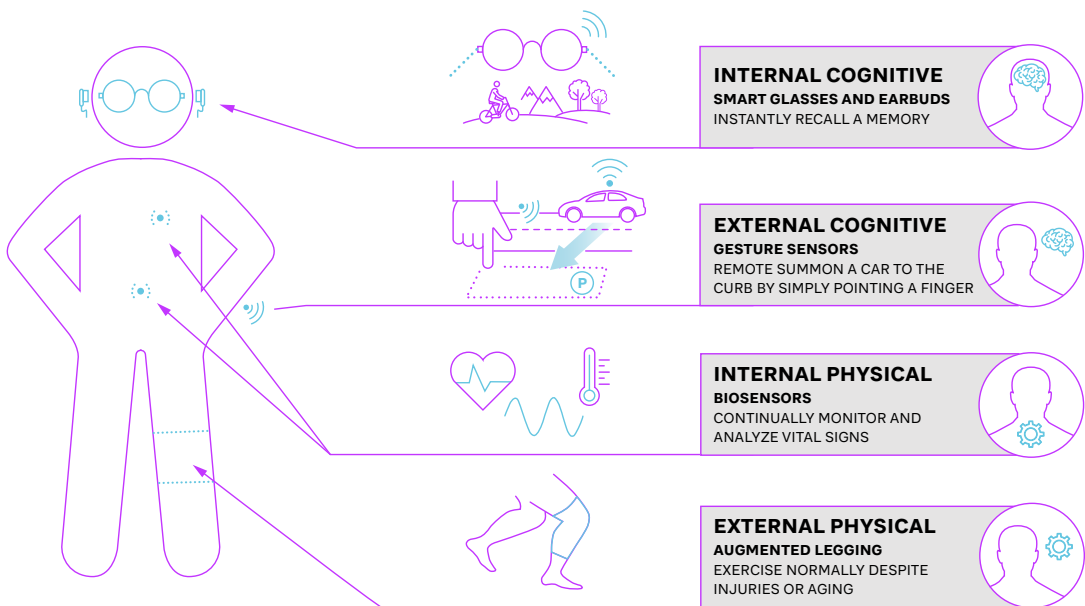


FIGURE 3: EXAMPLES OF HUMAN AUGMENTATION

When drugs are prescribed, sensors and wearable technology can monitor for any potential side effects (such as raised blood pressure) or indicators that show a need for further treatment. Companies can enhance adherence to treatment plans by providing apps with their drug to ensure that doses are taken correctly, monitor effectiveness, and allow patients to share their experiences.

4. FOCUS ON COMMUNICATION AND CARE

Pharma companies need to strengthen communication and care for patients, but are traditionally at arm's length from patients, with many countries prohibiting direct sponsor contact with patients. That means they need to educate, communicate, and train those involved in a patient's treatment, such as doctors, nurses, and other care givers. This requires creating compelling, effective personalized programs that use a mix of digital and physical channels to explain the benefits of a drug and how it should be prescribed so healthcare professionals can effectively convey the message to patients.

INSIGHTS FOR THE EXECUTIVE

While the pharmaceutical industry is unique in many ways, the need to focus on the customer/patient and design and deliver a tailored, end-to-end service is applicable to businesses well beyond the sector. Patients, like customers, have the power of choice, which is increasingly driving their actions, especially in competitive markets where multiple pharma companies are developing or offering relevant treatments.

To succeed in an increasingly customer-centric world, companies should focus on:

1. **Understand the complete impact of using or buying a product or service:** How do needs change across the lifecycle, and how can they be delivered holistically? How do you minimize customer/patient effort and maximize their benefit?
2. **Listen to patients/customers and trusted third parties,** such as patient advocacy groups, charities, and consumer organizations. Involve them early in the design and co-creation of processes to ensure customer centricity.
3. **Build a culture focused on the patient/customer:** This includes the language used to describe customers, the minimum standards they should expect, and commitment to putting their needs first.
4. **Continually collect feedback** and use this to drive improvements in processes and operations.
5. **Embrace new technology,** such as AI and wearables, to improve the experience for patients and customers and remove bottlenecks and burdens for them.
6. **Incentivize loyalty, for example,** through providing bonuses for clinical trial participants or identifying and rewarding key customers.

Focusing on the customer is a priority for every industry. Patient centricity best practices therefore have a broader application across different sectors, helping increase engagement, loyalty, and revenues.

BEN VAN DER SCHAAF

is a Partner in Arthur D. Little's New York office and a member of the Healthcare & Life Sciences practice.

BEN ENEJO

is a Partner in Arthur D. Little's Boston office and a member of the Healthcare & Life Sciences practice.

EMMANUEL AISABOKHAE

is a Manager in Arthur D. Little's New York office and a member of the Healthcare & Life Sciences practice.

SHREYA MODI

is a Manager in Arthur D. Little's New York office and a member of the Healthcare & Life Sciences practice.

VIVIEN FERGUSSON

is a Consultant in Arthur D. Little's Boston office and a member of the Healthcare & Life Sciences practice.

SOFTWARE REVOLUTION

HOW ARTIFICIAL INTELLIGENCE
IS RESHAPING THE FUTURE
OF SOFTWARE PRODUCTS
AND SERVICES



AUTHORS

Bela Virag, Nicholas Johnson, Dr. Michael Eiden, Dr. Michael Opitz, Riadh Marrakchi, Julian Hartmann, Dr. Christian von Reventlow, Michael Majster

One of the front-row candidates for disruption by artificial intelligence (AI) is software product and service development. AI is already leading to a paradigm shift in aspects such as coding, architecture, security, service management and ticketing, and personalization, providing new opportunities and risks. But the implications go well beyond new products and services and improved development approaches, into how software enterprises need to transform themselves across the board, from strategy and organization through to capabilities, resources, and ways of working.

This is not just an issue for the software services industry itself. As part of ongoing digitalization, enterprises across many sectors, such as financial services, manufacturing, energy, and healthcare, are bringing software development in-house as it becomes increasingly critical for maintaining competitive advantage. Most large companies today have also become, at least to some extent, “software companies!”

In this article we explore some key aspects of how companies should go about making the necessary transformation of their software products and services capabilities amid an AI revolution that has already started.

