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Bridging the AI Divide

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1.0 Overview

AI systems are ubiquitous, with the ability to contribute close to $20 trillion to global GDP.[1] It will touch every walk of life – the IMF predicts 40% of jobs worldwide will be impacted by AI.[2] AI is not only transforming economies, industries, and jobs, but societies and the planet too. Despite significant onboarding of AI in the post-pandemic era, we are already seeing a widening gap of access and use fueled by AI geopolitics, infrastructure needs, regulations, and supply chain. The purpose of this policy brief is to report on the various features of the AI digital divide and suggest policy recommendations to bridge the gaps.

2.0 AI – A Brief Definition

While there is no unanimous definition of AI, it is basically a machine miming aspects of human intelligence. The recent 2024 EU AI Act and the Council of Europe AI Treaty all borrow from the OECD definition of AI systems. An AI system is referred to as a "*machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environment*". [3] AI is a tool that encompasses hardware, software (code or algorithms), data and human input[4]. The varying degrees of knowledge of AI systems across the many users and actors involved in its regulation is an area of concern being flagged by the EU AI Act – now it is an obligation to have a minimal level of literacy for all stakeholders working directly or indirectly with AI. There exists various types of divides when it comes to AI - not just in our understanding of the definition but in our knowledge about AI and its impact.

3.0 AI Divide

This paper highlights nine key areas of the digital divide: (1) Digital infrastructure, (2) Data, (3) Talent, (4) AI Literacy and Ethics, (5) Intellectual Property, (6) Regulation, (7) AI Securitization, (8) Supply Chain, and (9) Impact. While they are not arranged in order of priority, they are divides that prevent AI from achieving its true potential for the benefit of humanity and the planet.

3.1 Digital Infrastructure

Only 68% of the world's population is online, which prevents many people from accessing, using, or benefiting from AI.[5] This also becomes a fairness issue if services that were previously available physically have been stopped as they are only available online. This infrastructure divide may also disproportionately benefit cities more than rural areas. Even in urban spaces, there may be 'pockets of digital poverty', often linked to low-income groups.[6] This is true even in prosperous cities like New York where 1.6 million people **cannot** access the internet.[7]

AI relies on a robust digital infrastructure. Over $300 billion is spent annually at a global level to enhance AI (mostly in high income countries).[8] This could be for data transfer using the 4G and 5G networks provided by telecommunications infrastructure, data storage devices like cloud warehouses, CPU servers, data collection devices like sensors or personal devices that do all three like personal hardware devices like laptops and mobiles. The current digital divide is often exacerbated by the digital infrastructure gap that arises because of costs and the inability to power the machines due to poor electricity access. Currently, 33.8% of the world is offline due to the lack of digital infrastructure.[9] As per the November GSA report, 151 operators in only 63 countries are rolling out 5G (only 24.3% of operators). A key challenge is that to access 5G services, you need 5G devices which are expensive, and need access to the internet for devices to be updated.[10] A study by the World Bank finds that this digital divide is widening when looking at broadband connections (see Table 1). The issue of access is increasingly one of industry profitability. The cables that connect the world and transmit up to 95% of the world's data are 99% owned by the private sector or consortiums with them.[11]

Table 1: Broadband connections out of 100 people

High-Upper Middle-Income Countries	Lower-Middle Income Countries	Low-Income Countries
30	4.4	0.5

Source: World Bank (2023)[12]

3.2 Data

The data divide simply evaluates whose or what data is being fed to the AI-enabled machines. While earlier GPT systems scraped the Internet which is English-language dominant, LLMs for example, are now being trained on custom data which is both good and bad. A new study underscores how the various sources of data are concentrating power in the most powerful tech companies, with, for example, over 70% of data for both speech and image data sets for video models coming from YouTube.[13] The very nature of the choice of what to train and how to collect data directly affects the outcomes of AI and hence creates bias.

It is estimated that 90% of the world's data was produced in the last two years,[14] and only 2% is stored.[15] Data is stored in data warehouses or in the 'cloud'. In 2024, there were 5,709 public data centers of which were 523 hyperscalers[16], the majority in the USA. The sensitivity of data and the perception of national data as a resource is leading to data sovereignty, and approximately 100 countries have some sort of data sovereignty laws.[17]

Further, there is a data divide in terms of gender, age, language and culture - as to who is creating, capturing, storing, mining, sharing, and exploiting data. More than 50% of data being produced is visual data in the form of videos.[18]Another current challenge we face is AI-generated synthetic data (data made by AI systems) is outpacing real data (made by humans). It is estimated that 60% of data is synthetic.[19] In AI models, this ratio of synthetic data versus real data impacts the quality of the output. In simulations, models collapse in quality when recursively trained on AI-generated data.[20] This will be a significant data divide we are not prepared to face as we are now unable to differentiate adequately between original human content and machine-generated content.

3.3 Talent

AI requires both specialized talent with deep knowledge of the domain of AI and its application areas and talent to train and build and maintain AI machines. Currently, the industry has retained 2.5X the new AI doctoral talent than governments, [21] though AI is being deployed in the public sector and for public services. This makes governments more heavily dependent on outside contracting from the private sector since it does not have the capabilities, nor can it attract talent with the market-rate for salaries. It is also ironic that much of the research in AI, which was historically funded by the government, is now being funded by the private sector, [22] suggesting the motives for research and talent development are clearly for profit and not public value. Even where government funding was used in AI labs, the beneficiaries are the private sector. [23] Why does this matter – because there is an expectation and presentation of more transparency in academia with research being published than in industry where trade secrets and competitiveness take precedence. The USA remains the top destination for international AI talent – with 4 out of 5 of Indian AI researchers opting to move abroad. [24] China has focused on retaining domestic talent and today has 47% of AI talent. [25]

We also need to consider both upstream and downstream AI talent. Upstream talent includes data collection, cleaning, tagging, or coding; downstream talent can include training, decision-making, AI teaming, etc. In some cases, the talent being sourced can come from low-income countries to manage the rising costs of AI. It may create an unfairness issue that needs to be addressed. India, Eastern Europe, the Philippines, South Africa, Nigeria, Kenya, Egypt, and Jordan remain significant business outsourcing markets for AI training and coding (all labour-intensive tasks like image labelling or content moderation).[26] This AI divide based on cheap labor is a worrying trend, suggesting that talent valuation is skewed and unfair.

