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AIm high

How AI can improve life outcomes around the world

UBS

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> "The greatest danger for most of us is not that our aim is too high and we miss it, but that it is too low and we reach it"
>
> Michelangelo

Editorial

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If history is any guide, AI, like other general purpose technologies, is set to unleash waves of wealth creation, resource reallocation, and societal change. These are unpredictable in shape and speed, but as investors and custodians we can, and must, seek to guide them in the long-term interests of our clients and broader society. This is the essence of sustainability.

As the AI roll-out gathers pace, we find ourselves at an inflection point—the use cases, regulation, and arguably ownership of AI and its outputs still uncertain. The decisions taken in the next few years will determine whether its upsides are fully realized and its risks adequately mitigated. In this report we look at how AI's consequences for human capital can be optimized, focusing on education, workplace productivity, and health.

AI offers numerous opportunities in these areas, from improving the quality and availability of education, to boosting productivity, to helping to address chronic health worker shortages while reducing the cost of care. But the ensuing risks—from concentrated job losses in certain industries, to privacy concerns, to potential harms from algorithmic bias—need to be addressed urgently if trust in the technology is to be preserved.

Long-term investment potential in AI is linked to societal impact—if the latter is suboptimal, then the former is at risk from backlash, policymaker scrutiny, and regulatory response. Companies, and those who invest in them, should aim high, being bold in seeking to maximize the opportunities from AI, while working together with other stakeholders to get ahead of the curve in addressing this transformative technology's challenges.

Executive Summary

AI has the potential to augment human capital through multiple, mutually reinforcing channels. But these opportunities are accompanied by significant risks. Addressing them will be key to optimizing the AI roll-out and maintaining trust in the technology.

Education first

Improving human capital starts with great education. AI can help provide tailored learning for students as well as administrative and analytical support for teachers, which could automate 20–40% of teachers' existing workload. But there are risks, from de-skilling if teachers and students are tempted into overreliance, to reproducing the biases of AI in the real world.

Teaching will need to change, moving away from assessments that rely on rote memorization or the "simple" essay writing at which AI-services excel, to pushing students to think creatively and critically. This is needed to prepare them for a global workplace where 40% of roles are highly exposed to AI.

A just AI transition

AI will help many existing workers become more productive, potentially contributing to a doubling of the global economy, if the optimists are correct. But about half of the roles highly exposed to AI are more likely to face automation than augmentation. This poses social risks, particularly where those roles are geographically concentrated. This is not an argument against implementing AI, but for ensuring that its benefits are widely spread, jobs are enhanced where possible, and communities are provided with new opportunities when it is not. This is the difference between a just and an inequitable AI transition.

It is also important not to view AI as a silver bullet. In the areas where it excels, like synthesizing data, or drafting text, productivity gains of 25% are not uncommon. But in areas where it is less well-suited, like evaluating contrasting information to arrive at a correct conclusion, AI has been shown to diminish performance. Understanding how and where AI is most effective is a skill that will become increasingly prized, and it is incumbent on companies and governments to expand the range of training opportunities to achieve that, and on labor to take them up.

The final piece of the puzzle is health

AI has already been incorporated into healthcare in many ways, but there are major improvements in delivery, diagnostics, drug discovery, and disease prevention still to be realized. For example, it is estimated that 50% of general practitioners' time is spent on

administrative tasks and that 44% of those are either mostly or completely automatable with existing technology. Such gains could help address chronic health worker shortages, which were estimated at around 15 million globally in 2020.

Risky business

These three channels are interrelated and mutually reinforcing. Maximizing the gains in each will require addressing the risks that accompany the AI roll-out, from bias and explainability issues to concerns about privacy and safety. Companies that fail to take into account the societal impacts of their use of AI are likely to be riskier than similar organizations that do. Regulatory and legal risks, threats to public trust, to a firm's social license to operate, not to mention the risks of inaccuracy and low performance, are all likely to be higher in companies that are not taking proactive measures to optimize AI oversight and mitigate potential negative impacts.

Investors increasingly need to be aware not just of the opportunities that AI brings but also the risks, and how different stakeholders will need to come together to identify, assess, and mitigate them. In this paper we identify seven areas where progress needs to be made, both at the company and policy level, to optimize the AI roll-out, maintain trust in the technology, and align private benefit with public good.

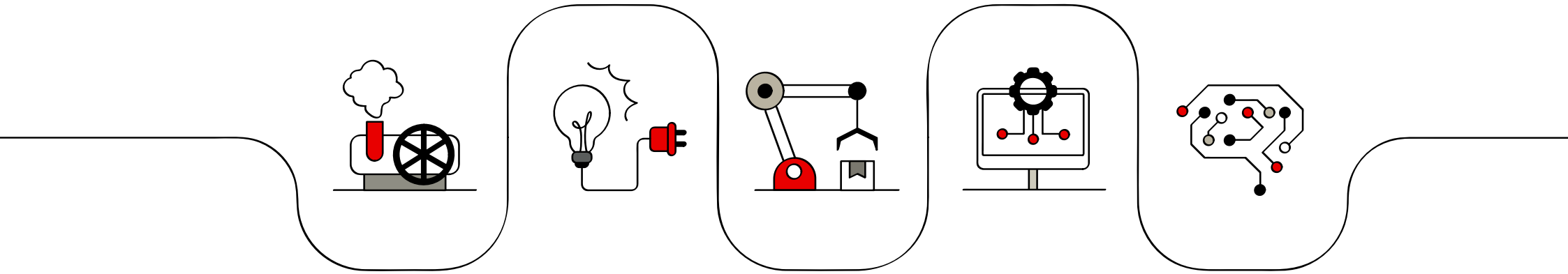
Seven steps to socialize AI

First, it is important to approach AI with an open mind but also to ask the right questions, like what improvements and risks will the use of AI bring? Second, any AI implementation needs to be accompanied by a robust oversight framework. Third, accountability needs to be clear, top-down, and bottom-up. Fourth, truth and traceability are critical to assess the quality of output. Fifth, the right incentives need to be in place to align corporate and public benefits. Sixth, the social implications need to be put front and center to ensure a just AI-transition; and lastly, measures need to be taken to address digital divides, like unequal access to the best models or the data and compute needed to train and run them, which in turn undermine broad sharing of AI's opportunities.

Grasping that opportunity from AI requires bold innovation, but this must be coupled with thoughtful deployment. Investors and other stakeholders in the AI value chain should aim high, while remaining aware that subordinating trust, safety, and fairness to short-term gains is likely to undermine AI's long-term value and raise the risk of backlash.

A technology-driven society

The story of human development is a story of technology. When technologies have broad application, they can unleash self-reinforcing waves of change, impacting civilizations' wealth, well-being, and social cohesion. AI is the next such "general purpose technology" with profound implications for society.



The commercialization of the steam engine did not just facilitate travel, production, and trade at previously unimaginable scale and speed; it helped to shift the balance of power in favor of workers. By creating dependencies on groups of workers, concentrating them in urban areas, and forcing them to work in harsh, unsafe environments like mines and factories, the technology helped create the conditions for political unrest, the formation of trade unions, workers' rights, and ultimately the welfare state.[1]

> We cannot predict the consequences of AI with certainty, but history tells us that we should expect them to be profound, unfold over decades, and play out in ways that we simply cannot anticipate or control.

In modern times, general purpose technologies[2] have included electricity, the internet, and now, artificial intelligence (AI). We cannot predict the consequences of AI with certainty, but history tells us that we should expect them to be profound, unfold over decades, and play out in ways that we simply cannot anticipate or control. AI's environmental impact is well studied and there is reasonable clarity on what needs to be done to optimize it—AI should be deployed to improve efficiencies and reduce resource use, while at the same time its own, seemingly insatiable energy and water hunger will somehow need to be brought under control. In contrast, the question of AI's social and governance impact is much more ambiguous and even contentious, though no less significant (Figure 1).