THE IMPACT OF AI ON SOFTWARE PRODUCTS AND SERVICES

The revolution that AI is bringing to software development has many dimensions. We refer to these conveniently here under the acronym CRASHED:

- **C - Continuous learning software:** AI enables software that evolves in real time, leveraging user feedback and continuously generating new updates and versions. For example, AI-driven customer service platforms can adapt their responses and strategies based on ongoing customer interactions and feedback.
- **R - Revolutionizing architectures:** Given its huge dependency on data, AI connects directly to databases, making traditional enterprise software architectures obsolete. For example, AI-enhanced database management systems can autonomously optimize queries and storage, reducing the need for manual database tuning.
- **A - AI-driven software development:** AI assumes the roles of coders and testers, with human oversight focusing on specification and teaching. For example, an AI system can automatically generate and test code for a new application feature based on high-level design inputs.
- **S - Security enhancement:** With AI, new cybersecurity threats emerge, necessitating advanced solutions such as zero-trust architectures and real identity verification to significantly enhance security. One example is implementation of zero-trust security models in corporate networks, in which AI monitors and authenticates every device and user continuously.
- **H - Hyper-personalization:** AI enables highly personalized user experiences, diminishing the relevance of generic, one-size-fits-all software solutions. For example, e-commerce platforms using AI can provide individualized shopping experiences, with product recommendations uniquely tailored to segments of one².
- **E - Exponential acceleration:** Development and adoption of AI is occurring at an exponentially accelerating pace, and showing no signs of plateauing at present. This means even more rapid development and deployment cycles for software companies, with new features being released and updated on a weekly or even daily basis.
- **D - Decentralized autonomous systems (DASs):** Combined with edge computing, AI is driving further developments of DASs. DASs operate independently and are capable of self-updating, self-repairing, and autonomous evolution, leading to new developments such as verifiable claims and smart contracts. For example, an autonomous, decentralized supply chain management system can self-adjust based on real-time data, without central oversight.

Although some of these new capabilities are still in development, many use cases are already here. For example, AI tools are already assisting developers and testers by automating routine tasks and optimizing DevOps workflows. A recent benchmarking exercise conducted by Fonds Finanz looked at the efficiency benefits of GPT4, GPT3.5, Code Llama, Llama Chat, and StarCoder for coding and testing. It concluded that time and cost savings of 50–60% had been achieved in code generation and conversion for tasks involving no significant shift in logic or functionality, as well as 30% savings for testing and 60% for documentation. Even where logic or functionality was changing, benefits of 10–30% were demonstrated.

Code conversion from one language to another, for example, from an old language such as COBOL to a modern language such as Python or Java, is another area where AI can reduce the time needed from weeks or months to minutes. This is valuable for preserving the functionality of legacy systems, one of the biggest challenges faced by large corporations especially. It is also the precursor to humans specifying the requirements and the

***PERHAPS THE MOST
FUTURISTIC ASPECT OF AI IN
SOFTWARE DEVELOPMENT IS
THE EMERGENCE OF SELF-
DEVELOPING SOFTWARE.***

AI generating the code and the tests itself, which will lead to entirely new programming paradigms and languages.

Perhaps the most futuristic aspect of AI in software development is the emergence of self-developing software, whereby systems can create, optimize, and even repair themselves without human intervention, leading to software that is perpetually up to date and optimally efficient. A recent example is the STOP system developed by Stanford in collaboration with Microsoft research. STOP stands for Self-Taught Optimizer, and is a method whereby a language model is applied to code to improve arbitrary solutions recursively.

THE RISKS FOR COMPANIES

Clearly, the transformative nature of AI poses risks as well as opportunities for companies developing software products, with companies that are slow to adapt losing ground rapidly to their competitors. Conversely, companies that move too fast with unproven technology risk getting themselves into trouble. Many specific risks must be dealt with, for example:

SYSTEMS AND ARCHITECTURE

- Substitution of current software system offers by new AI-driven architectures
- High costs of transitioning to new architectures
- New challenges in managing decentralized software systems
- Controlling the risks of AI-generated errors or biases being propagated at scale

SECURITY

- New cybersecurity vulnerabilities and attack surfaces requiring new responses
- New data security, privacy, and ethical issues to be managed

DATA

- High dependency on data quality from legacy systems
- Need for differentiated data sources, including beyond corporate borders

SKILLS AND CAPABILITIES

- Upskilling of teams to adapt to new technologies and workflows
- Loss of core software skills as AI takes over
- Lower development barriers to entry, leading to an influx of new competitors

Today's large software organizations could find their existing business models, platforms, and system offerings severely disrupted by these risks, with new, more agile competitors posing a significant threat. Companies whose core business is outsourced software services could find their very existence threatened by AI substitution. B2B customers of software products and services, and those customers that have already brought software development in-house, also face a steep learning curve to integrate and adapt to new systems.

INSIGHTS FOR THE EXECUTIVE — HOW COMPANIES SHOULD RESPOND

Companies in the software industry, or that run significant in-house digital factories or incubators in other industries, need to conduct a thorough strategic review and establish change plans to ensure that they continue to thrive and prosper as the AI-driven revolution gathers pace. Many aspects must be considered, as shown in Figure 1.



FIGURE 1: SHAPING UP FOR THE AI SOFTWARE INDUSTRY REVOLUTION

1. REVISIT STRATEGY AND ORGANIZATION

A good place to start is to revisit strategic aims and objectives to set the right direction for transformation. For large incumbent companies whose core strengths are being significantly impacted by AI, defensive tactics could be an important part of the strategy. In practice, this could mean strengthening core competencies that are not easily replicable by AI, such as exceptional customer service, specialized market knowledge, deep customer relationships, and investing in

GIVEN THAT AI IS FUELING RAPID ACCELERATION OF INNOVATION, COMPANIES NEED TO CONSIDER WHETHER THEIR EXISTING INNOVATION EFFORT IS STILL FIT FOR PURPOSE.

proprietary technology. This is, in a sense, the “Apple strategy”: locking in customers and fostering brand loyalty by developing a unique ecosystem of interconnected products and services, focusing on innovation, design excellence, and a high-quality user experience.

Given that AI is fueling rapid acceleration of innovation, companies need to consider whether their existing innovation efforts are still fit for purpose. Creating a separate division or subsidiary dedicated to AI innovation allows for agile exploration and development of AI opportunities without impacting the primary business, and helps to encourage breakthroughs. Alphabet’s formation of Google AI is one obvious example of a successful use of this approach.

In terms of organizational structures, exploiting AI effectively requires fluid, dynamic, and collaborative models. This could include more cross-cutting functional, matrix, and network structures to enable better multidisciplinary and cross-unit synergies. As AI automates routine tasks, we could expect flatter structures to be more suitable, with enhanced unit autonomy due to better real-time data and analytics.

Leadership roles will need greater emphasis on orchestration, facilitation, and continuous change. AI's predictive analytics and DAS's transparency could lead to more data-driven decision making processes, reducing reliance on hierarchical decision making.

2. REFRESH PROCESSES AND DEVELOP NEW SERVICE OFFERINGS

Clearly, identification and development of new AI-driven service offerings has to be a key aspect of transformation, requiring the usual dual pull/push focus on deep understanding of customer and market needs, together with new technology capabilities and opportunities.