Current AI talent discussions often do not acknowledge the need for systems thinkers, ethicists, philosophers, sociologists, psychologists[27] and other domain experts in the development of AI. The bias to strictly STEM-educated talent is not necessarily positive when it is well-known that we are developing and deploying a technology meant to solve human problems.

3.4 AI Literacy and Ethics

AI Literacy and Ethics need to be at multiple levels and to use both a top-down and a bottom-up method for education. Without the rapid onboarding of policy-makers to better understand AI technologies, there will continue to be regulatory gaps and misalignments. Further, while there are many policies on AI ethics and an increasing number of regulations (a majority are soft regulations), the challenge is operationalization and implementation. Since the scale of deployment of AI and its adoption is increasing at an accelerating rate, AI literacy and the adoption of ethical values are critical to ensure safe, responsible, and trustworthy AI. Over 12% of the world's population is illiterate, and some of the current debates on AI may not be easily accessible to them, removing their ability to choose whether to adopt such systems.[28] While AI is steadily improving in some narrow domain areas like – image recognition, text and speech recognition and generation, the need for humans to remain in control of final decision-making outcomes is still an area not easily implemented. Gartner predicts that by 2028, 33% of AI will be agentic (i.e. uses AI bot or agents to make decisions without a human).[29]

3.4.1 Policy-makers: Policymakers face significant challenges in acquiring literacy in AI due to the rapid pace of technological advancement and the multidisciplinary nature of AI, requiring expertise in computer science, cognitive science, ethics, and economics. Educational boot camps, like those run by Stanford University's Institute for Human-Centered Artificial Intelligence (HAI),[30] offer House and Senate staffers intensive discovery environments with experts to learn about AI and keep up-to-date with latest developments. This serves as a model worthy of replication across a larger geographical span. UAE's Mohammed Bin Rashid School of Government is deploying an AI Literacy course in early 2025 geared for its policy-makers. While the EU has AI literacy embedded as an obligation in its EU AI Act, policy-makers are not specially mentioned, though they take decisions that shape AI adoption.

3.4.2 Across Industry: AI has the ability to cross industries with little regulatory oversight. For example, software deployed in a medical situation could be used to manage insurance premiums (using preexisting conditions). Similarly, software in an office can use data to create an AI agent that makes a job redundant without the explicit permission of the employee or via blanket terms of reference. Data from social media, ride-hailing apps, and loyalty apps can be sold across industries. Data collected on a wearable (used for fitness or as a watch) may be used for health and may not have the same level of scrutiny that a health device should require. At the same time, data from a civilian source can be used for military purposes without permission or knowledge. There is a current policy debate on whether AI systems should be regulated from a technology or an industry perspective. Whatever the decision, AI crosses industry jurisdictions faster than regulatory oversight, suggesting industry actors need to know the provenance of the objectives of why AI was created, the data, algorithms and if it is fit for purpose and ethical for use in its industry context.

3.4.3 General Public: Widespread public awareness and education, like knowledge transfer and upskilling, are essential to help individuals understand and effectively engage with AI-enabled technologies. Countries like Singapore have launched national AI literacy programs (i.e. AI Singapore which provides workshops, online courses, and resources to help citizens of all ages develop AI skills and comprehension).[31] Denmark [32] and Finland [33] have integrated AI and digital literacy into their national educational curricula, ensuring students from primary school through higher education gain practical knowledge about AI's capabilities, limitations, and ethical considerations. UNESCO also developed a global framework for AI literacy,[34] promoting initiatives that empower individuals to not only utilize AI technologies but critically analyze, adapt, and participate in shaping the future of these tools. There is an obvious need for educators to be appropriately trained to teach AI skills and to ensure that students use AI tools in a safe way.[35]

To sum up, apart from very few initiatives which are very fragmented in their approach, there is a huge AI literacy divide among policy makers and general masses and the AI ignorance makes it very easy for AI giants, industry actors to breach ethics and cross-pollinate across the industries.

3.5 Intellectual Property

Intellectual property allows the economic exploitation of AI. According to WIPO as of 7 December 2024, there were 127,977 patents with the word 'artificial intelligence' in them.[36] Of these, China had 62.7% of the patents, followed by the USA with 11.5% (see Table 2). However, the table does not capture the patents in technologies behind AI like hardware development such as Wi-Fi routers, hardware cooling needed for cloud computing, or chemical processes needed for semiconductor manufacturing. This poor understanding of AI and the complex intersection of hardware, software and data exacerbates the IP divide.

Table 2. Patents in AI (as of 7 December 2024)

Country	Patents
China	80239
USA	14742
South Korea	10226
PCT	9806
India	5287
European Patent Office	3560
Japan	1023
Australia	882
Canada	711
United Kingdom	295

Another observable divide is that companies (more than individuals, or research institutions, or governments) are patent owners for new technologies like GenAI.[37] China has eight research organizations, USA - six, UK - four, and one each from Canada and Japan in top 20 universities or research organizations from research publications (with one corporation - Alphabet, USA). In terms of impact, of the top 20 organizations whose papers are cited, there are more corporations - Alphabet, Meta, DeepMind, Nvidia, OpenAI, Microsoft and Twitter showing their influence in research.[38] The USA leads other countries in terms of AI models - 61 models compared to 21 from the EU and 15 from China. Hence in terms of IP, there is an AI divide that will leave many countries and companies disadvantaged.[39]

