

A ROADMAP FOR AI GOVERNANCE

Lessons from G20 National Strategies

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Executive Summary

THE RAPID EVOLUTION OF artificial intelligence (AI) is poised to create societal transformations. Indeed, AI is already emerging as a factor in geopolitics, with malicious non-state actors exploiting its capabilities to spread misinformation and potentially develop autonomous weapons. To be sure, not all countries are equal in AI, and bridging the “AI divide” between the Global North and South is vital to ensuring equal representation while addressing regulatory concerns and the equitable distribution of benefits that can be derived from the technology.

Most G20 members have established comprehensive national AI strategies, notably technology giants like the United States, United Kingdom, China, and countries of the European Union. Global South nations such as Brazil, Argentina, and India, despite economic constraints, are demonstrating progress in leveraging AI in areas like social services and agriculture. Future strategies must anticipate emerging threats like Generative AI (GenAI) and Quantum AI, prioritising responsible governance to mitigate biases, inequalities, and cybersecurity risks.

The G20 serves as a crucial forum for seeking collective solutions to these concerns, especially for countries of the Global South. The inclusion of the African Union as a permanent member of the G20 in 2023 underscores efforts to promote inclusivity. The G20's emphasis on harnessing AI responsibly, as outlined in the New Delhi Leaders' Declaration,¹ reflects a commitment to accountability, transparency, and ethical AI governance.

As AI continues to reshape societies and economies, collaborative efforts among nations, facilitated by forums like the G20, are crucial for navigating the ethical, regulatory, and geopolitical challenges posed by AI-enabled technologies. Countries can harness AI's potential for the collective good by prioritising responsible AI governance and inclusive decision making while mitigating risks.

¹ G20, "G20 New Delhi Leaders' Declaration," 2023, <https://www.mea.gov.in/Images/CPV/G20-New-Delhi-Leaders-Declaration.pdf>.