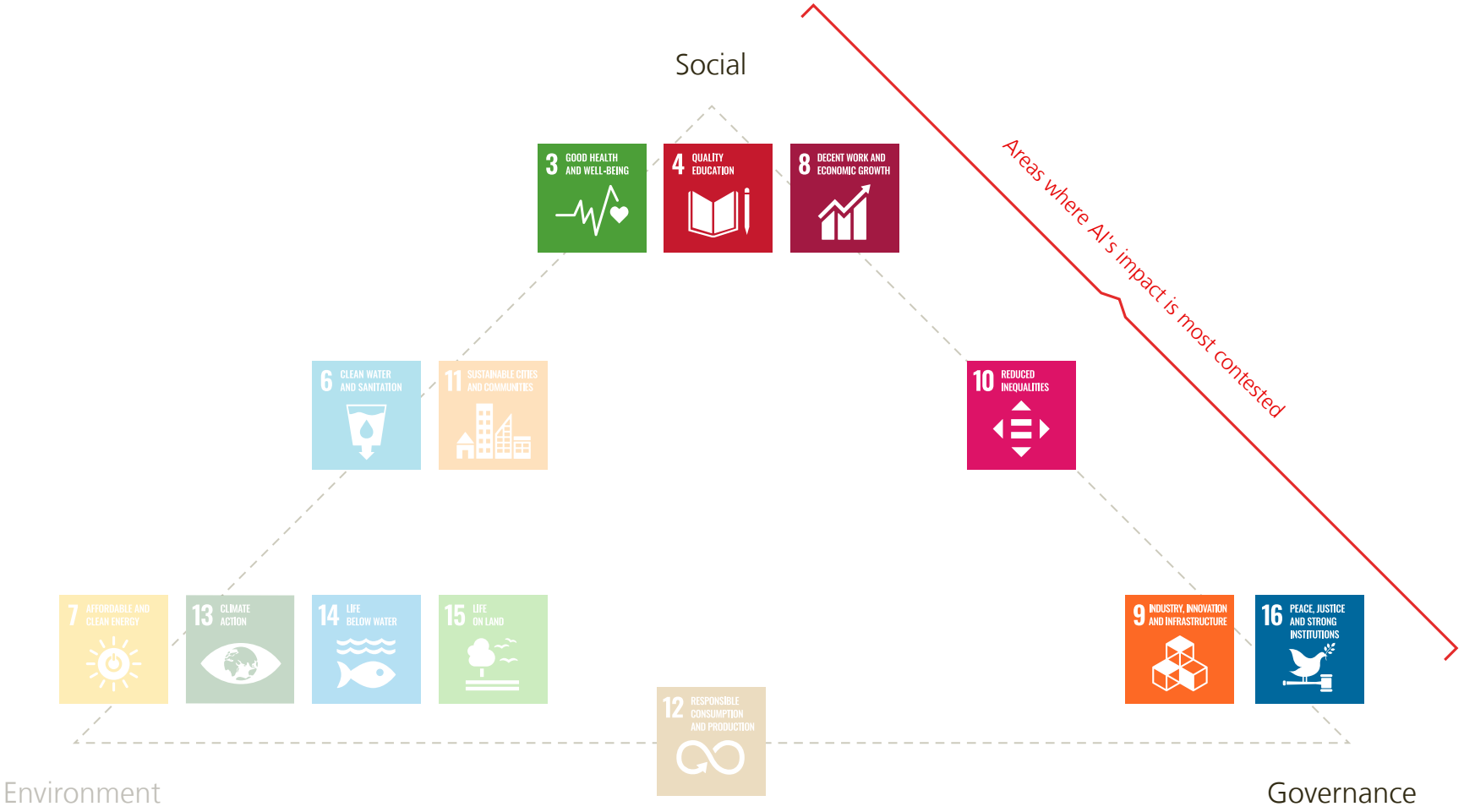
Companies, including those in sectors long-thought largely immune to technological displacement, like professional services and the creative industries, are increasingly incorporating AI into their products, production processes, and distribution channels. Companies that fail to take account of the societal risks of their use of AI are likely to be riskier than similar organizations that do. Regulatory and legal risks, threats to public trust, and a firm's social license to operate, not to mention the risks of inaccuracy and low performance, are all likely to be higher in companies that are not taking the social impacts of their use of AI seriously or are not taking proactive measures to mitigate potential impacts.

Today's economy relies on the interactions and interplay between different forms of capital—financial, manufactured, natural, social, human, intellectual.[3] Activity that unsustainably impacts one or more forms of capital is likely to sow the seeds of its own demise. Human capital is an area where clarity is urgently needed, where potential opportunities from AI are among the largest, but where the risks to society are also particularly daunting. Failing to confront and manage these risks could worsen existing social divisions and inequities, fueling resentment and unrest, and reducing the gains AI brings to society as a result. In this paper we look at AI's consequences for human capital through the lens of its effects on education, workplace productivity, and health.

[1] Acemoglu, D. & Robinson, J. A., (2002), *The Political Economy of the Kuznets Curve*, Review of Development Economics.
[2] Jovanovic, B. & Rousseau, P. L., (2005), *General Purpose Technologies*, Handbook of Economic Growth.
[3] ACCA, *Integrated Reporting and Performance Management*.

Figure 1: "Easy" E, difficult SG

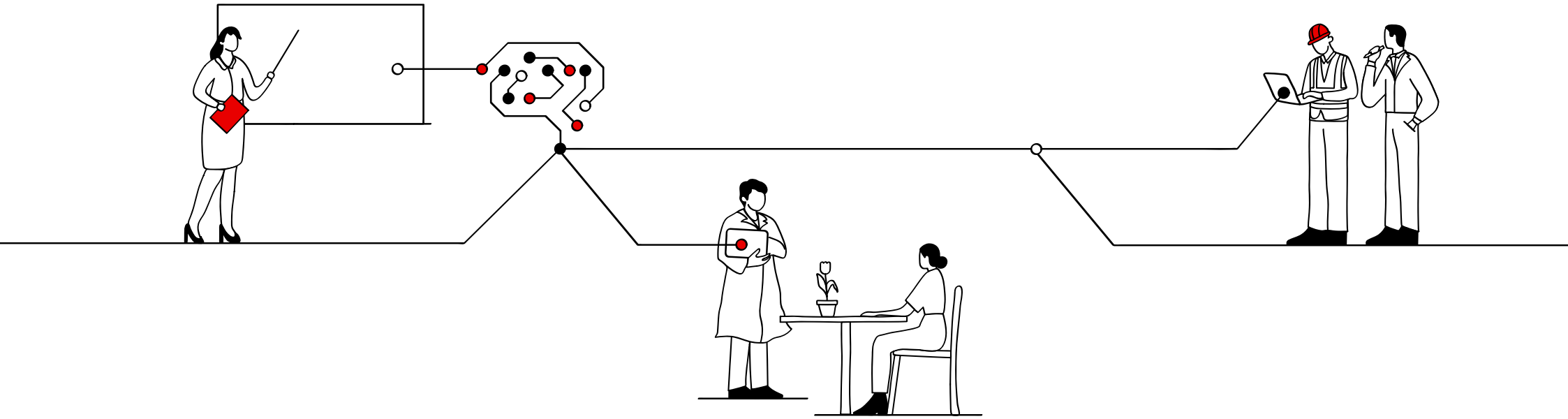
ESG categories and selected UN Sustainable Development Goals



Source: UN, Burnaev, E. et al., (2023), *Practical AI Cases for Solving ESG Challenges*, Sustainability; UBS

AI and human capital

The opportunities for improving education, raising productivity, and optimizing health outcomes are likely to be life-changing for many, but come with attendant risks. Addressing AI's challenges and the disruption it will cause, while ensuring broad, inclusive access to its benefits will be critical to avoid exacerbating social inequities.



Disrupting education

Optimizing human capital starts with high quality education. Here, AI has broad application. It can provide personalized learning and instant feedback to students and offer various forms of support to teachers—from analytics and monitoring solutions, to lesson planning

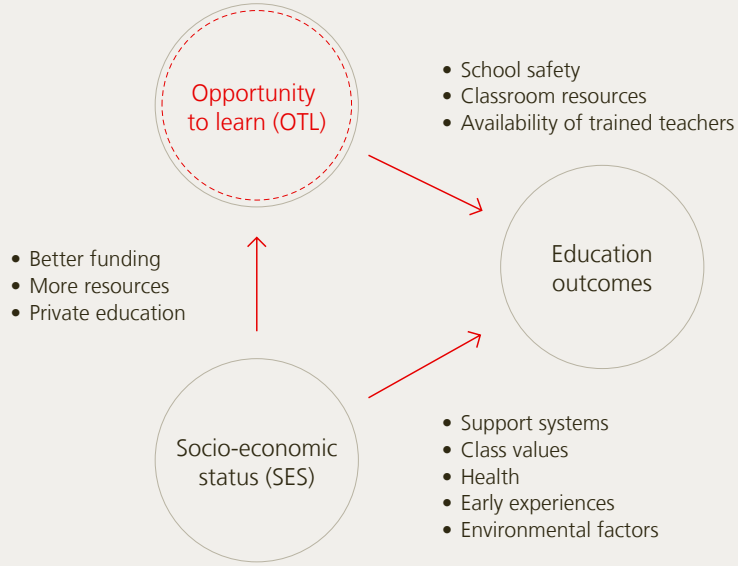
> Optimizing human capital starts with high-quality education. Here, AI has broad application.

and administrative support. The latter could enable the automation of 20–40% of teachers' existing workloads, helping to reallocate roughly 13 hours per week to activities that can better support students.[4] Taken together, these capabilities can help to increase the "Opportunity to Learn" (Box 1), which in turn can raise aggregate attainment and potentially act as a powerful moderator of the effect of socioeconomic status on educational outcomes.

Box 1

What is Opportunity to Learn (OTL)?

OTL refers to the conditions of teaching and learning that allow students to achieve educational success. Examples include teacher quality, comprehensive curriculums, school safety, and access to resources such as up-to-date textbooks. Through access to private tutors or higher quality schools, children from higher socioeconomic cohorts can afford better OTL than less privileged ones. This in turn can facilitate better education outcomes for the former.



Source: Schmidt, W. H., Burroughs, N. A., Zoido, P., & Houang, R. T., (2015). *The Role of Schooling in Perpetuating Educational Inequality: An International Perspective.* Educational Researcher, 44(7), 371–386; UBS

[4] McKinsey, (2020), *How Artificial Intelligence Will Impact K-12 Teachers.*

Personalized, AI-enabled learning solutions take various forms, from the obvious, like AI tutors or chatbots, to the less so, like generating or translating content for students with different levels of learning or special needs, or gauging students' understanding from their response patterns and generating novel practice questions that correspond to their skill level. AI solutions have shown promise at all levels, from elementary schools to higher education,[5,6,7] and take-up is already significant—Indian education app ConveGenius, for example, claims 250 million users (Interview 1).