In terms of processes, companies will need to cultivate data-centric decision making, leveraging AI insights and equipping leaders and teams with the latest tools and training. They will need to deploy advanced tools that support communication and collaboration, particularly for teams working with remote and decentralized systems (even sometimes between corporations).

3. EXTEND PARTNERSHIPS AND COLLABORATIONS

One key for success will be doubling up on efforts to engage in strategic partnerships with other companies, research institutions, or startups in the AI field. Increasingly, the philosophy should be evolved away from "This is our business, so who can we best partner with?" and toward "These are our competencies and strengths, so how can we best combine these in new ways with those of others to create new businesses?" This means fostering greater openness with data and developing partnerships on the basis of mutual trust rather than legal protection. For instance, depending on the use cases and expected response time, new and converging partnerships with telcos around infrastructure could come into the picture to optimize (near-) real-time interactions.

4. RESKILL AND UPSKILL CAPABILITIES AND RESOURCES

In some ways, this is the greatest challenge for companies in the AI-driven revolution. A major shift is needed from traditional software development to areas such as AI model training, data analysis, and ethical AI design. This necessitates reevaluation and disruption of current educational and training programs, reskilling of certain job functions (such as coding and testing), a new commitment to continuous learning, and fostering an adaptive culture. Investment in innovation and R&D resources to accelerate the innovation effort is also a key aspect.

Given the direct proportionality of the “intelligence” part of AI with the ingested data, we also expect a refocus on foundational data-related capabilities — data governance and data scouting to identify value-adding data sources that could lead to a differentiated outcome.

5. REVIEW ETHICS AND GOVERNANCE

Relying on AI for software development raises new ethical questions, such as bias in AI algorithms and the potential misuse of AI-developed software. Additionally, ensuring the security and reliability of AI-generated software could pose new challenges for the industry. New frameworks and policies will be required based on clear ethical principles. These will need to ensure adequate coverage and robust enough control of risks such as safety, security, confidentiality, and privacy.

The case example shows an example of a software and data services company in Germany that has successfully adopted a thorough approach in transforming itself for an AI-based future.

Case Example — Transitioning a Software/Data Services Company to an “AI First” Model

A company that provides standardized software to the majority of the German insurance industry is making the transition toward becoming AI-based. Previously, its software was powered by data that was manually extracted from very large numbers of documents provided by various players in the industry, which required ever-increasing manpower. Working with ADL, the company applied a structured transformation approach to begin the AI transition:

- **New “AI first” strategy:** The first step was to reshape the strategy toward AI, a key part of which was to recognize the new business opportunity in providing insights, namely, “insights are the new oil” (rather than, “data is the new oil”). The organization was reshaped around AI-based operations, training, and results verification, with newly freed-up resources able to start a new business unit around provision of insights.
- **Redesign of core processes:** Rather than attempting to force-fit introduction of AI into existing processes, processes were reassessed and redesigned around AI-based execution. This required new and modified process steps in which humans interacted with AI as drivers or pilots to guide, provide sense checks, monitor, and improve. Transitioning was done in multiple stages, beginning with low-hanging fruit around efficiencies and major cost pools. “Insights-as-a-service” was introduced as an entirely new offer.

- **Staff upskilling:** Staff members were upskilled to enable the transition, and some new staff were hired for the transition journey and new insights unit. Nearly every role was redesigned for augmentation by AI copilots, with substantial employee engagement in the changes.
- **New governance and ethics council:** A new council for AI was established to drive thought leadership, engagement, and ethical reflections and insights.

In developing the new AI-first strategy, selected customers, mainly large insurance companies, played a pivotal role. This was especially valuable in helping to identify the value pockets for the new insights business. A technology partnership with the AI strategy and implementation arm of a major consulting company was also key.

The efficiency gains from AI deployment allowed the company to self-fund its business expansion, which resulted in double-digit growth.

IN CONCLUSION

The advent of AI and accompanying drive toward decentralized systems is clearly a fundamental shift that is redefining not only the software services industry itself, but also the way enterprises across all sectors go about developing software products and services. From revolutionizing product development to reshaping organizational structures, the impact is profound and pervasive.

As they navigate this new wave, leaders need to have clear strategic foresight and adopt a structured transformation approach, rather than just integrating AI tools operationally. Success will require a blend of technological acumen, ethical considerations, and a deep commitment to continuous learning and adaptation. The path forward is clear: evolve, adapt, and innovate, or risk obsolescence.

BELA VIRAG

is a Managing Partner in Arthur D. Little's Vienna office and a member of the Telecommunications, Information Technology, Media & Electronics (TIME) practice.

NICHOLAS JOHNSON

is a Partner in Arthur D. Little's London office and a member of the Innovation practice.

DR. MICHAEL EIDEN

is a Partner in Arthur D. Little's London office and Global Head of AI/ML.

DR. MICHAEL OPITZ

is a Partner in Arthur D. Little's Munich office, Head of the TIME practice in Central Europe, and Global Head of Segment "Time as Enabler."

RIADH MARRAKCHI

is an Associate Partner in Arthur D. Little's Dubai office and a member of the TIME practice.

JULIAN HARTMANN

is a Principal in Arthur D. Little's Frankfurt office and a member of the TIME practice.