3.6 Regulation

With the increased focus on AI and its role in national competitiveness and security, its widespread adoption has led to a growing debate on the need for AI governance. These regulations are either to encourage AI national competitiveness for economic, defense supremacy or security; or to ensure that the impact of AI is positive and beneficial for all. The OECD estimates that there are over 1000 AI policy initiatives in place across 69 countries (Table 3 shares the list of policy trackers). Major policy frameworks follow the digital empire perspective: market-driven regulatory model in the USA; state-driven regulatory model in China and the democracy and human rights-driven regulatory model in the EU.[40] The rest of the world picks and chooses from these three models. The EU led the way with data privacy with the GDPR causing what many called the “Brussels Effect”. Peru introduced a bill in AI modeling it after the EU AI Act.[41] However, the concept of democracy and human rights has many cultural nuances, and many countries are only part of the vast supply chain of AI, as discussed below, and thus may not obtain the same returns on investment in AI as some of the market leaders. Meanwhile, many countries (like in South America) are leading in other areas of much needed regulations – Chile is the first country to introduce legislation to protect neuro-rights in its constitution, effectively establishing that scientific and technological development must be at the service of people and carried out with respect for life and physical and mental integrity.[42] Mexico has followed suit.[43]

Table 3: Compilation of AI policies overview tools

Tools	Link
OECD	https://oecd.ai/en/dashboards/overview
AI Policy Tracker	https://aipolicytracker.org/
Stanford AI Index Report	https://aiindex.stanford.edu/report/
CAIDP - AI and Democratic Values Index	https://www.caidp.org/reports/

3.7 AI Securitization

With the increasing securitization of AI, access to AI hardware, software, data, and talent is becoming an issue. This AI geopolitics is leading to nearshoring or friends-shoring where countries need to pick partners for access to certain types of technology. This leads to opportunities for other Asian, Latin American and African countries to get embedded in the supply chain.[44] USA has strategically looked at Vietnam as a new partner in its "friends-shoring" program to manage its AI supply chain.[45] In other cases, there is a quid-pro-quo movement for infrastructure development or aid in exchange for data. Health data which are considered sensitive was in effect 'bartered' when Israel wanted access to the Pfizer vaccine during COVID. [46] The struggling under-funded NHS in the UK 'gave access' to its data to Palantir (USA) for £1.[47]

To secure talent, on the one hand we see new visas for tech entrepreneurs popping up across the globe - like the UK (with the Global Talent Visa), Singapore (Tech Pass Visa), and the UAE (Golden Visa), to attract frontier tech talent. The USA plans to rehaul the H-1B visa in 2025, though the restrictions on Chinese talent will continue.[48] The fine divide between attracting talent for future competitiveness and restricting immigration in the fear of losing intellectual property continues to be a challenge.

Another simple measure of challenges in this space is the cost of data access or broadband. Prices range from $2.40 in Sudan (the cheapest) to $457.84 in the Solomon Islands.[49] Broadband alone is not enough - for example, using a World Bank loan, Togo built 5G infrastructure (the first in West Africa and third in Africa) with the challenge that 5G handsets are not easily affordable for the majority of the public, supporting the reality that access can be hidden by many layers. In addition to the fact that most private sector companies own data cables, and the majority are from two or three countries, it adds another layer to securitization challenges.

3.8 AI Supply Chain

3.8.1 Funding

The cost of investment into silicon manufacturing has been increasing exponentially (as demand rises). A new semiconductor factory, which can become obsolete in 5-6 years, costs as much as $7-100 billion.[50] A foundational model with 100 billion parameters could cost as much as $100-200 million for training.[51] This restricts the development of such types of AI to very large companies with deep pockets or governments with those kinds of budgets. The USA has 4X the machine learning models as China in 2023.[52] The funding fueling AI comes largely from the private sector. However, we cannot discount indirect funding incentives to adopt AI. China's BRI project, for example, spans close to 140 countries around the world.[53] The geopolitics of this can be highlighted by the complexities of the India-China relations in the Maldives regarding data submarine cable systems.[54] Cables cost $40,000 per mile with trans-oceanic cable falling in the range of $250-$400 million.[55] Bridging the digital divide needs funding. Another challenge seems to be that about 50% of global trade is invoiced in US dollars.[56]

Are female-led AI startups receiving their fair share of opportunities they deserve? This trend has improved in some markets, for instance in 2023 the proportion of VC funding that went to startups with at least one female co-founder reached a new peak in the US, with ¼ of funding – $34.7 billion – invested in companies with at least one female founder, according to Crunchbase[57] data. But can this trend be maintained and be reflected globally? This is another type of funding divide.

3.8.2 Manufacturing

This is a challenge when countries like the USA consume 34% of global silicon chips but produce less than 2%, leading to the CHIPS Act to redress this problem. [58] East Asian countries control 75% of the production process. For example, to create a silicon wafer, over 50 classes of precision equipment are required. [59] Complicating this is the fact that they are scattered around the globe with the time to produce lasting 6 months with up to 1,400 process steps. [60] Unfortunately, the process of silicon manufacturing is laborious and depends on resources from around the world. Not all countries involved in the process reap the same benefits.

3.8.3 Raw Material

AI components depend on extractive industries, and these are often geographically concentrated with either a scarcity problem, a supply chain risk, or facing a demand intensity - all of which can create bottlenecks.[61] For example, Ukraine was a significant supplier of neon (approx. 50%) and this was disrupted with the Ukraine-Russia invasion. Ed Conway in his book, Material World: A Substantial Story of our Past and Future, highlights that our consumption of materials means we use 6x that weight in resources for its production and this ratio is increasing.[62] This leads to a sustainability risk for the planet.

3.9 Impact

The benefit of AI is not proportionate across societies and geographies. Apart from the above mentioned reasons for the AI divide, issues like biases, poor AI literacy, lack of political will and lack of global citizenship behaviors further aggravate the situation. For example, how responsibly people work with open-source data sets or with crowdsourced material impact the performance of AI. There have been examples of purposeful poisoning of open-source datasets or codes leading to cybersecurity challenges.[63] The use of AI agents in this co-creation process adds an additional layer of complexity as seen with the high frequency algorithmic trading and the Flash Crash of 2010. The advantages of AI should encompass not just economic factors but also take into account political, social, and personal needs. Issues like cultural preservation, content authenticity, safety and privacy must be addressed with priority.[64] The importance of AI's non-maleficence is crucial, yet applications of AI in defense or military contexts are not included in the current EU AI Act, for instance.