AI's educational promise comes with risks, however, from the potential to de-skill teachers and students that are tempted into overreliance, to reproducing the biases of its training data in the real world (Table 1). Teachers will need to adapt to a new role of guiding students through potentially biased information, teaching them when, where, and how AI can malfunction, as well as how to use the technology effectively. Some resources for building such skills already exist, such as the International Society for Technology in Education's "Hands-on AI Projects for the Classroom." This contains assignments and projects that teachers can adapt and incorporate into their classrooms. But further investment will be needed—retraining and upskilling teachers is projected to require up to USD 6bn globally by 2025. Set against the potential benefits AI could bring the global education sector—USD 200bn over the same time frame—this is a comparatively small price to pay.[8]

The combination of AI and teachers is likely to be more powerful than either alone.[9] AI solutions are not capable of, nor are they designed to replace teachers' professional skills and the human connection that students both need and desire. But the combination of human and machine can be problematic too—teachers will increasingly need to design assessments that don't promote or rely on rote memorization, or the kind of "simple" essay writing at which AI-services excel. Rather they will need to help

> The combination of AI and teachers is likely to be more powerful than either alone.

students "learn how to learn," to think creatively and critically, with a view to developing the problem-solving and critical thinking skills needed to evaluate AI output. These skills will be essential for preparing students for a global workplace where 40% of roles are "highly exposed" to AI.[10] This will likely require action at the curricular level, with educators and policymakers adapting the priorities of the education system to ensure emphasis is placed on the skills needed to get the most out of AI, rather than those that replicate things AI can do with minimal supervision.

[5] Bussgang, J., (2024) *Enhancing Student Course Preparation*, Harvard University, Generative AI @ Harvard.
[6] Brenner, M., (2024), *Learning by Teaching Chatbots*, Harvard University, Generative AI @ Harvard.
[7] Dockterman, D., (2024), *Harnessing Gen AI as a Collaborative Tool in Educational Problem-Solving*, Harvard University, Generative AI @ Harvard.
[8] Morgan Stanley, (2023), *Generative AI Is Set to Shake Up Education*.
[9] Chan, C. K. Y. & Tsi, L. H. Y., (2023), *The AI Revolution in Education: Will AI Replace or Assist Teachers in Higher Education?* University of Hong Kong.
[10] IMF, (2024), *Gen-AI: Artificial Intelligence and the Future of Work*, P8.

Interview 1

AI in the Indian education system

Jairaj Bhattacharya, founder of ConveGenius, an AI education platform

How is ConveGenius using AI?
ConveGenius was designed to bridge learning gaps in a large ecosystem, which is particularly important for India as the country does not have sufficient money or capacity to train enough teachers.

Moreover, our technology provides various other applications that can take student attendance, help create lesson plans, mark assessments, and generally make teachers' lives easier. Our impact assessment tools provide psychometric measurement that uses AI to pinpoint misconceptions and gaps in children's learning. AI synthesizes the data in a format that can be understood through infographics. We also provide synthesized insights about students' performance to parents, with communication between parents and teachers supported through the platform.

As long as students have access to the bot, they have access to education, which brings equity to schools that were previously unable to adequately provide education.

How are you addressing the risks of using AI in education?
One has to be careful about the choice of data fiduciaries and data processors. Our messaging technology on the Swift Chat platform is interoperable with WhatsApp, which ensures privacy since a unique mobile number is required to send a message. To ensure student safety, we restrict the output of our bots. For example, if a student is interacting with a physics bot, the bot is programmed to only respond to questions about physics.

To help mitigate risks around hallucinations and bias, we fine tune the model based on learning outcomes and transactional data that ConveGenius has generated over the years. These data sets are used to train our AI avatars and bots for curriculum, context, dialects, language, and many other variables associated with a certain territory.

What role can AI play in equalizing educational outcomes across the world?
There is strong demand for education in emerging markets but a lack of resources, making AI-augmented education a need, not a want in those markets. Roll-out is aided by the fact that digital infrastructure is reaching every school and student faster than any physical infrastructure. To draw a parallel, we can look at how quickly digital financial transactions were adopted in India after 2016.

I see AI as an equalizing force in education both within India and around the world. Human beings are unpredictable and performance varies—AI can help provide consistent support. In classrooms where there are good teachers, our bots make them better. In classrooms without teachers, our bots can act as a partial replacement. That said, our education chatbots are never going to be a replacement for traditional teachers; they are intended to be an assistant that makes the job easier.

What is the next big advance AI will enable in education?
There's still a lot to do. We are working on real-time video calling experiences with AI so students with access to a screen and the internet can receive round-the-clock support from specialized tutors and mentors in a language of their choice.

Table 1: Great opportunities, but significant risks

	For students	For educators	For society
Opportunities 	• Personalized learning • Rapid individualized feedback • Customized practice sets • Emphasis on critical thinking and digital literacy skills • Improved access in developing countries and for differently abled students	• Decreased administrative workload and increased teaching time • Improved understanding of students' skillset and performance • Assistance in creating tailored course plans	• Higher human capital, productivity, and wages • Achieving UN sustainable development goals • Broader, more inclusive access to quality education, resulting in fuller achievement of individuals' potential
Examples	The Accessible Digital Textbooks (ADT) initiative uses AI to meet diverse needs through narration, sign-language videos, audio description of images, text-to-speech, and other functions.	Oak National Academy aimed to reduce teachers' workloads by up to 5 hours per week using AI to streamline lesson planning and classroom content creation.	3D Africa for Girls aims to close the gender gap in AI by teaching young girls to program, design, prototype, market, and sell their 3D-printed products and solutions.
Risks 	• Privacy breaches • Exposure to AI hallucinations, misinformation, and bias • Digital classrooms may not foster social connections and skills • Overreliance on AI could lead to deskilling or non-learning of skills	• Overreliance may cause de-skilling • AI can misrepresent students' ability • Performance metrics may not fully capture students' skillsets • Plagiarism by students using AI can lead to job dissatisfaction in teachers	• Dissemination of bias • Digital divides risk a worsening of education gaps due to: – Lack of AI-trained teachers – Lack of a stable internet connection – Language disparities
Examples	School security company Raptor Technologies kept millions of records including sensitive school safety data and personal information of students, parents, and staff in an unsecured database.	An academic paper written entirely by AI was published in an education journal, which proved that AI-driven academic dishonesty is becoming increasingly difficult to pinpoint.	Research found that ChatGPT perpetuated gender stereotypes when used to translate conversations from a language with gender-neutral pronouns to a language without.

Source: UBS

AI's promise for the workforce

AI is projected to deliver a significant boost to aggregate productivity, resulting in an estimated economic boost of between USD 13–16tr by 2030.[11,12] However, its true economic effects are likely to unfold over a much longer period and could ultimately be significantly larger—some estimates put the eventual prize at closer to USD 100tr, in effect a doubling of the global economy.[13,14]

> AI's benefits are not just about doing existing tasks better and faster, but also about enabling new capabilities that were simply impractical without it.

Where jobs are augmentable, the early signs for a significant productivity boost from AI look promising. A Microsoft experiment looking at the impact of its Copilot™ on tasks like information retrieval, meeting recap, and blog writing found that test subjects accomplished the tasks 25–30% faster, with no significant change in quality of output.[15] This kind of gain is comparable with other studies (Interview 2).[16] AI's benefits are not just about doing existing tasks better and faster, but also about enabling new capabilities that were simply impractical without it (Box 2).

Box 2

Using AI to support a smooth integration of UBS-Credit Suisse

Integrating two global systemically important banks (G-SIBs) is both massively complex and has a significant impact on society and people, and therefore ensuring a smooth integration process is of utmost priority. To that end UBS has recently started to harness the power of AI to support the integration of Credit Suisse with the main aim to increase transparency on program risks and act as an early warning indicator before they turn into issues.

With the help of Generative AI, Group Integration Office (GIO) who oversees the overall integration efforts, is able to gain additional insights on cross-workstream inter-dependencies, key emerging risk themes, and unbiased summaries of, risks, issues and key program updates on progress in respect of around 10,000 milestones that each of the workstreams capture in the central integration program management tool. As a result, the GIO can focus more on conducting critical analysis rather than spending countless hours reading, digesting, and summarizing thousands of data points mannually. Whilst AI is a critical enabler, it will be used further in the Integration as an assistant to humans who continue to be accountable for reviewing its outputs and juxtaposing it with their own thorough analysis to ultimately make more informed decisions and support a smoother integration that benefits all parties.

[11] McKinsey, (2018), *Notes from the AI Frontier: Modeling the Impact of AI on the World Economy.*
[12] PWC, (2018), *The Impact of AI Technical Report*.
[13] Suleyman, M., (2023), *The Coming Wave*, P131.
[14] NVIDIA, *GTC March 2024 Keynote with NVIDIA CEO Jensen Huang.*
[15] Microsoft, Edelman, B. et al., (2023), *Measuring the Impact of AI on Information Worker Productivity.*
[16] Dell'Acqua, F. et al., (2023), *Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality*, Harvard Business School.

Interview 2

No evidence that humans are going to be generally replaced

Fabrizio Dell'Acqua, author of the Jagged Technological Frontier study

What differences do we see between high performers and low performers who use AI?
We've observed consistently during previous waves of technologies that highly productive people typically make higher productivity gains. But we are not seeing that with AI yet. For example, non-native English speakers tend to benefit from AI more in English language jobs. In our study comparing management consultants using AI in a variety of tasks, the low performers benefitted more than the high performers, so there was an element of equalization. It's worth noting, however, that these were relatively naïve users. Very skilled users may capture the benefits of AI more, so the skill differentiation may emerge over time. It's a dynamic space.

What impact does workforce training have on AI's enhancement of performance?
In our study, we provided a simple overview of the best ways to approach ChatGPT. This had a limited effect—consultants relied a bit more on AI when given information on how to use it, which improved performance. I see this as Human–AI augmentation; we know that humans with AI will beat those without AI. But we can also see this "falling asleep at the wheel" dynamic that reduces performance. Simple training is not enough to ensure alertness—we need something that is more involved. This will be task specific, maybe worker specific, and will require a lot of experimentation. The key point is that workers need to remain in the loop.

Will there be tasks and areas where humans retain the edge over AI (for now)?
The key thing is that there is a frontier, and one that will remain for the foreseeable future. We have no evidence that humans are just going to be generally replaced. It's a bit harder to assess exactly what tasks AI can and can't do. Constant experimentation on the specifics of the task is needed. These are not only technical problems—falling asleep at the wheel is a human problem—we need the human element to perform too!