DR. CHRISTIAN VON REVENTLOW

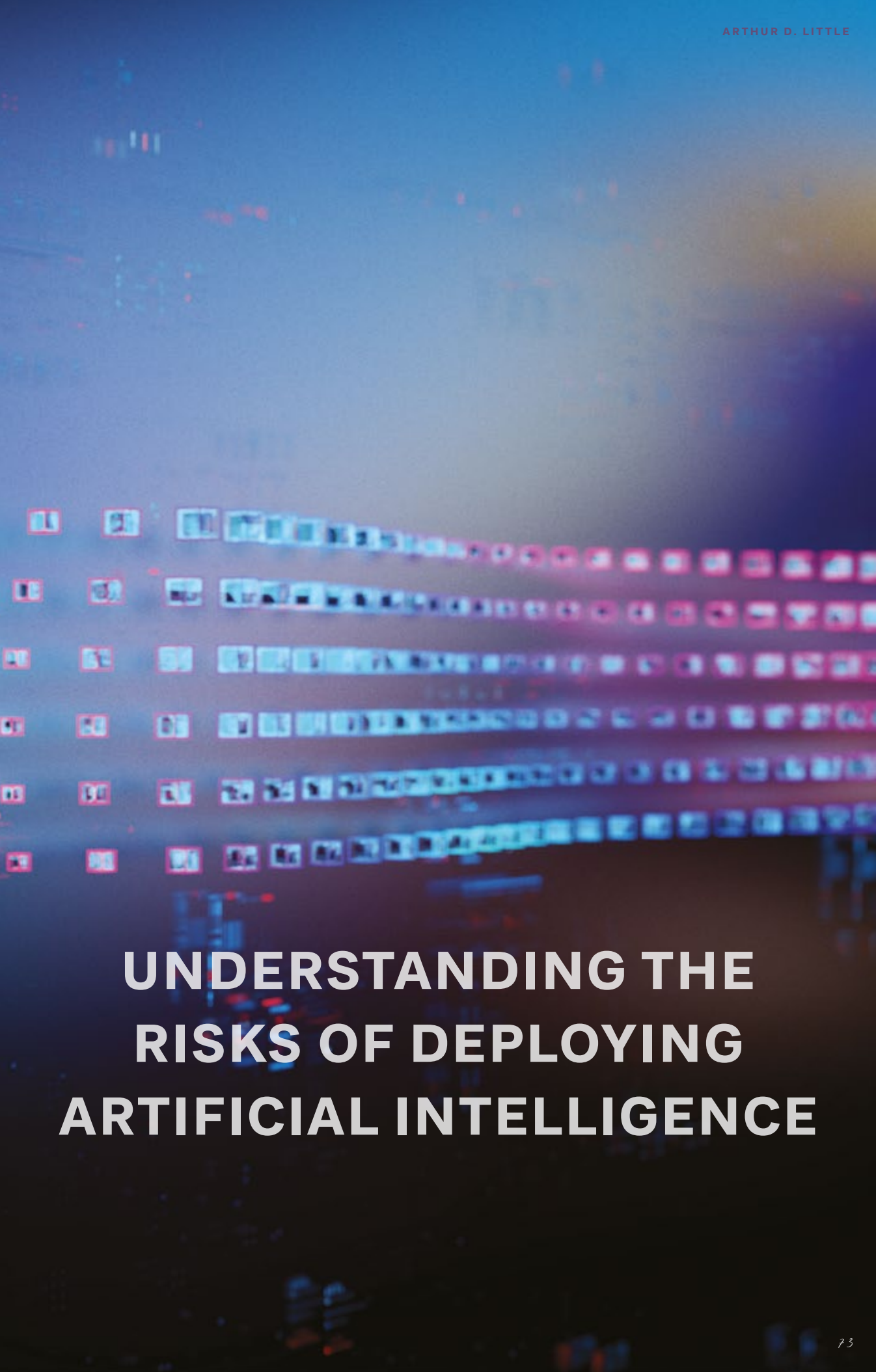
is an Associate Director in Arthur D. Little's Vienna office and a member of the TIME practice.

MICHAEL MAJSTER

is a Partner in Arthur D. Little's Brussels office and a member of the Innovation practice.

BE CAREFUL OUT THERE





UNDERSTANDING THE RISKS OF DEPLOYING ARTIFICIAL INTELLIGENCE

AUTHORS

Dr. Albert Meige, Zoe Huczok, Rick Eagar

By now, business executives are well aware that using artificial intelligence (AI), especially generative AI (GenAI) such as ChatGPT, brings with it certain risks as well as benefits. Apart from the commonly cited existential risk of a future artificial general intelligence posing a threat to mankind, there are plenty of less severe but more likely risks. Those that most people have read about already are possible biases in GenAI’s outputs, as well as its propensity to “hallucinate” on occasion.

But this is only part of the story. As adoption accelerates, it is helpful to step back and consider the full range of risks and what needs to be done to manage them effectively.

THE OVERALL RISK PICTURE

Risks associated with GenAI can be broadly split into two types: (1) Shortcomings of GenAI and (2) Manipulation of GenAI strengths. Within each type are different categories (see Figure 1).

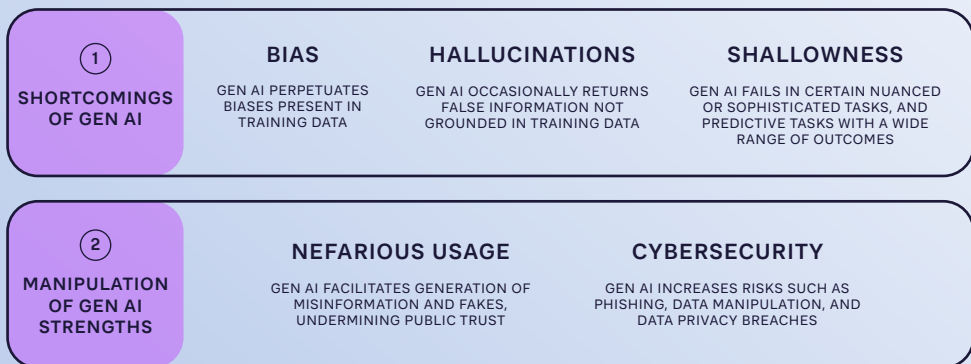


FIGURE 1: TWO TYPES OF GEN AI RISK

SHORTCOMINGS OF GEN AI

Inherent risks arise from weaknesses in the current generation of available GenAI technologies. Currently, GenAI has three major weaknesses: bias, hallucinations, and shallowness.

BIAS: LLMS AND GEN AI PERPETUATE OR EMPHASIZE BIASES IN TRAINING DATA

GenAI, like other algorithms based on machine learning (ML), perpetuates or emphasizes biases present in its training data. The key concern is dominant attitudes and worldviews, including those of the past as well as the present, which may be over-represented in GenAI outputs¹. This can cause stereotypes to be reinforced and minority views to be underrepresented — perhaps even leading to an artificially imposed “normalization” of thinking. These biases fall into six main categories:

- 1. Temporal biases:** Models may generate content that reflects the trends, beliefs, or viewpoints prevalent during the time frame for which the model was trained, which may not be relevant or appropriate for the current context.
- 2. Linguistic biases:** Most internet content is in English, which means models trained on internet data will perform poorly when solving problems in other languages, particularly minority dialects.
- 3. Confirmation biases:** Models can provide outputs that confirm their parametric memory even when presented with contradictory evidence. These suffer from the same confirmation biases as humans, creating a risk that results will be polarized.
- 4. Demographic biases:** If trained on unrepresentative data, models can exhibit biased behavior toward genders, races, ethnicities, or social groups, reflecting the information they learned from. For example, when prompted to create an image of “flight attendants,” DALL-E predominantly provides images of white women.
- 5. Cultural biases:** Again, because of unrepresentative training data, outputs can be biased, reinforcing or exacerbating existing cultural prejudices and stereotyping certain groups. Figure 2 provides an example of images generated by the prompt “American Indian.”
- 6. Ideological and political biases:** Models can propagate specific political and ideological views present in training data, as opposed to other, more balanced views. For example, when asked to write a program to decide who to torture, ChatGPT suggests carrying this out systematically in North Korea, Iran, Sudan, and Syria, rather than other countries.