The rapid development of AI also raises significant ethical concerns, particularly regarding privacy invasion, job displacement, and the potential for critical high-risk decisions, like medical diagnosis and loan approval, to be autonomously made without complete human oversight. The technology's ability to process and analyze massive amounts of data and find patterns otherwise unobservable has led to breakthroughs (e.g. early disease detection, climate modeling, personalized education). At the same time, AI presents risks, including algorithmic bias, widespread surveillance, and the growing existential concern of superintelligent systems that may surpass human control and comprehension. Without steadfast requirements for system transparency, mandated audits, and standardization of documentation, system risk management remains unnormalized and unenforceable. Another challenge is the impact of AI on the environment. AI is a resource-hungry system – from extraction, its carbon footprint, water consumption pattern and the volume of e-waste being generated. It is encouraging that some tech companies have taken the initiative to tackle the sustainability challenge, for instance, Samsung's [65] use of purified sewage water as industrial water for its chip manufacturing or Microsoft's [66] new data center design to consume zero water for cooling. But this clearly needs to be enforced across the tech ecosystem globally.

The impact of AI (good or bad) is rarely uniform, and that also is a divide that needs to be bridged. A key problem is lack of shared data. We know 85 million Microsoft computers were affected by the CrowdStrike release, and it was projected to cost Fortune 500 companies around $5.4 billion in damages. [67] Yet we still do not have other important details – how many patients did not get the treatment due to lack of access to medical records? How many passengers had to pay for another flight ticket or a room night due to the airline industry being hit? How many restaurants lost businesses as they were unable to bill customers? The key challenge is whether this could happen again and how it can be prevented, particularly if it were done on purpose by a negative actor. This is where regulation and transparency in the ecosystem become critical.

4.0 Recommendations

4.1: Bridge the Budget Deficit

Infrastructure is expensive. While there is clearly a geopolitical aspect to infrastructure development, finance is key to bridging the digital divide. Digital infrastructure development has many benefits, as seen with drone deliveries (Zipline), microfinance for digital financial inclusion (M-PESA), and customized health interventions for diabetes (Sugar Clinics in Mexico). Each benefit to the society comes from a sustained vision and finances to stay the course to achieve service coverage at a scale that equalizes access and delivery of whole-of-society benefits.

Bridging the financial divide requires us to:

- Create access to infrastructure financing (concessions, bonds, loans, public-private partnerships).
- Promote globally coherent policies for easier access to VC funding. It is estimated that 90% of startups fail [68] and 65% of them are VC backed startups. [69]
- Frontier technologies using AI will be high-risk businesses that require deep pockets of funding. It would be better to have more players for fair competition rather than a scenario where large players acquire promising or challenging startups. It is also critical that female-led AI startups are given appropriate funding globally.
- Deploy long-term strategies with associated budgets to create sustainable economic clusters with a distinct advantage. Rather than replication strategies, countries or cities need to move to a white spot strategy, where they find promising spaces that are not crowded.

Some of these financial strategies at a global level can bridge the digital infrastructure divide and the supply chain gaps. However, it is not enough, as you need to be able to support a culture of entrepreneurship. Further, at this moment, many countries are copying each other without a clear idea of what will be their unique competitive advantage in the AI race. Without understanding the strategic intent, they will not have the long-term returns that infrastructure financing requires (15-30 years).

4.2: Fair Valuation of Talent

The outcome of the debate on how many jobs AI will create versus replace is still unclear, leaving greater uncertainty not just for people and their families but for governments who need to maintain stability, security and provide social services. Unlike previous industrial revolutions, the AI revolution is impacting white-collar and middle-manager jobs.[70] This impacts knowledge transfer (as AI cannot capture tacit knowledge) and may leave us with more biased systems since there will be no clarity on what and how an AI system was developed. Most AI systems build on top of other systems (as seen with the increasing number of API calls - about 83% of all internet traffic). [71] This valuation of talent at a global level is needed, with policies to ensure the right to work is protected. It requires us to:

- Conduct foresight studies on what talent is needed from an interdisciplinary point of view based on national competitive strategies.
- Invest in talent growth, augmentation, cross-pollination and this means reforming visa and mobility laws across countries and industries.
- Identify a whole-of-society governance reskilling and training strategy to ensure security for future generations and to prevent old-age poverty.

4.3: Accelerate AI Literacy, AI Ethics and Responsible Entrepreneurship

AI literacy, ethics and responsible entrepreneurship go together. Without a strong understanding of what AI is capable of, cannot do and should not do, there will always be a divide. Further, to scale AI responsibly, we need responsible entrepreneurship. This type of literacy needs to start at the school level and continue through university. AI literacy and ethics should not be confused with digital skills. It is a transdisciplinary domain that necessitates a transdisciplinary curriculum. [72] The current debate is who is responsible for AI literacy. There is a need for a whole-of-government, whole-of-business and, a whole-of-society effort. No one should be left behind and since the technology evolves so rapidly, so should AI literacy and training. Microsoft's ADVANTA(I)GE India Initiative, in partnership with TATA Strive, has committed to upskilling 2 million people in India by 2025 as part of its Skills for Jobs Program. This will benefit university students and students in remote areas (as well as government officials and nonprofits).[73] This type of program needs to be implemented globally. Accelerating AI Literacy requires us to:

- Constantly develop AI curricula across various stakeholders to ensure meaningful and responsible decisions about frontier technologies like AI and the industries it impacts.
- Use a transdisciplinary perspective towards AI literacy, since AI knowledge cannot be viewed in silos.
- Fund transdisciplinary research on the long-term effects of AI adoption on society and governance.