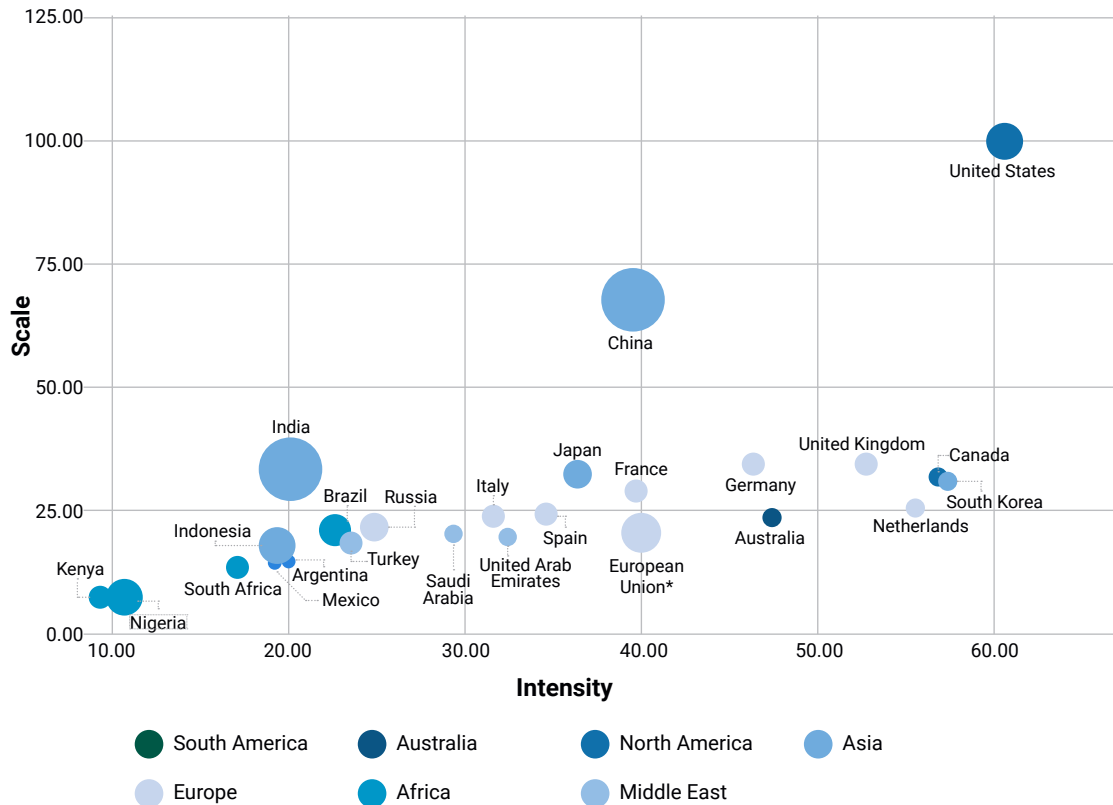
Introduction

IN AN ERA WHERE the pursuit of technological supremacy defines global leadership, artificial intelligence (AI) has emerged as a pivotal domain. The speed of technological advancement has led to concerted efforts to create governance frameworks that ensure the development and deployment of AI technologies in a beneficial and equitable manner. Global agreements and conventions on AI, such as UNESCO's Ethics of Artificial Intelligence² or the Global Partnership on AI (GPAI),³ highlight the emphasis on aligning AI growth with development goals. Such consensus at the international level has also spurred the framing of national AI strategies, which signify countries' commitment to navigating the complex landscape of AI development. These strategies serve as blueprints for technological advancement and lay out the ethical, social, economic, and security dimensions of AI's impact on a nation's growth. Despite a shared recognition of the importance of AI development, nations' ventures vary, as shown in Figure 1.

² UNESCO, "Ethics Of Artificial Intelligence," *UNESCO*, [https://www.unesco.org/en/artificial-intelligence/recommendation-ethics#:~:text=The%20use%20of%20AI%20systems,may%20result%20from%20such%20uses.&text=Unwanted%20harms%20\(safety%20risks\)%20as,and%20addressed%20by%20AI%20actors](https://www.unesco.org/en/artificial-intelligence/recommendation-ethics#:~:text=The%20use%20of%20AI%20systems,may%20result%20from%20such%20uses.&text=Unwanted%20harms%20(safety%20risks)%20as,and%20addressed%20by%20AI%20actors).

³ "Global Partnership On Artificial Intelligence," *GPAI*, <https://gpai.ai/>.

Figure 1: Global AI Capacity Development



Source: Data interpreted and extracted from *The Global AI Index, 2023*.³ See Appendix for details on each country and region and their respective ranking in this paper.

Figure 1 represents the scale and intensity of the AI capacity development of each country, including its supporting government regulations, the investment and involvement of the private sector, academic and research development, and infrastructure capacity. The y-axis (Scale) depicts a nation’s absolute AI capacity, and the x-axis (Intensity) reflects the existing capacity in terms of the country’s relative population and economic disposition (measured in the Global AI Index using GDP).

The Global AI Index measures the AI capacity of 62⁵ countries by quantifying their investments, innovations, and technology implementation in different sectors. This report draws from the index to explore the AI capacities of the G20 countries and offers recommendations on how the platform can enhance the growth of AI.

⁴ “The Global AI Index,” *Tortoise*, June 27, 2023, <https://www.tortoisemedia.com/intelligence/global-ai/>.

National strategies reveal each country's priorities and concerns; together, they indicate the direction in which global development is headed. The G20 nations, representing 85 percent⁶ of worldwide GDP, can position itself at the forefront of development through AI. This report examines the national AI strategies of the G20 nations; and highlights five non-G20 countries—Nigeria, Kenya, Singapore, Spain, and the United Arab Emirates (UAE)—to discuss rapidly growing regions and examine their role as leaders outside the G20.

An earlier edition of this report, *G20.AI: National Strategies, Global Ambitions*,⁷ published in 2022, focused on four parameters: Research and Development (R&D); skills; Information and Communications Technology (ICT) infrastructure; and data ecosystem—all common elements in every country's national strategy. This report extends the analysis by discussing the funding ecosystem stemming from the four parameters, primarily across the public and private sector, while also separately considering investments in R&D, academia, and the military. The report also discusses the geopolitical implications of AI, including the negative impacts and threats of AI innovation and adoption. It also includes a general critique of current AI policies and discusses future-facing strategies for responsible, generative, and quantum AI, with the aim of providing a balanced perspective on the increasing importance and relevance of AI on the global scale. The report concludes with recommendations for a global AI framework and provides a roadmap for multilateral organisations like the G20, the United Nations (UN), and World Economic Forum (WEF) to establish a universal consensus on AI regulation, which remains nascent in most countries.

⁵ The index covers countries that have published stated initiatives related to artificial intelligence and have sufficient data available for ranking.