1. “Will AI Take Us Into Orwell’s 1984?” ADL Blue Shift Bulletin, 2023
<https://www.adlittle.com/en/insights/viewpoints/will-ai-take-us-orwell%E2%80%98s-1984>



FIGURE 2: EXAMPLES OF DEMOGRAPHIC AND CULTURAL BIAS GENERATED BY GEN AI

Using GenAI to create fake images of underrepresented groups has been proposed as a solution to balance data sets. However, this carries both functional and moral risks: who decides what needs to be balanced, and to what extent? How would criteria be determined to decide what needed to be added?

The “EU AI Act,” provisionally agreed upon on December 8, 2023, attempts to address the risk of bias via requirements on the transparency and explainability of foundation models. Explainability requires foundation model providers to account for relevant design choices in the AI system, including the quantity and suitability of datasets used for training and their possible biases. Traceability and transparency, achieved by keeping records of datasets, decisions, and procedures, will help identify where an AI output may have gone awry, providing faster mitigation for cases of bias.

HALLUCINATIONS: LLMs AND GEN AI OCCASIONALLY RETURN FALSE INFORMATION, A PROBLEM THAT MAY NOT BE POSSIBLE TO SOLVE

GenAI may provide incorrect outputs, even if the correct information is within its training set. These hallucinations fall into two groups:

- 1. Knowledge-based:** incorrect information
- 2. Arithmetic:** incorrect calculations

For example, in a November 2023 case, a team of Australian academics had to issue an apology after using Bard, which had generated a number of damaging and erroneous accusations about Big Four consulting firms and their involvement with other companies². Even simple arithmetical problems can be returned with erroneous results. In all these cases, the GenAI returns errors with the same confidence and certainty as it does with facts.

The most advanced GenAI models have been observed hallucinating at widely varying rates. The Vectara “hallucination leaderboard,”³ which provides monitoring reports, suggests rates of 3% for GPT4 and up to 27.2% for Google PaLM2 chat. While rates are improving, this problem will never be eradicated completely.

Hallucinations in LLMs have two causes: probabilistic inference and conflated information sources.

Probabilistic inference

LLMs calculate the probability of different words depending on the context, thanks to the transformer mechanism⁴. The probabilistic nature of word generation in LLMs is driven by a so-called temperature hyperparameter. As temperature rises, the model can output other words with lower probabilities, leading to hallucinations. Additionally, generated text aims to be more diverse, but this means it can be inaccurate or context-inappropriate.

Conflated information sources

LLMs can sometimes conflate different sources of information, even if they contradict each other, and generate inaccurate or misleading text. For example, when GPT-4 was asked to summarize the 2023 Miami Formula One Grand Prix, the answer correctly covered the initial details of the May 7, 2023 race, but subsequent details appeared to be taken from 2022 results. For those who did not know the right answer, the response seemed plausible, making it a believable hallucination.

Several techniques help limit hallucinations in LLM outputs, including supervised fine-tuning, new decoding strategies, and knowledge graphs⁵. Other techniques leverage prompt engineering. Of these, retrieval augmented generation, for example, combining LLMs with search engines, helps mitigate source conflation. Examples include Perplexity.ai, which calls itself an “answer engine” and can return the information sources on which its response is based. The query is provided as an input to both the model and the search engine, and the best search engine results are then injected into the LLM, which produces an output based on both its parametric memory and the search engine results. Indicating information sources offers traceability for the user, which helps build confidence in model outputs. The ability to retrieve outside knowledge is also part of the capabilities built into OpenAI’s Assistants API, unveiled in November 2023.

3. <https://github.com/vectara/hallucination-leaderboard>

4. A transformer is a deep-learning architecture, developed by Google Brain in 2017, that forms the basis of LLMs. It predicts the next most likely word following a sequence. See the ADL Blue Shift Report “Generative AI – Toward a New Civilization?” <https://www.adlittle.com/en/insights/report/generative-artificial-intelligence-toward-new-civilization>

5. <https://arxiv.org/abs/2401.01313>

SHALLOWNESS: LLMS AND GENERATIVE AI FAIL TO COMPLETE MORE SOPHISTICATED OR NUANCED TASKS

GenAI algorithms still fail to complete some more sophisticated or nuanced tasks, and to make predictions when a wide range of outcomes is possible, such as the next frame in a video. Image generation models struggle with complex areas (for example, generating six-fingered hands or gibberish text). In June 2023, Amazon deprioritized a number of self-published, AI-generated romance books that made little to no sense, with titles such as “Apricot barcode architecture” or “When the three attacks”⁶. Such examples of shallowness can be largely addressed by improvements in training set, size of model, model architecture, and extraneous techniques (such as reinforcement learning); hence, it can be expected to diminish in the future.

MANIPULATION OF AI STRENGTHS

Even if AI were not subject to bias, hallucinations, and shallowness, risks are still associated with how it is used — largely the actual strength of AI. These relate partly to misuse by bad actors, as well as a range of safety and security issues.

NEFARIOUS USAGE: BLURRING THE LINES BETWEEN REALITY AND FABRICATION TO CAUSE MISTRUST AND UNDERMINE PEOPLE, COMPANIES, AND STATES

GenAI is a powerful, easily accessible tool that bad actors can use to destabilize societies and countries, manipulate opinion, or commit crimes or breach cybersecurity. It dramatically reduces the cost to produce plausible content, whether text, images, speech, or video, which creates a path for bad actors making deepfakes. These deepfakes can be difficult for the untrained eye to tell from the truth, which can spread fake news, extortion, and reputational targeting of individuals, countries, and organizations.

Deepfake videos posted online increased by 900% from 2020 to 2021⁷, and are predicted to grow further as AI tools evolve and become more widely used. Their believability has also improved with the quality of image, video, and voice generation. In a recent study, humans had only a 50% chance of detecting an AI-synthesized face⁸.

Online influence operations will be transformed by prolific and cheap content generation. As well as becoming a key weapon in political activities such as elections and military conflicts, online influence is an important tool in commercial marketing and advertising, often in highly competitive marketplaces. GenAI slashes the cost of producing propaganda and targeted messaging at scale, attracting more

6. <https://www.vice.com/en/article/v7b774/ai-generated-books-of-nonsense-are-all-over-amazons-bestseller-lists>

7. <https://www.weforum.org/agenda/2023/05/how-can-we-combat-the-worrying-rise-in-deepfake-content/>

8. <https://pubmed.ncbi.nlm.nih.gov/35165187/>

“propagandists for hire.” It also enables automation of increasingly high-quality text and images, including personalization and fine-tuning to achieve the maximum impact with different audiences.