4.4: Focus Not Just on Risks but Trade-offs

While there is a strong focus on risks, given the impact of AI across all domains, more discussions and debates should center around the trade-offs of AI decisions. How is productivity and accountability managed? What are we gaining and/or losing with speed and accuracy? How far can we de-bias a system and what gains/losses result from the convenience of specific data sets and what are the costs? Security with privacy? This shift to include trade-offs will ensure that we also make more conscious choices of what we are willing to trade – the benefits and the costs of reaching those benefits for a few segments of the population. This conscious choice will help close the impact gap, transparency gaps, ethics gaps, data debates and redress the general hype about AI. This refocus requires us to:

- Balance short-term gains with long-term impacts and track the same.
- Increase transparency on the hidden upstream and downstream supply chain and its acknowledgement to prevent whitewashing
- Determine various levels of accountability for funding, researching, deploying, using and disposing of AI systems.

4.5: Ensure Human-in-the-Loop

The advanced cognitive capabilities unique to AI systems introduce the dilemma of how much decision-making authority we delegate to a machine. As a result, there needs to be policies on why we are delegating certain processes, when we should delegate, and where and when we should take control and accountability. This will help bridge many of the gaps described above. The human-in-the-loop processes ensure the development, deployment, use and, retirement of AI systems are conscious acts. Ensuring human-in-the-loop requires us to:

- Promote transparency on which human decisions are bypassed and the motivations for bypassing human decisions.
- Understand the impact of bypassing human decision-making on skills and knowledge and, understand if there is a failure - what will be the levels of accountability.
- Change laws if needed to ensure humans are not penalized more than machines or firms when there is a failure for similar sets of outcomes - death, mental or physical trauma, reputation loss, etc. This is a fairness issue.
- Ensure we have adequate policies that reflect the role of caregivers for minors and those that are vulnerable to AI.

4.6: Contribute to the Common Good

AI systems are global. The influence, experience and impact are often co-created, requiring a common understanding of AI (literacy) and a commitment to the intergenerational common good. This contribution to the common good is for the benefit of the present and future of humanity and the planet. This can only be done in cooperation between private sector, public sector and the public based on a shared understanding of values and principles to foster policies needed to ensure AI is used for the greater good across countries to bridge the divide. This will need policies to foster inclusiveness and representativeness, tolerance of diversity of opinions and cultures, ensure transparency and allow for dissent with the popular viewpoints. While there are many AI values and policies, a common understanding of the key terms and what it means to be implemented needs to be developed. A method for redressal at the global level also needs to be designed to ensure no one is left behind. This requires us to:

- Agree on common good principles and agree on how to translate the same in each national context and across various stakeholders.
- Embed this training across the whole-of-society, whole-of-industry and whole-of-government.
- Ensure that values are embedded in AI companies, agencies and research and there is accountability for these values being publicly espoused, to ensure that there is transparency in actions and motives.

4.7: Promote Global Cooperation

To bridge the global AI divide, we need global cooperation to share the costs, profits, and burdens of AI. We need to share more about what does not work (than just what works). The benefits of large-scale deployment of AI result in a huge planetary footprint; how can we prevent that? Should AI investment also focus on e-waste recycling plants and product modularity? The EU, for example, introduced the Right to Repairability to extend the product lifecycle.[74] Generative AI needs large data sets - how can we ensure privacy? An example is India's DEPA platform that it is offering to other countries. Can we standardize such new initiatives across the globe as a privacy by default mechanism?

At a global level, greater adherence to cooperation is required amidst the AI race which exacerbates existing geopolitical dynamics. As countries increase the use of AI in contentious areas such as military activities and diplomacy, it further warrants a level of political sensitivity and commitment to ensure there is an ethical and agreed upon approach to international cooperation and effort to prevent over-dominance.

AI could also be used to create more cooperation opportunities, if countries could come together and pool resources to develop research and co-creation concepts that benefit all. CERN is often regarded as an equivalent example in fostering international relations in the common pursuit of scientific understanding on our quantum nature.[75] Other similar approaches include a multilateral Open Quantum Institute,[76] and at the EU regional level the European Digital Infrastructure Consortium (EDIC) with a joint activity of developing LLMs to address language gaps.[77] Countries could take a page from these successful cooperation examples to jointly develop and equalize benefits of AI technologies. To promote global cooperation we need to:

- Deploy policy education on the AI supply chain, its lifecycle, the short-term and long-term costs, and unintended effects of AI failures. This requires not just compiling the best use-cases with longitudinal data but also the failures to create better informed policy guidelines.
- Ensure more alignment at an international level on the red lines between securitization (and warfare) and nonmaleficence for humanity and the planet.
- Introduce AI diplomacy as a topic area in international affairs and humanitarian sectors to ensure that the intended benefits are not sabotaged for harm.

5.0 Conclusion

In this policy brief, we have identified nine types of AI divides and seven recommendations to bridge the AI divide. The AI divide seems to be in some ways, a Global North-Global South issue and as AI is spreading across the world, this imbalance needs to be addressed quickly. More research needs to be presented on the understanding of the Global North-Global South perspective, and what fuels this perception. Future research can delve deeper into the role of Big Tech as a growing power influencing policy making, and AI's role in diplomacy and in governance. Public value and profits can have synergy, but we need more discourses on the feasibility. While the authors have touched on various topics to further AI literacy, we also highlight the need for global cooperation towards creating trustworthy AI.

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References:

1. IDC (2024). *Artificial Intelligence Will Contribute $19.9 Trillion to the Global Economy through 2030 and Drive 3.5% of Global GDP in 2030*. Available: https://www.idc.com/getdoc.jsp?containerId=prUS52600524 [Accessed 20 December 2024].

2. Georgieva, K. (2024). AI will transform the global economy. Let's make sure it benefits humanity. *IMF Blog*. Available: https://www.imf.org/en/Blogs/Articles/2024/01/14/ai-will-transform-the-global-economy-lets-make-sure-it-benefits-humanity [Accessed 11 December 2024].

3. EU AI Act (2024). *Article 3: Definitions*. Available: https://artificialintelligenceact.eu/article/3/ [Accessed 5 December, 2024].