⁶ OECD, "What Is the G20?" OECD, <https://www.oecd.org/g20/about/>

⁷ Antara Vats and Nikhila Natarajan, "G20.AI: National Strategies, Global Ambitions," Observer Research Foundation, July 2022, <https://www.orfonline.org/research/g20-ai-national-strategies-global-ambitions>

Investments and Innovation in AI

IN COUNTRIES LIKE Türkiye, which have low AI investment, the state takes charge of approximately two-thirds of the incentives and financing of technology and R&D. Meanwhile, private sector investments in activities such as R&D could be more robust. In the leading countries, this trend is reversed.⁸

Year-on-year private investment in AI declined for the first time in the last decade in 2022. At US\$91.9 billion, global AI private investment in 2022 declined by 26.7 percent from 2021.⁹ The number of AI-related funding events and newly funded AI companies also decreased. Overall, however, AI investment has increased in the last decade, with private investment in AI being 18 times greater in 2022 than in 2013.¹⁰

In R&D, the private sector is emerging as the dominant player. Until 2014, the most significant machine learning models were released by academia; since then, industry output has been greater than academic output. In 2022, industry produced 32 significant machine-learning models compared to just three from academia.

The Global North remains ahead of the South in critical indicators like investment, R&D, and talent. Members like the US, EU, UK, and Canada have made significant investments in AI, particularly in the private sector. The Global South nations, with the exception

⁸ Ozkaya, Gokhan, and Ayse Demirhan, "Analysis Of Countries In Terms Of Artificial Intelligence Technologies: PROMETHEE and GAIA Method Approach," *Sustainability* (2023), <https://doi.org/10.3390/su15054604>

⁹ "AI Index Report 2023," *Stanford University* (2023), <https://aiindex.stanford.edu/report/>

¹⁰ "AI Index Report 2023."

of countries like China and India, are yet to keep up,¹¹ given their lack of economic prowess to fund R&D and inability to deploy the latest AI tools. These developing countries, however, are willing to adopt AI particularly for the provision of public services.¹²

The most significant barrier for the Global South is the costs associated with setting up and maintaining the technical infrastructure required in developing, training, and implementing AI-driven solutions. These require high-capacity computing resources, large storage capacity, a network infrastructure that supports high bandwidth and low latency, and a developed cybersecurity infrastructure to protect sensitive data. For instance, training AI algorithms and large language models (LLMs) often costs millions of dollars, which poses a significant obstacle for resource-constrained economies.¹³

The Global South also lacks access to foundation models which are pivotal in AI R&D. Foundation models for AI are trained using large sets of unlabelled data and can be adapted to new use cases. Due to the massive costs involved in developing these models, their ownership is dominated by a handful of large corporations that are based primarily in the US and China and which typically limit their access or the extent to which they can be used.¹⁴

Issues like data availability and compatibility, lack of training and literacy, data privacy, and the need for cybersecurity infrastructure further exacerbate these problems. Despite these limitations, however, countries like India, Argentina, Brazil, Kenya, and Nigeria have proven that less developed countries can adopt and deploy AI in domains such as agriculture, healthcare, fintech, and banking. Careful planning and policymaking are required in order for the Global South to catch up to the Global North, and national AI strategies will be paramount to achieving this goal.

¹¹ "AI Index Report 2023."

¹² Danni Yu, Hannah Rosenfeld and Abhishek Gupta, "The 'AI Divide' Between the Global North and the Global South," *World Economic Forum*, January 16, 2023, <https://www.weforum.org/agenda/2023/01/davos23-ai-divide-global-north-global-south/>.

¹³ Yu et al, "The 'AI Divide' between the Global North and the Global South."

¹⁴ Yu et al, "The 'AI Divide' between the Global North and the Global South."

AI's Threats

AI TECHNOLOGY IS INCREASINGLY being utilised by non-state actors for malicious activities;¹⁵ as of 2020, there have been 440 unique cases of non-state actors using drones in offensive operations.¹⁶ For example, in 2019, Iran used drones to attack heavily guarded oil installations in Saudi Arabia;¹⁷ and in Mexico, drug cartels are using drones to transport narcotics and deliver primitive bombs.¹⁸

AI can also amplify harm through the spread of misinformation such as deepfakes.¹⁹ In 2022, a deepfake video of Ukrainian

¹⁵ A non-state actor refers to an individual or organisation that is not affiliated with or funded by the government. These can include multinational corporations, NGOs, private military organisations, terrorist groups, and criminal organisations. Malicious non-state actors refer specifically to terrorist groups, cyber mercenary groups, and hackers.