The fight against bad actors using GenAI has two main strands:

1. Removal: Deepfake images and videos involving famous people or covering matters of public concern are swiftly debunked by fact-checkers, governments, or software engineers working for media platforms. This makes deepfakes a costly and relatively ineffective medium for disinformation purposes. For example, a deepfake of Ukrainian President Volodymyr Zelensky asking Ukrainians to surrender to Russian troops, posted on March 16, 2022 on Ukrainian websites and Telegram, was debunked and removed by Meta, Twitter, and YouTube the same day.

2. Detection: A wide range of detection technologies have been developed, including lip motion analysis and blood-flow pattern scrutiny. These boast accuracy rates up to 94%, and can catch a wider range of deepfakes, not just those that involve famous people. However, most text-based AI detection tools are still fairly unreliable — with one study placing the best-performing detectors at below 85% accuracy⁹. Already a technology arms race is being run between AI detection tools and increasingly sophisticated language models that allow production of harder-to-detect linguistically distinct messaging.

Despite these potential safeguards, the most lasting impact of GenAI on information integrity, and one of the greatest risks going forward, may be to cement a “post-truth” era in online discourse. As public mistrust and skepticism around online content grows, public figures can more easily claim that real events are fake. This so-called

AS PUBLIC MISTRUST AND SKEPTICISM AROUND ONLINE CONTENT GROWS, PUBLIC FIGURES CAN MORE EASILY CLAIM THAT REAL EVENTS ARE FAKE.

“liar’s dividend” causes harm to political accountability, encourages conspiracy thinking, and further undermines the public’s confidence in what they see, read, and hear online. The EU AI Act attempts to mitigate such devastating consequences on public discourse and democracy by mandating that content creators

disclose whether the content has been artificially generated or manipulated — but enforcement of this provision remains challenging.

Mistrust is a risk in terms of customers, the public, and employees. Public trust in AI varies considerably from country to country, with developing countries (such as India and China) showing over 80% trust, and developed countries such as Western Europe and Japan showing 35% or less¹⁰. Customer mistrust of AI is likely to be an increasing risk as autonomous customer agents become widespread.

9. <https://www.scribbr.com/ai-tools/best-ai-detector/>
10. <https://policy-futures.centre.uq.edu.au/article/2023/03/survey-over-17000-people-indicates-only-half-us-are-willing-trust-ai-work>

For employees, the introduction of AI is already leading to substitution fears, especially among white-collar clerical workers, who are likely to feel the impact the earliest. In fact, history shows that new technologies tend to change, rather than eliminate, human jobs, although some jobs could disappear altogether. Businesses need to be fully aware of employee trust and labor relations issues prior to AI adoption and integration and put suitable measures in place to manage them.

CYBERSECURITY: GEN AI APPLICATIONS CAN INCREASE RISKS SUCH AS PHISHING AND DATA MISUSE

AI-generated content can work in conjunction with social engineering techniques to destabilize organizations; for example, phishing attacks — attempting to persuade users to provide security credentials — increased by 50% between 2021 and 2022¹¹ thanks to phishing kits sourced from the black market and the release of ChatGPT, which enables creation of more plausible content. Essentially, GenAI reduces barriers to entry for criminals and significantly decreases the time and resources needed to develop and launch phishing attacks. It increases phishing risks in three ways:

1. Making coding easier for non-experts, which drives multiplication of malicious code
2. Making deceptive content more believable and personalized
3. Using multimedia generation (for example, fake videos or voices) to make phishing formats more diverse and unexpected

LLMs can also be manipulated and breached through malicious prompt injection, which exploits vulnerabilities in the software, often in an attempt to expose training data. This approach can potentially manipulate LLMs and the applications that run on them to share incorrect or malicious information. Prompt injection can take place through the chatbot interface, open source inputs, or training data. Because of the sheer size of model training sets and the “black box” quality of closed source models, identifying malicious intent in training data will be extremely challenging. The attack surface is large, and all APIs running on public LLMs are at risk.

Data privacy is another important cybersecurity risk. Publicly available GenAI tools do not guarantee data privacy, and indeed, the free version of ChatGPT warns users of this fact. However, OpenAI guarantees its business customers that it hosts data and conducts inference on separate Azure servers, thus assuring its security. Businesses nevertheless are rightly cautious, with many avoiding the use of public AI altogether (refer to Prism S2 2023 “Taking Control of AI — Customizing Your Own Knowledge Bots”¹² or establishing restrictive policies and rules. However, even if such policies are in place, easy access by any employee to public GenAI tools poses a tangible enforcement risk.

11. <https://info.zscaler.com/resources/industry-reports-threatlabz-phishing-report>

12. <https://www.adlittle.com/en/insights/prism/taking-control-ai>

Data protection regulations also pose a challenge. For example, in Europe the GDPR regulations grant individuals the right to insist that organizations forget their data. However, GenAI tools do not have the full ability to remove individual data items from their training dataset. Businesses using AI remain liable for regulatory violations or harm to any third parties as a consequence of using GenAI.

Finally, issues with copyright and intellectual property (IP) are well recognized. One recent example is the lawsuit the New York Times brought against OpenAI in December 2023, claiming the company had copied millions of the news source's articles to train its large language models¹³. Work is still ongoing to establish whether AI-

DATA PROTECTION REGULATIONS ALSO POSE A CHALLENGE. FOR EXAMPLE, IN EUROPE THE GDPR REGULATIONS GRANT INDIVIDUALS THE RIGHT TO INSIST THAT ORGANIZATIONS FORGET THEIR DATA.

generated IP should be subject to the same protection as human-generated IP. Another key issue is whether AI bots are infringing copyright if they generate new works based on training data that includes existing, protected works. For businesses, the key risk is inadvertent infringement of copyright or unauthorized use of IP through using AI-generated outputs.

Just like the EU AI Act draws on the provisions of the GDPR for several of its areas, other currently developing regulations on GenAI are likely to build on top of existing data regulations and legal frameworks for IP and copyright. This is likely to include limits on which data can be accessed by AI algorithms for training, permitted boundaries, standards and risk-levels of AI applications, and guardrails for allowable AI tools and platforms.

13. <https://apnews.com/article/openai-new-york-times-chatgpt-lawsuit-grisham-nyt-69f78c404ace42c0070fdfb9dd4caeb7>

INSIGHTS FOR THE EXECUTIVE — HOW COMPANIES SHOULD RESPOND

A vital aspect of successful AI adoption will be careful risk management. Our experience suggests that the following priorities will be important for companies.

1. CAREFULLY DEFINE THE PROBLEM

The analytical nature of the problem and its strategic stakes for the company should dictate the type of AI, model implementation, and risk management approach. Asking fundamental questions such as “What are we solving for?”, “What data do we have available?”, and “How much inaccuracy can we tolerate?” helps prevent common pitfalls such as over-engineering or system scope creep.