4. Stephens, M., Vashishtha, H. & Wagner, D. (2023). *AI Enabled Business: A Smart Decision Kit*. Available: https://www.amazon.ae/AI-Enabled-Business-Smart-Decision/dp/B0CBNTSY6H [Accessed 11 October, 2024].

5. ITU (2024). *Measuring Digital Development - Facts and Figures 2024*. Available: https://www.itu.int/itud/reports/statistics/2024/11/10/ff24-internet-use/ [Accessed 11 December, 2024].

6. For example see: Mulyaningsih, T. et al., (2021). *Poverty and Digital Divide: A Study in Urban Poor Neighborhoods*. Available: 350419750_Poverty_and_Digital_Divide_A_Study_in_Urban_Poor_Neighborhoods [Accessed 19 December, 2024].

7. NYC (2021). *New York City to Close Digital Divide for 1.6 Million Residents - Advance Racial Equity*. https://www.nyc.gov/office-of-the-mayor/news/724-21/new-york-city-close-digital-divide-1-6-million-residents-advance-racial-equity [Accessed 20 December, 2024].

8. International Labour Organization (2024). Mind the AI Divide. Available: https://www.ilo.org/publications/mind-ai-divide [Accessed 24 December, 2024].

9. Datareportal (2024). Internet Use in 2024. Available: https://datareportal.com/reports/digital-2024-deep-dive-the-state-of-internet-adoption [Accessed 20 December, 2024].

10. GSA (2024). *5G-Standalone November 2024*. https://gsacom.com/paper/5g-standalone-november-2024/ [Accessed 10 January, 2025]

11. Gervasi, K. (2023). *Diving Deep into Submarine Cables*. Available: https://www.kentik.com/blog/diving-deep-into-submarine-cables-undersea-lifelines-of-internet-connectivity/ [Accessed 20 December, 2024].

12. World Bank (2023). *Digital Progress and trends Report*. Available: https://openknowledge.worldbank.org/server/api/core/bitstreams/95fe55e9-f110-4ba8-933f-e65572e05395/content [Accessed 7 December, 2024].

13. Heikkilla, M. & Arnett, S. (2024). *This is Where the Data to Build AI Comes From*. MIT Technology Review. Available: https://www.technologyreview.com/2024/12/18/1108796/this-is-where-the-data-to-build-ai-comes-from/ [Accessed 20 December, 2024].

14. Bartley, K. (2024). *Big Data Statistics, How much Data is there in the World*. Available: Big-data-statistics-how-much-data-is-there-in-the-world [Accessed 7 December, 2024].

15. Michalowski, M. (2024). *How Much Data is Generated Each Day*. Available: How-much-data-is-generated-every-day [Accessed 7 December, 2024].

16. Wong, Y-K. (2024). How Many Data Centers are Being Built and Where Are They Being Built? Available: Data-centers-by-region-size-company [Accessed 7 December, 2024].

17. Scale Computing (2023). Data Sovereignty, Data Residency, and Data Localization: An Introduction. Available: https://www.scalecomputing.com/resources/data-sovereignty-data-residency-and-data-localization [Accessed 7 December, 2024].

18. Michalowski, M. (2024). How Much Data is Generated Everyday in 2024. Available: https://explodingtopics.com/blog/data-generated-per-day [Accessed 10 December, 2024].

19. Wiggers, K. (2024). The promise and perils of synthetic data. TechCrunch. Available: https://techcrunhttps://www.scalecomputing.com/resources/data-sovereignty-data-residency-and-data localizationch.com/2024/10/13/the-promise-and-perils-of-synthetic-data/ [Accessed 20 December, 2024].

20. Shumailov, I., Shumaylov, Z., Zhao, Y. et al. (2024). AI models collapse when trained on recursively generated data. Nature 631, 755–759.https://doi.org/10.1038/s41586-024-07566-y

21. Lynch, Shana (2022). The State of AI in 9 Charts. Stanford HAI. Available: https://hai.stanford.edu/news/state-ai-9-charts [Accessed 24 December, 2024].

22. Boroush et al. (2021). U.S. R&D Increased by $51 Billion in 2020 to $717 Billion; Estimate for 2021 Indicates Further Increase to $792 Billion. NSF - National Science Foundation. Available: https://ncses.nsf.gov/pubs/nsf23320 [Accessed 24 December, 2024].

23. Lane, J. et al. (2024). How to track the economic impact of public investments in AI. Nature. Available: https://www.nature.com/articles/d41586-024-01721-1 [Accessed 24 December, 2024].

24. Marco Polo (n.d.). The Global AI Talent Tracker 2.0. Available: https://macropolo.org/interactive/digital-projects/the-global-ai-talent-tracker/ [Accessed 24 December, 2024].

25. Ibid.

26. Artkai (2023). Discover the Best Countries to Outsource Machine Learning. Available: https://artkai.io/blog/discover-the-best-countries-to-outsource-machine-learning [Accessed 22 December, 2024]; Agbetiloye, A. (2024). 10 African countries with the highest number of AI organisations.Business Insider Africa. Available: https://africa.businessinsider.com/local/markets/10-african-countries-with-the-highest-number-of-ai-organisations/y8tehk3 [Accessed 22 December, 2024].

27. Xu, R. et al. (2024). AI for social science and social science of AI: A survey. Information Processing & Management, 61(3). https://doi.org/10.1016/j.ipm.2024.103665

28. Our World in Data (2024). Literate and illiterate world population. Available: https://ourworldindata.org/grapher/literate-and-illiterate-world-population [Accessed 7 December, 2024].

29. Brooks, B. (2024). Agentic AI is Set to Dominate in 2025: Get Ready for the Revolution. eWeek. Available: https://www.eweek.com/news/agentic-ai-trend-2025/ [Accessed 15 December, 2024].

30. HAI (2024). *Congressional Boot Camp on AI*. Available: https://hai.stanford.edu/congressional-boot-camp-ai [Accessed 23 December, 2024].