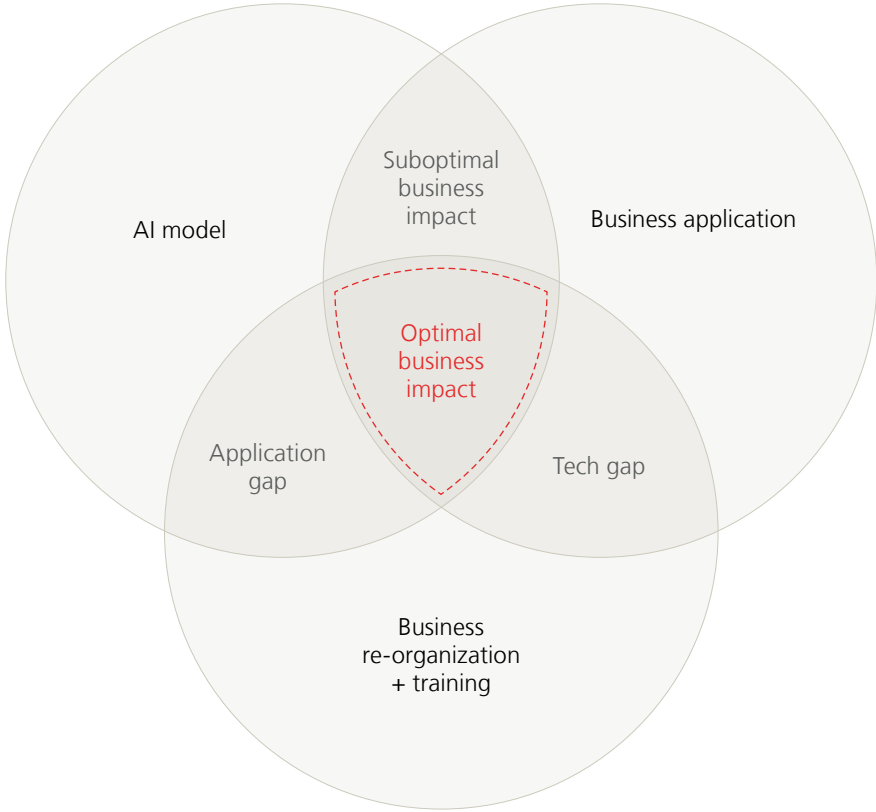
Will the optimal mix for some or even most jobs be a human being augmented by an AI assistant, rather than a human or AI alone?
Yes, in the sense that these jobs are going to evolve with the technology. In the US there is a classification of tasks—and some can be performed by AI very well, and those will be automated; and so there will be more focus on other tasks, maybe with the addition of new ones. The jobs of the future will not look the same as today, just with AI plugged in. One can fundamentally restructure these jobs to make more gains. Longer term there is the question of what happens when people grow up with these tools? On the one hand there is a fear that humans can lose some abilities—e.g., our reliance on GPS—though it's not obvious we want to maintain all human skills. Then there is the other side that humans can learn better using these tools, e.g., a chess master using AI, or a student working with an AI tutor. Cracking this issue will be fundamental to unlocking the full benefits of AI.

Major modern tech breakthroughs, like electrification and the IT revolution, have tended to improve productivity slowly at first, accelerating more rapidly after complementary technologies, infrastructure, and business models are developed.[17,18] Investments in IT upgrades have typically taken 5–7 years before the full productivity benefits are realized, with every dollar spent on computer hardware requiring another USD 9 in software, training, and business process redesign.[19] But productivity gains are not a given.

> In some cases, AI has actually been shown to diminish performance, when workers use it uncritically for tasks that it is not (currently) well-suited for.

While AI has already shown significant gains in some areas; these have tended to be concentrated among lower-skilled, lower experience workers.[20] In some cases, AI has actually been shown to diminish performance, when workers use it uncritically for tasks that it is not (currently) well-suited for, like evaluating contrasting information delivered in different formats to arrive at a correct conclusion. The full gains of the AI-productivity revolution may be larger, but are likely to require a more thoughtful, root-and-branch approach to realize (Figure 2).[21]

Figure 2: With complements



Source: UBS

[17] Brynjolfsson, E. & McAfee, A., (2014), *The Second Machine Age*, P103.
[18] Chad, S., (2013), *Will History Repeat Itself? Comments on "Is the Information Technology Revolution Over?"* International Productivity Monitor, Centre for the Study of Living Standards.
[19] Ibid, P104.
[20] Brynjolfsson, E. et al., (2023), *Generative AI at Work*, National Bureau of Economic Research.
[21] Dell'Acqua, F. et al., (2023), *Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality*, Harvard Business School.

Importantly from a sustainability perspective, productivity improvements do not always have positive social impacts in the short-to-medium term. The classic example: Productivity increased dramatically during the Industrial Revolution, but real wages stagnated and working hours increased.[22] This increase in the extraction of value from labor resulted in significant wealth creation for the owners of capital, but the ultimate result of such imbalances in the rewards from growth was political upheaval and, in some countries, revolution. In modern times, "research suggests that automation accounts for as much as three quarters of the overall increase in inequality between different demographic groups in the US."[23] So, while AI will likely generate material and lasting social benefits over the long term, there are likely to be challenges, setbacks, and unanticipated costs in the short and intermediate term.

Nice work, if you can get it

Nearly 40% of jobs worldwide are highly exposed to AI, rising to nearly 60% in advanced economies like the US.[24] Of such roles globally, roughly half are expected to be enhanced by AI, while the other half are more likely to be replaced. There is also a polarization between professions, typically favoring those with higher skills and likely higher incomes already (Figure 3).

Automation is not a new phenomenon, of course—the OECD estimated that from 2012–2019, 14% of jobs were at high risk of automation, yet overall employment growth for the period was still an impressive 12%.[25] Similarly, despite the potential disruption AI may cause, it is expected to be a net creator of jobs. Between 400 and 800 million jobs globally may be automated, while another 555–890 million new ones may be created by 2030.[26] But there is a risk of significant differential impacts for different groups.

Areas where jobs were provided by concentrated industries like car-making in Michigan showed what happens when those jobs start to disappear—deep recession, followed by political upheaval as citizens looked to those who promised a reclamation of their lost socioeconomic status.

The solution to this problem is not to eschew technological advances, but to ensure that the benefits of innovation are shared, jobs are enhanced where it is possible, and communities are re-trained and connected with new opportunities when it is not. Such an approach can also be better for business over the long term. By re-training experienced staff, companies retain institutional knowledge and perspective, which can enhance productivity. For example, whereas US auto manufacturers tended to embrace automation wholesale, German auto companies, who had to deal with stronger unions, worker representatives on boards, and potential skills shortages due to fast declining birth rates were more reluctant to shed trained labor, and embraced automation only in concert with occupational upgrading and the creation of new tasks. This contributed to an increase in the number of workers in the German car industry from 2000–2018, in contrast to a decline in the US auto manufacturer workforce of 25% over the same period.[27] During this time, the broader German economy shifted from "sick man of Europe to economic superstar."[28]

[22] Acemoglu, D. & Johnson, S., (2023), *Power and Progress*, P179.
[23] Ibid, P260.
[24] IMF, (2024), *Gen-AI: Artificial Intelligence and the Future of Work*, P8.
[25] OECD, (2021), *What Happened to Jobs at High rRisk of Automation?*
[26] McKinsey, (2018), *AI, Automation, and the Future of Work*, P3.
[27] Acemoglu, D. & Johnson, S., (2023), *Power and Progress*, P285–6.
[28] Dustmann, C. et al., (2014), *From Sick Man of Europe, to Economic Superstar: Germany's Resurgent Economy*, Journal of Economic Perspectives.

Figure 3: Occupational exposure to AI varies widely

Some occupations are highly exposed to AI, higher-value jobs are often more likely to be augmented, lower-value ones to be automated

Source: UK Government, Department for Education; UBS

Strength training

Understanding AI's strengths and weaknesses will become increasingly valuable. As important as AI's role in education, is education's role in preparing students to use AI effectively in the workplace. Just as critical will be training of the existing workforce—those lacking the wherewithal to augment their performance with AI will increasingly be outstripped by those who have it. There is a risk this disadvantages those who struggle more to retrain and upskill, typically older workers. As aging populations can suffer disproportionately from declining productivity growth, it will be more important to ensure not only the development of innovations stemming from AI, but also to secure their sufficiently rapid incorporation into work processes within those vulnerable regions.

AI's potential to feed into more intuitive interfaces, for example producing complex, working code in response to non-expertly worded requests from would-be developers, has the potential to not just widen access to AI applications, but also to unlock the creative realm in ways that have not hitherto been possible. If AI engineers can build systems that leverage emerging technologies in the back-end, while presenting simple, consistent front-end user experiences, this could unleash citizen scientists and developers, and help to level the playing field for the creation of value across age groups.