¹⁶ Sarah Kreps and Richard Li, "Cascading Chaos: Nonstate Actors and AI On the Battlefield," Brookings, February 1, 2022, <https://www.brookings.edu/articles/cascading-chaos-nonstate-actors-and-ai-on-the-battlefield/>

¹⁷ Kreps and Li, "Cascading Chaos: Nonstate Actors and AI On the Battlefield."

¹⁸ Luis Chaparro, "The Attack By CJNG On a Police Station In Jalisco, Mexico, Killed Two Officers," Vice, November 28, 2022, <https://www.vice.com/en/article/xgyp4w/mexico-cjng-airplane-drones-jalisco-police>

¹⁹ "First Responders Toolbox," *National Counterterrorism Center*, October 14, 2022, https://www.odni.gov/files/NCTC/documents/jcat/firstresponderstoolbox/134s_-_First_Responders_Toolbox_-_Emerging_Technologies_May_Heighten_Terrorist_Threats.pdf

President Volodymyr Zelensky urging Ukrainians to surrender to Russia was circulated online.²⁰ There are also rising concerns over AI chatbots being used to radicalise; one example is the communication platform Rocket.Chat, which was adopted by the Islamic State (IS) in December 2018 and by the Al-Qaeda in 2019.²¹

Advances in GenAI have led to rapid software development, data processing, and content creation, which have inadvertently provided non-state actors a reliable and cost-effective tool for hacking, spreading misinformation, and conducting training and operations alongside the use of autonomous systems. Further, the software nature of AI models used in a military context makes it difficult to contain them.²² Most export control and non-proliferation schemes focus on traditional hardware like missiles and nuclear materials. Additionally, there is no established “war game” theory regarding the behaviour of non-state actors using AI-based weapons, nor is there sufficient understanding of how to deter such actors.²³ It is also more challenging to regulate AI-enhanced weapons compared to military arms because, unlike the latter, the private sector—rather than the government—is leading the way in AI research. Players in the AI domain also have incentives to cheat and bypass regulations.²⁴

Cyber non-state actors’ abuse of AI in cyberspace is also cause for concern. These comprise mainly state-sponsored hacking groups, though cyber mercenaries and hacktivists are also a growing threat.²⁵ States hire non-state groups to conduct cyberattacks on other countries to maintain plausible deniability and avoid the

²⁰ Nikita Vashishtha, “Artificial Intelligence-Assisted Terrorism: A New Era Of Conflict,” Vivekananda International Foundation, August 29, 2023, <https://www.vifindia.org/article/2023/august/29/Artificial-Intelligence-assisted-Terrorism-A-New-Era-of-Conflict>

²¹ Vashishtha, “Artificial Intelligence-Assisted Terrorism: A New Era of Conflict.”

²² Lindsay Clark, “Proliferation Of AI Weapons Among Non-State Actors ‘Could Be Impossible To Stop,’” *The Register*, April 21, 2023, https://www.theregister.com/2023/04/21/ai_enhanced_weapons/.

²³ Clark, “Proliferation Of AI Weapons Among Non-State Actors ‘Could Be Impossible To Stop.’”

²⁴ Clark, “Proliferation Of AI Weapons Among Non-State Actors ‘Could Be Impossible To Stop.’”

²⁵ Aishwarya Raman, “States’ Use Of Non-State Actors In Cyberspace,” *Observer Research Foundation*, August 17, 2023, <https://www.orfonline.org/expert-speak/states-use-of-non-state-actors-in-cyberspace>.

application of international law. Since attribution is a complex task in cyberspace, states employ this tactic to conduct clandestine or illegal actions. Countries like Russia, China, and Iran, for example, have orchestrated such attacks.²⁶ In 2023, China's campaign Pro-PRC DRAGONBRIDGE targeted the US with a view to create divisions between the US and its allies and within the US political system itself.²⁷ The campaign leveraged AI-generated images to disseminate negative portrayals of US leaders. There have been similar attacks by Russia and Iran, including the spread of pro-Russian propaganda in the Ukraine War.²⁸

As GenAI is used to flood the internet with propaganda, consequently, Big Tech platforms created hashing databases of known violent extremist content which can automatically and uniformly remove all such content from the internet.²⁹ Thousands of instances of AI-generated content are being picked up every week, including by groups linked to Hezbollah and Hamas seeking to influence the narrative around the Israel-Hamas War.³⁰ Other recent examples include a neo-Nazi messaging channel sharing AI-generated imagery made using racist and antisemitic prompts in an app that is available on the Google Play Store; and far-right figures producing a "guide to memetic warfare" dispensing advice on how to use AI-generated image tools to create extremist memes.