31. AI Singapore webpage: https://aisingapore.org/

32. O Donovan, M. M. (2021). *The Progression of Technology Education in Denmark. Expanded Brief*. Available: https://pure.au.dk/ws/portalfiles/portal/219759853/Expanded_Brief_on_Technology_Education_in_Denmark_June_21.pdf [Accessed 22 December, 2024]

33. Finceed (Finnish National Agency for Education). *Exploring Finnish Digital Education*. Available: https://www.oph.fi/en/exploring-finnish-digital-education [Accessed 15 December, 2024].

34. UNESCO (2018). A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2. Available: https://uis.unesco.org/sites/default/files/documents/ip51-global-framework-reference-digital-literacy-skills-2018-en.pdf [Accessed 22 December, 2024].

35. Gerken, T. (2024). Chatbot encouraged teen to kill parents over screen time limit. BBC. Available: https://www.bbc.com/news/articles/cd605e48q1vo [Accessed 20 December, 2024].

36. WIPO (2024). Search Term: FP:(artificial intelligence). Available: https://patentscope.wipo.int/search/en/result.jsf?query=FP%3A%28artificial+intelligence%29&sortBy=-score [Accessed 7 December 2024].

37. WIPO (2024). Generative AI Patent Report. Available: https://www.wipo.int/web-publications/patent-landscape-report-generative-artificial-intelligence genai/assets/62504/Generative%20AI%20-%20PLR%20EN_WEB2.pdf [Accessed 7 December 2024].

38. Ibid.

39. HAI (2024). The AI Index Report - Measuring trends in AI. Available: https://aiindex.stanford.edu/report/ [Accessed 8 December, 2024].

40. Bradford, A. (2023). Digital Empires.The Global battle to Regulate Technology. Oxford University Press.

41. Werner, J. (2024). Peru Proposes Comprehensive AI Regulation. Available: https://babl.ai/peru-proposes-comprehensive-ai-regulation/ [Accessed 20 December, 2024]

42. The Neurorights Foundation (2024). Neurorights in Chile Available: https://neurorightsfoundation.org/chile [Accessed 8 December, 2024].

43. ANIA (2024). The regulation of neurotechnology: the neurorights bill in Mexico. Available: https://www.ania.org.mx/post/the-regulation-of-neurotechnology-the-neurorights-bill-in-mexico [Accessed: 10 December 2024]

44. Oleg Ruban (2023). Nearshoring, Friendshoring and Reshoring: Heads Up to Equity Allocators. MSCI. Available: https://www.msci.com/www/blog-posts/nearshoring-friendshoring-and/04065519030 [Accessed 24 December, 2024]

45. Knight, W. & Bui, T. (2023). *The US wants Vietnam to be its new tech best friend*. Available: https://www.wired.com/story/us-vietnam-new-tech-best-friend/#:~:text=Vietnam%20is%20central%20to%20a%20%E2%80%9Cfriend-shoring%E2%80%9D%20strategy%20the,components%20in%20the%20tech%20supply%20chain%E2%80%94and%20especially%20semiconductors [Accessed 1 December 2024].

46. Estrin, Daniel (2021). Vaccines for Data: Israel's Pfizer Deal Drives Quick Rollout — and Privacy Worries. *NPR.org*. Available: https://www.npr.org/2021/01/31/960819083/vaccines-for-data-israels-pfizer-deal-drives-quick-rollout-and-privacy-worries. [Accessed 24 December, 2024]

47. Clark, Lindsay. (2024). NHS Published Redacted Palantir Contract Just before Xmas. *The Register* Available: https://www.theregister.com/2024/01/02/nhs_england_published_heavily_redacted/. [Accessed 24 December, 2024]

48. Lau, Y. (2024). *China's AI elite rethink their Silicon Valley dream jobs*. Available: https://restofworld.org/2024/china-us-immigration-policy-ai-talent/ [Accessed 23 December 2024].

49. Cable.com. Worldwide broadband pricing league table 2024. Available https://www.cable.co.uk/broadband/pricing/worldwide-comparison/ [Accessed 23 December, 2024].

50. Congressional Research Service (2020). *Semiconductors: U.S. Industry, Global Competition, and Federal Policy*. Available: https://crsreports.congress.gov/product/pdf/R/R46581 [Accessed 8 December]

51. Lynch, S. (2024). *AI Index: State of AI in 13 Charts.* Available: https://hai.stanford.edu/news/ai-index-state-ai-13-charts [Accessed 15 December, 2024].

52. *Ibid.*

53. Green Belt and Road initiative Center (2024). Countries of the BRI. Available https://green-bri.org/countries-of-the-belt-and-road-initiative-bri/ [Accessed 23 December, 2024].

54. Aneja. A. (2023). In the battle for data, China and US fight to control undersea cables. India Narrative. Available: In-the-battle-for-data-china-and-us-fight-to-control-undersea-cables-126945.html [Accessed 15 December, 2024].

55. Gervasi, P. (2023). Diving deep into submarine cables - The undersea lifelines of internet connectivity. Available: https://www.kentik.com/blog/diving-deep-into-submarine-cables-undersea-lifelines-of-internet-connectivity/ [Accessed 24 December, 2024].

56. CRS (2022). The US Dollar as the world's dominant reserve currency. Available: https://crsreports.congress.gov/product/pdf/if/if11707 [Accessed 15 December, 2024].

57. Teare, G. (2023). The Portion Of US VC Funding That Went To Female Founders Hit A New Peak In 2023, Thanks To Massive AI Deals. Crunchbase. Available:https://news.crunchbase.com/diversity/us-vc-funding-female-founders-peaked-2023-ai-openai-anthropic/ [Accessed 15 December, 2024].

58. Borges, C. (2022). The Semiconductor Supply Chain: From Silicon to CPU. The International Affairs Review. Available: https://www.iar-gwu.org/blog/iar-web/the-semiconductor-supply [Accessed 23 December, 2024].