The digital divide

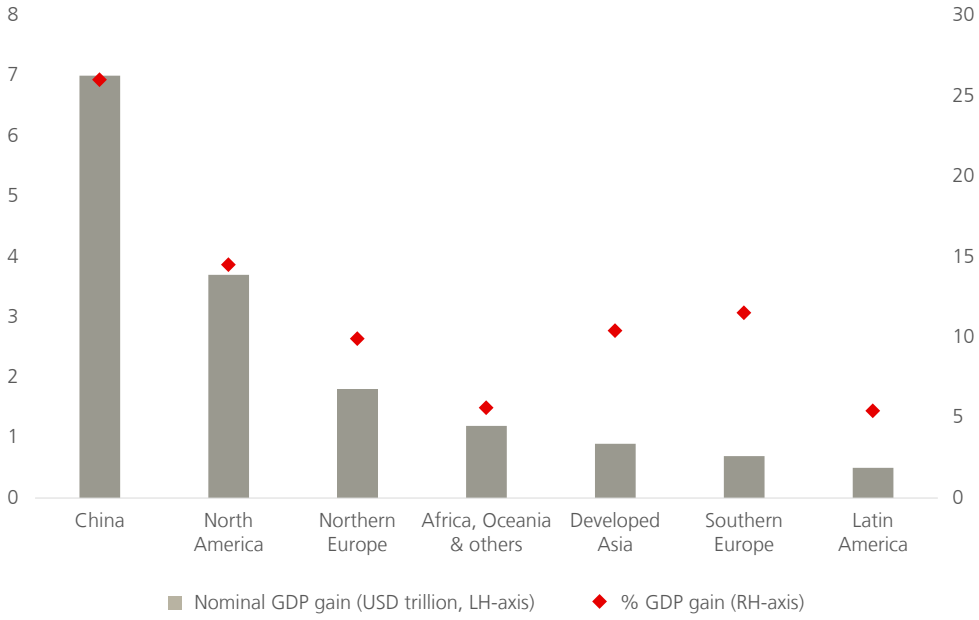
It has been argued that much of the inequality between countries is the result of the uneven dissemination and adoption of new technologies.[29] AI, as part of the Fourth Industrial Revolution, is arguably part of the most important tech roll-out since the first, and is therefore a major potential vector for inequality between, as well as within, nations. The gains from AI are projected to accrue very differently by geography (Figure 4). This is due to three "digital divides:"

1. **AI preparedness** comprises scores for digital infrastructure, innovation & integration, human capital & policies, and regulation & ethics.[30] Advanced economies like Singapore, the US, and Germany top the measure, with emerging markets like Brazil, Turkey, and Russia behind, and low-income countries bringing up the rear.

2. **Sector balance,** i.e., the concentration of sectors that are exposed to AI. Countries like the UK, with relatively large tech and finance sectors will potentially see greater gains from AI than countries with more exposure to materials and commodities such as many in Africa and Latin America.

3. **Language disparity** impacts AI model performance, in part due to variations in the available training data. Non-English speakers are penalized by this variation. For example, OpenAI's English GPT-4 model performs best on a Massive Multitask Language Understanding benchmark, achieving around 86% accuracy, while it declines for other languages.[31]

Figure 4: AI is expected to have very different impacts across geographies
Estimated gain in GDP from AI by 2030



Source: PWC (2018), *The Impact of AI Technical Report*; UBS

[29] Acemoglu, D. & Robinson, J. A., (2012), *Why Nations Fail: The Origins of Power, Prosperity, and Poverty.*
[30] IMF, (2024), *Gen-AI: Artificial Intelligence and the Future of Work.*
[31] OpenAI, (2023), *GPT-4 Technical Report.*

Building bridges

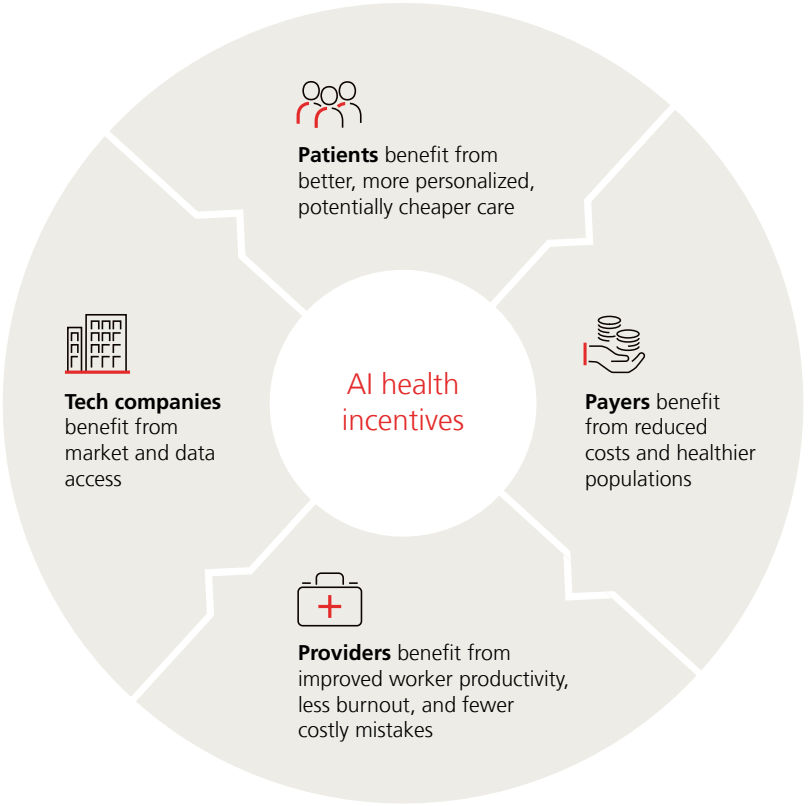
While AI could exacerbate existing divides, it also has equalizer potential. So far, lower performers have tended to see much higher performance gains from using AI than high performers (43% vs. 17%, according to the study described in Interview 2).[32] There are also opportunities for bridging the gap between developed and developing markets. While market discourse often focuses on how AI will replace jobs in industries such as IT outsourcing in India and call centers in the Philippines, AI also has the potential to empower those in the world's poorest countries to interact with the world's intellectual capital at minimal cost. Key to achieving this will be access combined with intuitive user experience that allows untrained users to build AI interaction skills effectively. Products that achieve this are likely to hold significant potential, particularly in the impact investment and philanthropic spheres.

Healthy, wealthy, and AIs

The final piece of the human capital puzzle is health. AI can improve overall outcomes, not just by raising standards of and access to healthcare, but also by improving preventative medicine. This in turn could improve labor productivity, reducing sick leave and raising labor force participation. But there are also risks that AI could compound existing inequalities in other ways. Incomplete or unrepresentative training data could result in treatments or therapies that work well for one demographic cohort but not for another. Finally, there is the issue of aligning private incentives with the public good. Patients, providers, practitioners, and tech companies can in theory all benefit from the AI health tech roll-out (Figure 5), but there will likely need to be protections and safeguards put in place, particularly to reassure patients that providers, payers, and technology companies are incentivized to use their data in their best interests.

Figure 5: The incentives to roll out AI health solutions

Idealized representation of the benefits of rolling out AI in healthcare for the key stakeholders



Source: UBS

[32] Dell'Acqua, F. et al., (2023), *Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality*, Harvard Business School.

A potential health revolution

AI has already been incorporated into healthcare in many ways, from drug discovery to transcribing medical notes, but there is even greater potential still to be explored and exploited. There four areas are expected to drive growth: Delivery, Diagnostics, Drug discovery, and Disease prevention (Table 2). The AI healthcare market is expected to grow from USD 11bn in 2021 to USD 188bn by 2030.[33] In addition to driving revenues, AI is also expected to reduce costs, with the potential to lower US annual healthcare costs alone by USD 150bn in 2026 (or roughly 3%).[34]

Most of the regulator-approved AI applications in patient care are in the scan-reading space, e.g., assisting radiologists in preparing and reading CT scans. Expanding the use of AI in other delivery areas, e.g., using it to analyze vast quantities of unique patient data, from genomes, wearable health monitors, and other sources in order to enable personalized healthcare,[35] as well as using it for more administrative tasks, will be essential to generate the greatest gains.

Such gains are sorely needed. Health worker shortages are estimated at around 15 million globally (2020), 20% of the total.[36] Most of that shortage is in low- or middle-income countries, yet rich countries also face pressures.[37] This is affecting retention—46% of US health workers reported feeling burnt out in 2022, up from 32% in 2018, with 44% intending to look for a new job, up from 33%.[38] As populations in developed countries age, their health systems are likely to face additional strains.

> AI should not be seen as a gatekeeper between patients and nurses or doctors. Instead, it should enable caregivers to provide more and better care.

AI should not be seen as a gatekeeper between patients and nurses or doctors. Instead, it should enable caregivers to provide more and better care. Physicians in the US spend on average over four hours a day completing electronic health records. It is estimated that 50% of general practitioners' time is spent on administrative tasks; 44% of such tasks are either mostly or completely automatable with existing technology. Such tasks prevent healthcare workers from performing their medical duties at full capacity, sapping productivity, limiting time with patients, and increasing the risk of burnout[39] (Interview 3).

[33] OECD, (2024), *AI in Health: Huge Potential, Huge Risks*.
[34] Bohr, A. & Memarzadeh, K., (2020), *The Rise of Artificial Intelligence in Healthcare Applications*, Artificial Intelligence in Healthcare.
[35] Johnson, K. B. et al., (2021), *Precision Medicine, AI, and the Future of Personalized Health Care*, Clinical and Translational Science.
[36] Boniol, M. et al., (2022), *The Global Health Workforce Stock and Distribution in 2020 and 2030: A Threat to Equity and 'Universal' Health Coverage?* BMJ Global Health.
[37] The Association of American Medical Colleges, (2024), *The Complexities of Physician Supply and Demand: Projections From 2021 to 2036*.
[38] CDC, (2023), *Health Workers Face a Mental Health Crisis*.
[39] Willis, M. et al., (2020), *Qualitative and Quantitative Approach to Assess the Potential for Automating Administrative Tasks in General Practice*, BMJ Open.