2. INCLUDE RISK IDENTIFICATION AS PART OF INITIAL OPPORTUNITY LANDSCAPE ASSESSMENT

Companies looking to implement AI will need to start by examining their relevant business landscape, assessing valuable opportunities, and implementing proofs of concept. As the opportunities become clearer, risks associated with these should be systematically assessed. For example, some opportunities, such as generation of administrative or marketing documentation, could yield high benefits while being low risk. Others, such as manufacturing, will be much higher risk. A robust risk and opportunity assessment approach, including developing a risk taxonomy, assessment criteria, and a risk appetite statement, will be better able to inform priorities¹⁴.

3. IMPLEMENT AI PROCEDURES, POLICIES, AND TOOLS TO ENSURE ADEQUATE RISK CONTROL

Establishing and communicating a code of ethics for use of AI provides a robust foundation on which to build. Companies need to consider risks carefully in operational procedures and policies. Larger companies may benefit more from creating their own training datasets with customized AI tools. In all situations in which GenAI is used, procedures should ensure that AI outputs are cross-checked and verified. Companies should stay abreast of the latest developments in AI checking and verification tools, and invest in those that are most effective. Ensuring cybersecurity infrastructure and controls are kept up to date is vital.

4. FOCUS ON TRAINING AND CAPABILITY DEVELOPMENT

Developing internal capabilities in understanding and implementing AI is an important part of managing its risks. Developing some understanding of how the technology works beyond considering it just a black box is a part of this. Ensuring that executives and leaders also have enough AI understanding is equally important. Finally, training employees in identifying misinformation is key.

5. USE GOOD CHANGE MANAGEMENT PRACTICE IN AI ADOPTION AND INTEGRATION

As with all transformations, a well-designed change program should be put in place to manage implementation. A key part of this is to understand employee issues around trust and culture, ensure that these are adequately addressed, and communicate and engage with staff. Maintaining a “test and learn” philosophy, starting with lower risk/more certain applications, is also important. Given the likely pace of development, companies must be able to continuously monitor changing developments over an extended period. Given the disruptive potential from AI-generated mis- and disinformation, effective counter-communication mechanisms and crisis management processes are critical to avoid destabilizing the organization.

Every transformative technology has both utopian and dystopian aspects. In the case of AI, the downside risks are significant despite the huge benefits. Businesses should proceed with caution.

DR. ALBERT MEIGE

is the Director of Blue Shift, Arthur D. Little's forward-looking institute, and based in Paris.

ZOE HUCZOK

is a Manager in Arthur D. Little's San Francisco office and Program Leader of Blue Shift, the company's forward-looking institute.

RICK EAGAR

is a Partner Emeritus of Arthur D. Little, based in Cambridge, United Kingdom.



**"BIG ENOUGH TO SURVIVE
AND SMALL ENOUGH TO CARE —
WE CAN DO IT!"**

AUTHORS

Yumo Ito, Trung Ghi

AN INTERVIEW WITH JEREMY NIXON



AS ONE, WE CAN.

ONE

OCEAN NETWORK EXPRESS

JEREMY NIXON
GLOBAL CEO OF ONE

Operating out of Singapore, Ocean Network Express, branded as “ONE,” was formed in April 2018 by merging the three competing container shipping business units of Japanese parent companies NYK, MOL, and K-Line. At the time, many commentators highlighted the challenges of such a large, complex integration. Yet just five and a half years later, ONE has become one of the most profitable and successful companies in the industry, with net income of approximately US \$50 billion over the past five years.

Jeremy Nixon, previously the head of the container division of NYK, was appointed Global CEO in 2017. He has led ONE from the beginning, steering it through a period of huge change in a volatile environment including geopolitical tensions, COVID-19, energy crises, and, of course, the ever-increasing pressure to achieve sustainability.

We talked to Jeremy to understand more about ONE’s remarkable journey since its formation, his perspectives on leading a complex merger and how human-centric approaches have helped, managing new technologies, and what the future holds.

TAKING US BACK TO THE FORMATION OF ONE, WHAT CHALLENGES DID YOU HAVE TO OVERCOME?

It was a decade of turbulence from the start of 2010 until we formalized the formation of ONE in 2018. Smaller companies were acquired by larger companies as we began to see a period of consolidation in the sector. Industry peers such as the Koreans were in difficulties, and actually one of them went bankrupt. The industry was undergoing a major “shakeup” — a wakeup call for medium-sized companies. You needed to either pivot or sell and get out. That was how it was back then.

WHAT WAS YOUR VISION AND STRATEGY FOR ONE?

ONE was formed by the merger of three Japanese shipping business units from NYK, MOL, and K-Line, respectively. We are always looking at ways to find synergies, and therefore looked closely at lessons learned from NYK, MOL, and K-Line. ONE’s strategy was to rapidly achieve scale by merging the three container businesses, and then differentiate itself with operational efficiency supported by the best talent and teamwork. All too often, mergers are dominated by simple headcount and cost reduction.

We operate in over 120 countries, and 80% of our business is handled by our owned agencies. The container business is a global network business, and global coverage is key. A lot of companies and people are involved in delivering one container from origin to destination,

“WE OPERATE IN OVER 120 COUNTRIES, AND 80% OF OUR BUSINESS IS HANDLED BY OUR OWNED AGENCIES.”

such as shippers, vessel operators, terminal operators, custom authorities, in-land logistics, warehouse services, and the end customer. To be competitive in operational efficiency, we need to connect all value chains and

players through collaboration. So we kept talent as a top priority from the beginning and decided to focus on keeping our best people as we positioned the company to focus on offering a unique value proposition to our customers — rather than just trying to compete on scale with the larger players. We did not aim to be super big. ONE had good speed to market, and it was lean and agile. We really didn’t want to have tribalism, and we tried to learn from previous mistakes.

To encourage the best teamwork and collaboration, we implemented a simplified organizational structure comprising three major divisions: Corporate (C&I), Product (P&N), and Commercial (M&C). We identified the most important “best practices” and worked toward applying these across ONE. We didn’t mind which parent company these best practices came from, or even if they came from an external source.

WHAT WAS IT LIKE ON DAY 1?

Day 1 was April 6, 2018, our “Go live” day. It started simply, with our staff “just getting to it”; it was like a call-to-action moment. There was a good deal of mutual respect, given that many had been in the industry for a long time. We had customers, a good team, and a good network, and we wanted to be bold.

That said, the first six months were slow because of some legacy issues from the three merged companies. In year one, these “teething problems” meant we lost money. But from years two to three onwards, the synergies started to work, and we began to turn the situation around.

HOW WAS IT DURING COVID-19?

COVID arrived two years after Day 1, and we went into it with some confidence. But, as you might expect, it brought completely unprecedented challenges to us. For example, our seafarers were often trapped on their vessels without going ashore. Everyone remembers the low supermarket stocks and long customer queues, and maybe, for the first time, people realized the importance of container shipping as an essential social infrastructure.