59. Calhoun, G. (2021). Which Companies Add The Most Value In The Semiconductor Industry? (Part 1). *Forbes*. Available: https://www.forbes.com/sites/georgecalhoun/2021/09/30/the-semiconductor-scoreboard-part-1-the-basic-value-chain-and-the-value-added/?sh=75d05332738a [Accessed 23 December, 2024].

60. SIA (2021). Chipmakers Are Ramping Up Production to Address Semiconductor Shortage. Here's Why that Takes Time. Available: https://www.semiconductors.org/chipmakers-are-ramping-up-production-to-address-semiconductor-shortage-heres-why-that-takes-time/ [Accessed 7 December, 2024]; Ji., K. et al (2023). Mapping Global Supply Chains – The Case of Semiconductors. Rabobank. Available: d011371771-mapping-global-supply-chains-the-case-of-semiconductors [Accessed 7 December, 2024].

61. Spanjersberg, M. (2024). Semiconductor Fabs and Raw Materials: Strategies to Manage the Growing Risk of Supply Bottlenecks. Sustainalytics. Available: https://www.sustainalytics.com/esg-research/resource/investors-esg-blog/semiconductor-fabs-and-raw-materials--strategies-to-manage-the-growing-risk-of-supply-bottlenecks [Accessed 11 December, 2024].

62. Conway, E. (2023). Material World: A Substantial Story of our Past and Future. Penguin Random House.

63. Huynh, D. & Hrdouin, J. (2023). PoisonGPT: How We Hid a Lobotomized LLM on Hugging Face to Spread Fake News. Available:https://blog.mithrilsecurity.io/poisongpt-how-we-hid-a-lobotomized-llm-on-hugging-face-to-spread-fake-news/; https://github.com/WormGPT-AI/WormGPT [Accessed 23 December, 2024]; Keary, T. (2023). Worm GPT. Techopedia. Available: https://www.techopedia.com/definition/wormgp [Accessed 23 December, 2024]

64. Calleja, G. et al., (2024). The Charter for AI Ethics. *Salzburg Globa*l. Available: https://salzburgglobal.shorthandstories.com/creating-futures-art-and-ai-for-tomorrows-narratives/index.html#group-section-Charter-for-AI-Ethics-amaswjzIpy [Accessed 23 December, 2024].

65. Samsung (2024). Samsung Semiconductor's Solution to Overcoming Water Stress. Available: https://semiconductor.samsung.com/news-events/tech-blog/samsung-semiconductors-solution-to-overcoming-water-stress/#:~:text=With%20that%2C%20Samsung%20Semiconductor%20plans%20to%20reuse,reuse%20plan%20with%20the%20Ministry%20of%20Environment [Accessed 23 December, 2024].

66. Solomon, S. (2024).Sustainable by design: Next-generation datacenters consume zero water for cooling. Microsoft. Available: https://www.microsoft.com/en-us/microsoft-cloud/blog/2024/12/09/sustainable-by-design-next-generation-datacenters-consume-zero-water-for-cooling/ [Accessed 23 December, 2024].

67. Gorelick, E. & Bloomberg (2024). CrowdStrike outage will cost Fortune 500 companies $5.4 billion in damages. Fortune. Available:*https://fortune.com/2024/08/03/crowdstrike-outage-fortune-500-companies-5-4-billion-damages-uninsured-losses/* [Accessed 23 December, 2024].

68. Flesner, P. (2024).Why startups fail despite acquiring venture financing. Inc. Available: https://www.inc.com/patrick-flesner/why-startups-fail-despite-securing-venture-capital.html [Accessed 15 December, 2024].

69. Main, K. (2021). 65% of VC-backed startups fail because they dont ask these two questions. Inc. Available: https://www.inc.com/kelly-main/65-percent-of-vc-backed-startups-fail-because-they-dont-ask-these-2-questions.html [Accessed 15 December, 2024].

70. Autor, D. et al. (2022). Artificial Intelligence and Jobs: Evidence from Online Vacancies. Journal of Labor Economics, 40 (S1), Copy available for reading: https://economics.mit.edu/sites/default/files/publications/AI%20and%20Jobs%20-%20Evidence%20from%20Online%20Vacancies.pdf

71. O'Neil, D. & Upadhaya, M. (2024). Why APIs are eating the world. *API Context.* Available: https://apicontext.com/why-apis-are-eating-the-world-wide-web/ [Accessed 23 December, 2024].

72. Stephens, M. et al (2023). The Benefits of a Multidisciplinary Lens for Artificial Intelligence Systems Ethics. *IEEE SA*. Available: Ead-benefits-multidisciplinary-lens.pdf

73. Microsoft (2024). Microsoft to provide AI skilling opportunities to 2 million people in India by 2025. Available: https://news.microsoft.com/en-in/microsoft-to-provide-ai-skilling-opportunities-to-2-million-people-in-india-by-2025/ [Accessed 23 December, 2024].

74. EU (2024). Right to repair: Making repair easier and more appealing to consumers.
Available:https://www.europarl.europa.eu/news/en/press-room/20240419IPR20590/right-to-repair-making-repair-easier-and-more-appealing-to-consumers [Accessed 23 December, 2024]

75. CERN (2024). International Relations - The Diplomatic and Stakeholder Relation group. Available: https://international-relations.web.cern.ch/ds-group-structure [Accessed 23 December, 2024].

76. About the Open Quantum Institute (2024). Available: https://open-quantum-institute.cern/ [Accessed 24 December, 2024].

77. EC (2024). European Digital Infrastructure Consortium. Available: https://digital-strategy.ec.europa.eu/en/policies/edic [Accessed 23 December, 2024].

About

The Digital Economist, based out of Washington D.C. is an ecosystem of 40,000+ executives and senior leaders dedicated to creating the future we want to see: where digital technologies serve humanity and life. We work closely with governments and multi-stakeholder organizations to change the game: how we create and measure value. With a clear focus on high-impact projects, we serve as partners of key global players in co-building the future through scientific research, strategic advisory and venture build out. We are industry-agnostic as most high-impact projects touch many different industries. Our portfolio ranges from energy transition to ethics in emerging technology.

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