Table 2: AI contributes to better health outcomes through four channels

AI's contribution to healthcare and public health is multi-faceted, coming through multiple channels in multiple ways—resulting in increased quantity and quality of existing health solutions, as well as new capabilities

	Delivery	Diagnostics	Drug discovery	Disease prevention
Quantity 	• Automating administrative tasks • Remote consultation, treatment, and rehab • Talking therapies	• Interpreting home-administered tests • Imaging assistance • Improving lab test workflow	• Automated molecule suggestions reducing discovery time • Quicker drug trial recruitment and analysis	• Rapid scan reading for large-scale screening programs • Applications using wearables data
Quality 	• Personalized medicine • Procedural advice • Less burnout • Better-coordinated communication	• Earlier diagnosis • Auto-generated second opinions • Remote monitoring	• Better, safer molecule suggestions • Identify unanticipated properties of existing drugs	• Pre-diagnosis e.g., pre-diabetes insulin insensitivity • Predictive health analytics
Innovation 	• AI-augmented surgical robotics • Decision Support System platforms	• Connecting the dots between multimodal datasets and synthesizing them for clinicians	• Simulation of cells or human anatomy to predict drug response	• Spotting patterns across genomic, proteomic, spatial, and other datasets • Digital twins

Source: UBS

Interview 3

The cutting edge of hospital care

Guru Sivaraman, Chief Information Officer, Member of the Executive Board, University Hospital Zurich

How are you using AI in the hospital currently?
I'd highlight three key examples: 1) in the intensive care unit, to help manage the flood of monitoring data. This can help improve performance and avoid burnout; 2) in the radiology department, to schedule utilization. When dealing with very expensive equipment, it's important to have it running every minute of the day; 3) for administrative tasks, like billing, documentation, etc.

The other big emerging area is personalized medicine. We have huge amounts of patient genomic data and considerable outcome and therapy data. AI can help to combine that data and find insights that can enable more targeted treatments for individuals.

What do you think are the biggest opportunities for expanding the use of AI at USZ over the short and long term?
The first is sustainably expanding operating capacity. The shortage of doctors and nurses is only going to get worse—which affects both cost and quality of care. AI can help caregivers operate for more of their time at "top of license"—meaning maximally utilizing acquired capabilities, rather than doing less demanding tasks, like a surgeon doing surgery, rather than filling out forms.

Currently, caregivers spend just 20–30% of their time on top-of-license activities. AI can increase that by using standardized clinical pathways. This means it specifies the exact steps to be taken and plans the care pathway—when the patient needs a bed, when they should be tested, when they can be discharged. By keeping track of these things centrally, more targeted therapies can be used, redundant procedures and tests avoided, and outcomes improved, all while costs are reduced.

The long-term perspective is that we move toward prevention and health management, using wearables etc., managing health the way we manage our finances. Currently patients have no access to data, and don't understand it—AI can help with that, e.g., simplifying reports to improve patient experience.

What type of process and organizational changes will need to happen to get the most out of AI?
We need scale and that requires 1) an integrated and structured data backbone; 2) a technology backbone; 3) strong organizational abilities e.g., an agile system (plan, design, develop, test, deploy, review); 4) interoperability between systems; and 5) a process for iterative improvements.

Take operability: currently we operate in a siloed manner—each department wants to keep their data. We need to open that up. And it's not just about application programming interfaces (APIs). We also need semantic interoperability. Each system has their own data model, so they can't link up easily. More data standardization and central platforms on which to keep data would help to improve that.

We also need a different mindset. The question of "how do we protect data" needs to change to "how do we all get the most out of our data in a safe manner?"

If it isn't safe, it isn't working

The oft-referenced need to "balance innovation with safety" is a false dichotomy, in our view—if an AI solution is not safe it does not work, although this does not mean solutions should be.[40] Realizing the full health benefits of AI requires scale, both in terms of data gathering and rolling out solutions. But achieving scale while maintaining safety is complex. The more variables that are introduced—different markets, demographics, data models, hospital designs, and equipment—the greater the possibility that an AI model, which performs well on a training dataset, runs into difficulties "out in the wild."

> Treatment efficacy can vary significantly across different ethnic groups, such that medication that would be correct for one patient would be incorrect and even dangerous for another.

Algorithmic bias is one of the most important AI safety risks in healthcare.[41] Treatment efficacy can vary significantly across different ethnic groups, such that medication that would be correct for one patient would be incorrect and even dangerous for another.[42] Similarly, algorithms trained predominantly on data from one ethnic group may not function as well for others.[43] Countering this risk requires obtaining large amounts of data from each different subgroup to ensure their specific needs and characteristics are represented.

An additional difficulty is inconsistency. Asking a question in different ways can yield very different results. The lack of transparency in most generative models means that it may not always be clear why an AI has taken a particular decision. This could be problematic for trained medical professionals in complex cases, where there are multiple plausible routes for treatment, potentially introducing additional risks around the choice of treatment and communication.[44] In cases where non-professionals are using products like AI chatbots at home to provide diagnoses or treatment suggestions, such risks could rise further. Achieving consistency of output where possible and ensuring awareness that user inputs can have a significant impact on AI outputs will be key.

Retaining trust is critical

Just as important as caution in rolling out AI until evidence of efficacy and safety is in place, is boldness once this has been achieved. One of the keys to accomplishing this is trust, in the AI solutions themselves, the people using them, and the companies and public institutions gathering and leveraging patient data.

Achieving and retaining trust in AI requires a continuing process of ongoing measurement and monitoring for latent risks like model drift (models deviating from their training over time). Sharing such data in central repositories in comparable, standardized formats can help facilitate monitoring and transparency, and engender trust that models are working as intended. In the UK, the National Health Service is piloting the AI Deployment Platform intended to gather evidence on how safe and deployable AI health solutions are in practice, as well as sharing data on who is using them.[45]

[40] US Supreme Court, (1980), *Industrial Union Department, AFL-CIO v. American Petroleum Institute et al.*
[41] Panch, T. et al., (2019), *Artificial Intelligence and Algorithmic Bias: Implications for Health Systems*, Journal of Global Health.
[42] Burroughs, V. J. et al., (2002), *Racial and Ethnic Differences in Response to Medicines: Towards Individualized Pharmaceutical Treatment*, Journal of the National Medical Association.
[43] Bae, J-M., and Kim, E. H., (2016), *Breast Density and Risk of Breast Cancer in Asian Women: A Meta-Analysis of Observational Studies*, Journal of Preventative Medicine & Public Health.
[44] This can cut both ways: Failure to overrule dangerous bias could lead to inappropriate use, while overruling novel approaches simply because they are not familiar could preclude the opportunity for new breakthrough therapies as well.
[45] NHS England, *Artificial Intelligence Deployment Platform Pilot*.

Pew data suggests that patients seem particularly concerned that AI could worsen their personal relationship with healthcare providers. Keeping humans in the loop will be important to allay such concerns. Studies suggest that AI's ability to potentially adopt anthropomorphic characteristics, like a human appearance and emotion, could enhance trust.[46] But retaining access to the "real deal" will likely be important for many patients, particularly the less digitally literate, who tend to be socially disadvantaged in other ways too.[47]

Those who have heard "a lot" about AI are much more comfortable with it in healthcare (50%) than those who have heard "a little" (37%) or "nothing" (28%). But the type of activity also makes a difference—while 65% of respondents said that they "definitely" or "probably" wanted AI to be used in their skin cancer screening, just 31% felt similarly about AI helping to determine how much pain medication they received, and only 20% wanted to use a chatbot to support their mental health. This is likely related to perceptions around the strengths and weaknesses of AI. Where technical objectivity and data-driven accuracy are considered useful (e.g., reading cancer scans), AI seems to be more trusted. Where empathy or moral values are called for—e.g., by patients seeking alleviation of pain or therapy—treatment delivery by humans is preferred.

AI's black box issues are particularly problematic in healthcare, potentially causing negative effects for patient-doctor communication, clinical collaboration and oversight, and accountability, as well as concerns over bias, compliance, and patient safety.[48] The ability of AI models to generate explanations of what factors were important in their arriving at a particular decision, as well as their level of confidence in that decision and why, is important not just for patient trust but also for clinician trust that the model is working properly, and for their understanding and confidence in the rationale for their decisions.[49]

> Those who have heard "a lot" about AI are much more comfortable with it in healthcare (50%) than those who have heard "a little" (37%) or "nothing" (28%).

Individual accountability needs to be maintained, not just to retain trust in AI, but to ensure caregivers maintain a critical, cautious, and careful approach in utilizing AI in clinical settings. Clear lines of accountability and liability, and mechanisms for feedback on what has gone wrong, how to fix it, and how to reduce the likelihood of the same thing happening again, all need to be built in when introducing AI to clinical workflows.

[46] Steerling, E. et al., (2023), *Implementing AI in Healthcare—The Relevance of Trust: A Scoping Review*, Frontiers in Health Services.
[47] NHS England, (2022), *Digital Inclusion for Health and Social Care*.
[48] Amann, J. et al., (2020), *Explainability for Artificial Intelligence in Healthcare: A Multidisciplinary Perspective*, BMC Medical Informatics and Decision Making.
[49] Ahmed, M. I. et al., (2023), *A Systematic Review of the Barriers to the Implementation of Artificial Intelligence in Healthcare*, Cureus.

The primacy of privacy

Privacy, particularly in the healthcare space, is one of the most important public concerns around the use of AI. Such concerns are fueled by media reports of data hacks, leaks, transfers of data between companies and jurisdictions,[50] and AI models being manipulated into spewing out training data. The best way of managing such concerns is for the public and private sectors to deploy top-down and bottom-up efforts aimed at protecting patient privacy. In practice this means first, regulators imposing robust data protection requirements; second, data custodians insisting not just on compliance, but justifiability and proportionality; and third, AI companies themselves employing robust data security measures and strict data protocols around access, anonymization, and sharing.

Privacy, particularly in the healthcare space, is one of the most important public concerns around using AI.