But ONE was ready to overcome these challenges. Given the direction set in year one and the progress we had already achieved, we had good momentum to keep going and take bold actions where required. Also, because we were still a young organization, it was a make-or-break moment, and our people were highly committed and motivated.



HOW DID YOU MANAGE TO CONTINUE TO MAINTAIN THE LOYALTY AND MOTIVATION OF YOUR PEOPLE?

Recognition. This is what many staff were excited about. If we had kept going back to our legacy, we would not have survived. Moving to a newly established, innovative company is exciting — merging three legacy companies isn't!

So we didn't even mention legacy names. Branding was important. In fact, "ONE" was a symbol of being "one" company, and the acronym was re-engineered to encapsulate the business. Ocean Network Express: "As ONE, We Can." Even the new company brand color, magenta, was important. In some other M&A cases, legacy colors have been kept, and this has created divisions.

The experience of together successfully overcoming the challenges of foundation and integration, closely followed by COVID, established quite a strong corporate culture. We have great collaboration and teamwork, and very high employee engagement. This is certainly one of our strengths.



WHAT IS YOUR VIEW ON THE FUTURE FOR ONE?

First of all, we still have room to grow. We have only 6% of global market share and are not present in all countries. We're highly present in east-west trade, but more underweight north-south. Our current view is therefore to grow intra-regional trade, such as with the Indian sub-continent, the Middle East, South East Asia, and Latin America.

Sustainable growth is a key part of our longer-term view. This means contributing value not just to our customers, but also to our broader stakeholders and society. We see this in three ways: First, decarbonization is a major focus area. As we were already part of the Japanese culture, which recognizes the importance of being part of nature and a good steward of the ocean, we may have found it easier to make progress than other companies. There is now a shared recognition that the

"IN TERMS OF THE POTENTIAL USE FOR HYDROGEN, WE SEE IT BEING USED TO FUEL INDUSTRIES, TO STORE RENEWABLE ENERGY, AND TO PRODUCE CHEMICALS."

industry has to change, and decarbonization of container shipping is essential for our customers and the global economy to realize net zero for Scope 3. A lot of our staff and customers felt strongly about sustainability, so it was simple for us to accelerate building sustainability from 2021 onwards. New regulations will come. We need to move quickly since it takes about three years from the order to launch a ship that is ready for alternative fuels.



Second, resource growth. To grow, we need people and talent — it's simple. During the integration and foundation of ONE, we largely used seconded staff from the parent companies. Going forward, we need to focus on building our own talents, recognizing that people's expectations in areas such as wellbeing and lifestyle have changed. We need to adapt to suit.

And third, earnings stability. We need to redefine our business model and portfolio to be more resilient to global economic and geopolitical fluctuations. Post-COVID, we had good cashflows, and leveraging this, we are investing into adjacent, stable earnings businesses along the container shipping value chain, such as ship ownership. This will also present new challenges, such as recruiting people to operate the new businesses. But we have done this before, and we see setting up a new organization as exciting given our past experience of setting up ONE.



"I GENUINELY HAVE A PASSION FOR THE BUSINESS — I LOVE CONTAINERS! I HAVE BEEN IN THE BUSINESS FROM AN EARLY STAGE AND NEVER SERIOUSLY THOUGHT OF LEAVING."

WHAT DO YOU SEE AS THE KEY SUCCESS FACTORS IN THE DIGITAL AGE?

A good, strong management team! ONE aspires to become the “digital logistics” network business, and we recognize that we need to raise our game. So we invest a lot in AI, digital, etc. However, to make all this work, we really need strong talent and leadership, for which a strong brand and culture are essential. For example, we recently launched the ONE Academy with four pillars: ONE Communications to build staff and management communications, ONE Connectedness to improve teamwork and avoid silos, ONE Learning and Development to boost training and coaching, and ONE Career to help incentivize and retain talent. We believe having good talent and corporate culture are

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still key success factors in the age of digital. We need to continue innovating to remain attractive.

HOW MUCH HAVE TRADITIONAL JAPANESE MODELS AFFECTED YOUR HR APPROACH?

It’s true that the Japanese model is known in the West for things such as the “job for life” mentality, with constant job rotation of generalist managers and a perceived “glass ceiling” for staff. But there are good aspects as well, such as the long-term mindset and prioritizing company value over individual interests. And the Western style has its own drawbacks, such as a long process to promote and create successions, too much internal competition, and poor continuity of culture.

Therefore, we have a hybrid model with the best balance for ONE. We have optimized job rotations, including some designed for specialists as well as generalists. Our evaluation system has a combined focus on short-term outputs and long-term development, and emphasizes both individual and team outcomes and performance, including helping others.

WHAT ABOUT YOUR OWN JOURNEY?

I genuinely have a passion for the business — I love containers! I have been in the business from an early stage and never seriously thought of leaving. Everything is a chapter — you need to refresh yourself every chapter, and you need to do new things as well as learn from your past. I was lucky to experience two major M&As in my previous career before ONE, which really helped me to do my best for ONE. We need to be hungry to learn, and we need to be very human. I have an open management style, and I try to explain things in a simple way. We need to recognize good management and remove their roadblocks. I catch up with the top 30–50 management staff every month and always ask them, “What’s stopping you from being better?” It is about also being fallible: make mistakes, listen to and learn from people, let others step forward, and be prepared to follow them.

DO YOU HAVE ANY LAST COMMENTS FOR OUR READERS?

We are here to make money — but also to build good companies and be sustainable. I have a phrase that I've used and is now framed on my office wall behind my desk. Come and let me show you this.



"I HAVE AN OPEN MANAGEMENT STYLE, AND I TRY TO EXPLAIN THINGS IN A SIMPLE WAY. WE NEED TO RECOGNIZE GOOD MANAGEMENT AND REMOVE THEIR ROADBLOCKS."

AS ONE, WE CAN.

Our company name "ONE" is both a name and a will.

It is the will to become "one" and continue to face the difficulties. Becoming "one" with customers facing business challenges, it is our intention to provide a more optimal method for each company. Becoming "one" with people all over the world.

It is the intention to continue to connect communities with each other.

We believe in the power of "one" more than anyone else in the world. Different ideas, different abilities, different cultures. Combine all differences, bump into each other, and polish them. From there, new methods are bound to be born.

There are still countless ways to unlock the future of container shipping.

We can support this world more.
If we become one, we can do it.

JEREMY NIXON
GLOBAL CEO OF ONE

YUMA ITO

is a Partner in Arthur D. Little's Singapore office and a member of the Automotive & Manufacturing practice.

TRUNG GHI

is a Partner in Arthur D. Little's Singapore office and a member of the Energy, Utilities, & Resources practice.

ARTHUR  LITTLE