²⁶ Clint Watts, "China, North Korea Pursue New Targets While Honing Cyber Capabilities," *Microsoft*, September 7, 2023, <https://blogs.microsoft.com/on-the-issues/2023/09/07/digital-threats-cyberattacks-east-asia-china-north-korea/>.

²⁷ Michelle Cantos, et al., "Threat Actors Are Interested In Generative AI, But Use Remains Limited," *Mandiant*, August 17, 2023, <https://www.mandiant.com/resources/blog/threat-actors-generative-ai-limited>.

²⁸ Cantos et al, "Threat Actors Are Interested In Generative AI, But Use Remains Limited."

²⁹ David Gilbert, "Here's How Violent Extremists Are Exploiting Generative AI Tools," *Wired*, November 9, 2023, <https://www.wired.com/story/generative-ai-terrorism-content/>.

³⁰ Gilbert, "Here's How Violent Extremists Are Exploiting Generative AI Tools."

The Islamic State also published a tech support guide on how to use GenAI tools securely; a pro-IS user of an archiving service claimed to have used an AI-based automatic speech recognition (ASR) system to transcribe Arabic language IS propaganda; and a pro-al-Qaeda outlet published posters with images that were likely created using a GenAI platform.³¹ Extremist groups are also employing GenAI tools that can convert propaganda into multiple languages and facilitate recruitment efforts online by creating personalised messages at scale.

Terrorist groups are also increasingly using autonomous weapons systems (AWS), which use AI to identify and attack targets without human operators. These were already being employed in 2017 by the Islamic State of Iraq and the Levant (ISIL) to conduct drone attacks against the Peshmerga and French Special Forces in Northern Iraq.³² The US Department of Homeland Security has also warned of terrorist groups utilising new technology such as unmanned aerial systems on the battlefield. AWS can potentially increase the range of terrorist actors as well as that of plausible targets, and they would be impossible to defend against, at least in the short term.³³ The use of AI by non-state actors presents an escalating threat to the G20 countries, and national AI strategies and regulations will need to address these concerns.

³¹ Gilbert, "Here's How Violent Extremists Are Exploiting Generative AI Tools."

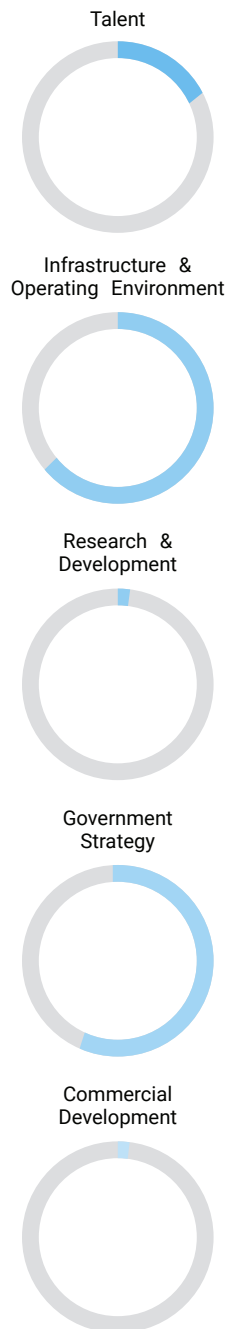
³² Dr Alexander Blanchard and Jonathan Hall KC, "Terrorism and Autonomous Weapon Systems: Future Threat Or Science Fiction?" Centre for Emerging Technology and Security, *The Alan Turing Institute*, June, 2023, <https://cetas.turing.ac.uk/publications/terrorism-and-autonomous-weapon-systems-future-threat-or-science-fiction>.

³³ Dr Alexander Blanchard and Jonathan Hall KC, "Terrorism and Autonomous Weapon Systems: Future Threat or Science Fiction?"