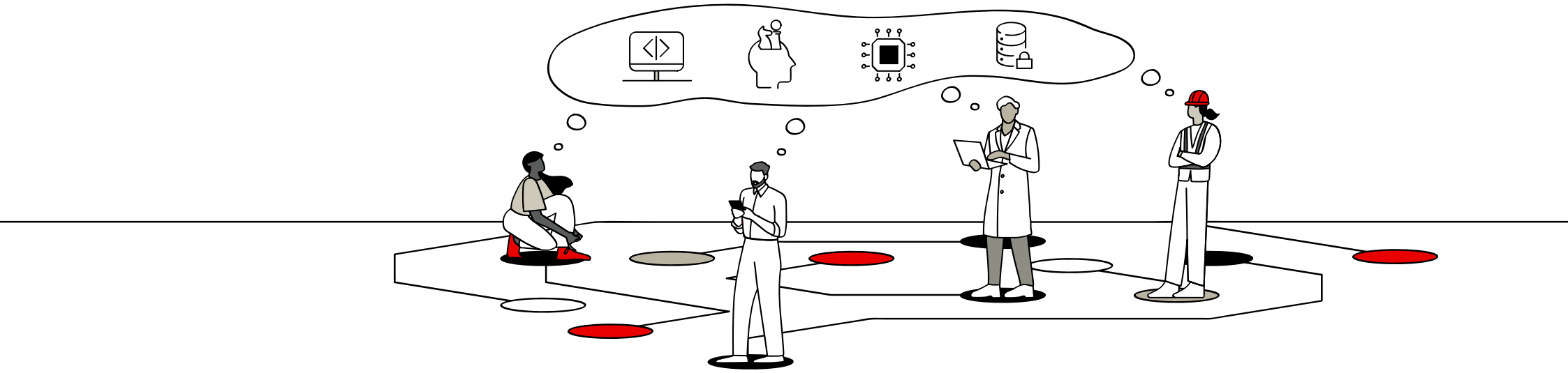
An alternative approach to maintaining patient privacy is using synthetic data generated by a model trained on genuine patient data. Based on the same characteristics and distributions as the genuine data, it allows analysis to be carried out without exposing the genuine records. Privacy risks cannot be eliminated,[51] but techniques like introducing "noise" to the data (differential privacy) can help to minimize them.[52] Where data are identifiable, collection should be opt-in, rather than opt-out.

Trust remains paramount. If, for example, patients fear that predictive analytics could be used to deny them health insurance at a reasonable price, or that the use of AI could weaken the accountability of providers when mistakes are made, buy-in will be harder to achieve and regulation will likely be required. The EU's AI Act is the first major foray into protecting citizens' rights, defining lines of accountability, and penalizing irresponsible uses of AI or patient data. But bottom-up efforts are also part of the solution. Value-based contracts where revenues are tied to patient and population health outcomes and healthcare costs can help align incentives between payers, providers, and patients to keep costs down, e.g., by leveraging AI's role in improved preventative medicine.

[50] Shah, H., (2017), *The DeepMind Debacle Demands Dialogue on Data*, Nature.
[51] Murdoch, B., (2021), *Privacy and Artificial Intelligence: Challenges for Protecting Health Information in a New Era*, BMC Medical Ethics.
[52] Gonzales, A., (2023), *Synthetic Data in Health Care: A Narrative Review*, PLOS Digital Health.

Socializing AI

Optimizing AI's impact on human capital will go a long way toward optimizing its impact on society. This will require alignment between a broad range of stakeholders to identify, assess, and mitigate the associated risks. Incentive structures must come from policymakers, but oversight and accountability at all levels is crucial, as is maintaining trust between parties.



A just AI transition

"Just Transition" is a concept typically reserved for the transition to a low-carbon economy, but it has high relevance for the transition to the AI-economy, too. AI can exacerbate social inequities via the unequal sharing of benefits and suffering of costs and burdens. Inequalities between countries, industries, or individuals are not necessarily a problem in and of themselves, but they may have a distortive effect if allowed to become extreme with no balancing measures put in place (Table 3).

Table 3: How AI could drive increases in inequality

Inequality channel	Example
Between AI / corporate owners and workers	Productivity improvements create shareholder value while leading to automation and/or proportionately lower increases in real wages.
Between industries	Industries more exposed to AI, like finance and insurance, are likely to see gains relative to those less exposed, like hospitality and food services.[53] More fundamentally, reliance on AI could entrench the tech sector's position as the "tail that wags the dog" in the global economy.
Between countries and regions	Divergence in preparedness, AI model language performance, and economic sector balance could drive an unequal roll-out. The US currently dominates development of the most advanced foundation models.
Between workers and non-workers	It is unclear to what extent the disabled, unemployed, or pensioners will benefit from gains accruing to asset owners and workers, though conversely AI's capabilities could help to expand work opportunities to those previously locked out of the workforce due to disabilities.[54]
Between demographics	Risk that those less able to upskill lose ground to those who can.

Source: UBS

Governments cannot insulate people entirely from the coming structural changes, but they will need to find ways of accommodating them. This means ensuring sufficient flexibility in the labor market as well as providing adequate levels of assistance to help people transition to new roles. The key goal should be supporting and facilitating change, rather than limiting it, while mitigating its negative impacts and spreading its gains widely across individuals and families.

Optimizing the relationship between corporates, governments, labor, finance, and educational stakeholders is crucial for ensuring a just and effective AI transition. A trained workforce is essential to getting the most out of AI and it is incumbent on labor to avail itself of such training. Similarly, it is paramount that corporates provide it, governments incentivize it, and finance facilitates its funding.[55]

This can help facilitate a job-rich and -enrichening AI transition. New task creation and occupational upgrading can help shift the balance of AI impacts in favor of enhancing the productivity of existing roles rather than labor shedding. This can be encouraged by providing the right incentives to both corporates and labor, and facilitated by sensible discussions between corporates, governments, and labor representatives about which jobs can be upgraded and which should be replaced. Governments may be best-placed to play such a convening role, e.g., the US House of Representatives' Bipartisan Taskforce on AI. Where roles do become redundant, transition trauma can be reduced if governments ensure labor markets are flexible enough and unemployment insurance and social security are generous enough to absorb the transition of workers. The alternative may risk a new era of labor discontent and unrest.[56]

[53] UK Government, (2023), *The Impact of AI on UK Jobs and Training.*
[54] US Department of Commerce, (2023), *How Artificial Intelligence Can Improve Diversity, Equity, Inclusion and Accessibility Efforts.*
[55] UBS, (2024), *TechGPT: Raising AI Revenue Forecast by 40%.*
[56] Brookings Institute, (2024), *Hollywood Writers Went on Strike to Protect Their Livelihoods from Generative AI. Their Remarkable Victory Matters for All Workers.*

Attempts to "over-automate" can be costly for companies.[57] Most jobs are a constellation of tasks, which often require different skills. The question is which individual tasks are suited to AI and which are suited to human beings, and how a combination of the best-suited tasks for each, embedded in a well-designed workflow, can create value for businesses and society. Even in areas of lowest hanging fruit, like reading radiology scans, the need for human radiologists persists, as only some parts of the radiologists' role lend themselves to automation.[58] As much as humans will likely become dependent on AI for optimal performance, AI remains, for now, dependent on humans. For example, the input of humans enabling reinforcement learning from human feedback is one of the lesser known but essential reasons why Chat-GPT performs as well as it does.[59] Together, organic and synthetic minds, operating as human-machine "centaurs," will likely achieve more than either can individually in complex value chains for a long time to come.[60]

The question is which individual tasks are suited to AI and which are suited to human beings, and how a combination of the best-suited tasks for each, embedded in a well-designed workflow, can create value for businesses and society.

Aligning stakeholders

Aligning stakeholders is always difficult—one person's benefit will often be someone else's liability. Seemingly uncontroversial goals, like lowering the overall cost of healthcare, can run counter to the interests of healthcare providers in fee-for-service reimbursement systems (which make up the majority), where volume of care is incentivized, rather than efficiency.[61] But if AI is to be rolled out effectively, it is important that different stakeholders are pulling in the same direction as far as possible (Table 4).

[57] CNBC, (2018), *Elon Musk Admits Humans Are Sometimes Superior to Robots, in a Tweet About Tesla Delays*.
[58] Taylor, P. (2024), *Llamas, Pizzas, Mandolins*, London Review of Books.
[59] Ouyang, L. et al., (2022), *Training Language Models to Follow Instructions with Human Feedback*, Advances in Neural Information Processing Systems.
[60] Thompson, C., (2013), *Smarter Than You Think: How Technology is Changing Our Minds for the Better.*
[61] World Economic Forum, (2024), *Transforming Healthcare*.

Table 4: Key action points for stakeholders along the value chain to get the most out of AI

Optimizing the relationship between corporates, governments, labor, and finance is crucial for ensuring a just and effective AI transition

	Education	Productivity	Health
Practitioners	Teachers should upskill to utilize AI solutions, while shifting the focus of their teaching toward projects that nurture students' critical thinking skills and prioritize in-class assessment.	Workers should embrace AI training, lend their expertise to AI programmers, and participate in good faith discussions about which roles AI is best suited for.	Health workers should utilize AI to improve performance, identify errors, and increase the time spent operating at top of license, while maintaining a critical eye on AI outputs.
Providers (e.g., companies, schools, hospitals)	Provide training; connect with technology experts and others successfully incorporating AI into classrooms; decide protocols for how AI should and shouldn't be used	Invest in AI solutions and training along with organizational innovation and redesign to maximize AI's productivity improvements.	Monitor AI's performance to ensure proper functioning; stratify performance assessments to identify potential bias; train caregivers in using AI in their work and identifying potential risks.
Governments	Work with the private sector to invest in tools that can help close educational gaps, while holding companies accountable with strong data privacy policies to ensure protection of sensitive data.	Connect corporates, tech companies, finance, and worker representatives; incentivize companies to upskill employees; promote labor market flexibility while facilitating and funding job transitions; upgrade regulations to protect workers and data laborers against AI that exploits their output without fair remuneration.	Build regulatory frameworks that protect health data security; prioritize accuracy, patient privacy, and safety; manage access to anonymized public data repositories to promote innovation; ensure clear lines of accountability.
Technology Companies	Hire diverse programming teams so that a variety of perspectives are integrated into the designs of models and algorithms; check outputs for biases and efficacy for different groups.	Incorporate workers' feedback into designs; build systems to protect employee data, and design AI that assists workers, rather than undermining their expertise and creating exploitative work conditions.	Test algorithms on large-scale, diverse data sets; build systems to incorporate feedback from healthcare workers and patients; ensure adequate monitoring to detect latent defects.
Investors	Enable the above with targeted financing and impact capital where appropriate, connecting stakeholders along the value chain, and spreading best practice among their investees.	Invest in companies that prioritize upskilling employees where possible; that prioritize combining AI with business and organizational innovations; and that have robust processes in place for when malfunctions occur.	Invest in companies that have robust monitoring mechanisms and data protections in place, and that prioritize efficacy across patient groups.

Source: UBS

Fortunate oversight

The myriad ways AI can go wrong are still being documented, but they include hallucinations, biased or toxic responses, and spewing out private training data in response to certain prompts.[62] Failures are inevitable with new technologies—what is therefore important is the swift detection of and response to such failures based on proper oversight (Table 5).

Technology will almost certainly outpace what is envisioned in statute books, which will make it incumbent on firms to make bottom-up efforts to ensure safety, security, privacy, and truth are prioritized. One possible template for the tech industry to emulate is the Taskforce on Climate-related Financial Disclosures (TCFD). A TCFD-style industry-led effort would ideally set a template for the responsibilities of tech companies and their customers; for regulation and enforcement; and for remedy and resolution as AI technology evolves.

Companies should aim to get ahead of coming regulatory waves. This starts with proactive measurement and detection: Companies actively searching for defects, biases, and malfunctions like model drift, using "red teams" to see if models and the services based on them can be lured into misbehaving. It continues with fixing those problems before they become a danger to users and the wider public. And finally, it requires having protocols in place to address more serious incidents when they do inevitably occur, determining the reasons for failure, and taking prompt remedial action to ensure the issue does not occur again.

Governments will ultimately need to upgrade regulatory structures to accommodate the fast-evolving nature of AI technologies, encouraging innovation while prioritizing the need for safety and clear lines of accountability for when damage is done. Top-down accountability involves making AI developers and platform providers responsible for the content their original or modified models produce and disseminate. Bottom-up accountability looks at the companies and individuals who use, and in many cases, fine-tune those models, with the latter potentially introducing additional risks with alarming ease.[63] There should be obligations on both to make proactive efforts to detect and root out damaging AI behaviors, like inappropriate content (Box 3). If companies are being negligent and damage can be shown, there need to be systems and enforcement mechanisms in place to penalize that behavior and disincentivize it in future.

Box 3

All things in moderation

The moderation of large media platforms has always been a difficult task, but AI has created an opportunity to improve the monitoring and moderation of content significantly. Just as copyrighted material is automatically flagged, so abuse, illegal images, or misinformation increasingly can be too. This is not a simple matter—one person's misinformation might be another's vociferous campaigning. Means of appeal, with human input, will need to be built into systems to ensure fairness—but the status quo, where large quantities of problematic content go unchallenged, is not sustainable.

[62] Wang, B. et al., (2023), *DecodingTrust: A Comprehensive Assessment of Trustworthiness in GPT Models*, NeurIPS 2023 Datasets and Benchmarks Oral.
[63] Qi, X. et al., (2023), *Fine-tuning Aligned Language Models Compromises Safety, Even When Users Do Not Intend To!* Arxiv.

Table 5: AI corporate oversight model

Utilizing existing structures inside the company is more likely to be effective

Layers of Oversight	Business functions that should be involved	Examples of considerations at each layer of oversight: Certainties "known knowns"	Expected risks "known unknowns"	Unexpected risks "unknown unknowns"
1. Foundational/ Technical	Legal & Compliance IT & Data Risk & Security Audit	Centralized IT governance: • AI Inventory • Process rationale requirements • Data ethics and protection • Group policies alignment • Algorithm fairness framework	Strategic risks assessment: • Ground truths to minimize hallucination • Web scraping/Copyright • Info/cyber security policies • Jailbreaking safeguards • Challenge transparency/explainability	Behavior and culture: • Question and test capabilities/limitations • Understand Inferential characteristics • External partnerships for rapid response and recovery • Scan foundational developments
2. Business case assessment	+ Finance Sustainability Business +	Sector/market specificity: • Align initiatives with organization-level governance, compliance, and risk management by market/business lines • Consumer (retail) protection—highest impact • Evaluation, testing, documentation	Specific risks assessments and impact analyses: • Contingency plans for critical AI systems • AI supplier due diligence • Copyright—data/code; third party risks • Model/data bias • Human bias labelling/feature engineering	Business continuity planning • Emergency procedures and crisis management plans established. • Cross-border/product lines applications suitability • Identify and isolate cause and effect
3. Business case application	Operations Other enabling functions	Customer education and communication: • Know the difference—use case vs. business case • Market research—test customer buy-in • Adherence to deployment standards • Identify key risks • Communicate risk mitigation measures	Risk management: • Monitor performance issues • Real-time risk detection and mitigation e.g. data poisoning/adversarial attacks • Data retention: privacy and personal identifiable information recovery • Manage cloud migration	Rapid incident response protocols: • Swift rollback/shutdown capability • Oversight to prevent abuse: e.g., fraud, scams, deep fakes, and voice clones • Feedback loops back to business, group and foundational model providers

Source: World Economic Forum, (2024), *Responsible AI Playbook for Investors;* UBS Asset Management

Summing up

Now that we have scoped out the key opportunities and risks from AI for society via human capital, we turn our attention to ways to progress forward in a constructive way. The following seven steps are intended to help investors, corporates, and regulators map a route to a safe, sustainable, socially beneficial roll-out of AI. These steps are about aligning private benefit with broader societal needs. This is not for reasons of altruism—failure to do so risks building AI's flaws and vulnerabilities into business models and markets. Previous tech roll-outs, from the first Industrial Revolution onward, have demonstrated the political upheaval and traumatic corrections that can ensue when technology is implemented without sufficient thought given to its impact on society. The following steps are thus aimed at future-proofing business models and profits against the risks that stem from an irresponsible or unsustainable incorporation of AI into businesses' operations and products.

1. Ask the right questions

– Does AI lead to improved access, service, or product quality versus what's currently available?
– Have AI-bias risks and safety/privacy concerns been assessed and addressed?
– Does it rely on a sustainable supply of data?
– Does AI worsen inequality or misinformation?

If the answer to the first three questions is "No" or to the last is "Yes," alarm bells should ring as to the long-term viability of the AI solution in question.

2. Institute robust oversight mechanisms

– There is a need to test, validate, and monitor AI at every phase, from development to implementation to maintenance. Also, there should be oversight at international, national, sector, and corporate levels.

3. Define lines of accountability

– Model owners need to take accountability for their model's outputs, but end users cannot be absolved of responsibility for their actions using those outputs.

4. Handle the truth

– Mechanisms to define what is reliably true and what should be interpreted with more care, are increasingly important.
– Chain of custody rules, like those used in legal cases to avoid evidence tampering, data watermarking, and potentially blockchain could be important parts of the solution, helping to keep track of where information has come from, if and how it has been altered, and whether it is genuine.[64,65]
– Clear labelling norms can also help human users distinguish whether an online interaction is between other humans or AI-generated bots.

5. Align incentives between corporates, finance, policymakers, and labor

– This will require a bargain between all stakeholders to incentivize, prioritize, finance, and take up AI training opportunities to prioritize maximizing worker productivity, rather than automation.
– Tax changes and policy measures that favor investment in human capital in combination with AI over standalone AI solutions can be helpful.

6. Put AI inclusivity and social risk management up-front

– Companies that incorporate safety, inclusivity, and social (not to mention environmental) risk management in their business models are more likely to survive any future policy-driven shakeouts as regulation is formulated.
– As with TCFD, an industry-led approach that utilizes expertise and private-sector efficiency is likely needed to lead the way. The Frontier Model Forum[66] is one such body, but consists solely of AI-leaders like OpenAI and Microsoft; a broader-based effort that incorporates each stage of the value chain, from AI innovators to end users, is likely preferable.

7. Support measures to address digital divides

– To reduce risks of AI becoming a vector for increased inequality, access to the latest models and the processing power and energy needed to run them needs to be broadened.
– Non-English speakers likely need models trained on material written in their own language.
– Simplifying front-end access to models could help to broaden the pool of people who can innovate.

AI is not a silver bullet, but it brings enormous opportunities to use technology to address some of society's most pressing needs. Grasping that opportunity requires bold innovation, but it must be coupled with thoughtful deployment. We should aim high, while remaining aware that subordinating trust, safety, and fairness to short-term gains is likely to undermine AI's long-term value and raise the risk of backlash.

[64] World Economic Forum, (2021), *Blockchain Can Help Combat the Threat of Deepfakes. Here's How.*
[65] Zhao, Y. et al., (2023), *Proactive Deepfake Defence via Identity Watermarking*, Winter Conference on Applications of Computer Vision.
[66] The Frontier Model Forum is a non-profit funded by Amazon, Anthropic, Google, Meta, Microsoft, and OpenAI to advance the safe development and deployment of advanced, general purpose AI systems. https://www.frontiermodelforum.org/

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