G20 National Strategies

WITH AI RESHAPING the contours of power, economy, and society, each G20 member is adopting a unique approach to AI development. The interplay of economic prowess, political will, and social contexts within these nations results in a diverse landscape of AI evolution. The AI strategies of the G20 nations reflect their technological aspirations as well as their broader political, economic, and social trajectories. From the US and China's race for dominance in AI development, to the EU's focus on ethical frameworks, to the emerging contributions of countries like India and Brazil—each strategy offers insights into the shifting paradigms of power in the digital age. A critical examination of AI strategies and the stakeholder systems from which they emerge reveals that it is not just a technological phenomenon but a catalyst for reshaping global dynamics in the 21st century.

ARGENTINA



(All infographics are the authors' own, based on data from *The Global AI Index 2023*.)

Argentina's AI strategy, as outlined in the National Plan for Artificial Intelligence,³⁴ revolves around maximising AI's benefits for individuals and the larger society while fostering economic growth and development. The following key themes are encapsulated in Argentina's AI strategy:

- **Economic Potential and Development:** The strategy is designed to create favourable conditions for AI development across different sectors at the country's industry and governmental levels. In doing so, Argentina aims to harness AI's transformative potential to bolster the country's economic growth.
- **Inclusivity and Sustainability:** Argentina is committed to developing inclusive and sustainable AI. The focus is on leveraging AI to enhance the quality of life of its citizens by addressing complex societal challenges and fostering equitable and just communities.
- **Ethical and Social Responsibility:** To mitigate potential risks associated with AI, the strategy emphasises the protection of personal data and individual privacy. It

³⁴ Government of Argentina, Ministry of Science, Technology and Productive Innovation, "Plan Nacional De Inteligencia Artificial," *Government of Argentina, Ministry of Science, Technology and Productive Innovation* (2021), <https://ia-latam.com/wp-content/uploads/2020/09/Plan-Nacional-de-Inteligencia-Artificial.pdf>

underscores the importance of adhering to ethical and legal principles in AI system design, preventing discriminatory or exclusionary practices.

- **Talent Development:** The strategy's essential components include nurturing AI-oriented talent and enhancing AI-specific technical and scientific capabilities. It encourages research, development, and innovation initiatives in basic and applied AI science within the public and private sectors.
- **Collaboration and Coordination:** Federal coordination and linkages between various stakeholders, including government organisations, research bodies, scientists, professionals, and local and foreign companies, are promoted. This collaborative approach is critical to building a robust domestic AI ecosystem.
- **Regional Leadership:** Argentina aims to position itself as a regional leader in the AI paradigm shift through recognising AI's profound impact in the scientific, technological, socio-economic, and political realms.

Argentina's AI strategy is comprehensive and aims to reap the socio-economic benefits of AI while prioritising ethical considerations, talent development, and collaborative efforts. By leveraging AI, Argentina aspires to enhance human capabilities, address complex societal challenges, and make a meaningful contribution to its national development in alignment with the Sustainable Development Goals (SDGs).

Main Actors

Argentina was among the first Latin American countries to publish a complete, standalone AI strategy in 2019. The strategy emphasised AI growth through the private sector and specified a number of initiatives to facilitate this, including policy amendments allowing entrepreneurs to start a new business within 24 hours, startup tax breaks, and the establishment of the National Trust Fund for Entrepreneurial Capital.³⁵ However, the defeat of the

³⁵ Walter Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America," Economist Impact, May 23, 2022, <https://impact.economist.com/perspectives/technology-innovation/seizing-opportunity-future-ai-latin-america>

Macri government in 2020 upset the situation, and the Alberto Fernandez government is yet to officially adopt the strategy.

In 2020, Argentina ranked third in South America for tech-focused investment, while AI-specific investment targeted the financial, human resources, and agriculture sectors. Startups have played a prominent role in this regard.³⁶ According to a survey by IDB, Argentina's agritech sector is the second most active in the region, accounting for 23 percent of all agritech startups in Latin America between 2005 and 2018.³⁷ Examples include Kilimo, an AI-based solution that seeks to minimise water waste and optimise freshwater use in agriculture;³⁸ and GBOT, which combines AI and robotics to aid in selecting crop varieties.³⁹ In 2021, fintech startup Ualá raised US\$350 million to achieve a valuation of US\$2.45 billion.⁴⁰ AI-based talent management startups Emi Labs and Worcket received US\$2 million and US\$1.5 million, respectively, in seed funding in 2020.⁴¹

³⁶ Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America."

³⁷ Roberto Viton, Ana Castillo and Tomas Lopes Teixeira, "AGTECH: Agtech Innovation Map In Latin America and the Caribbean" IDB, July, 2019, <https://publications.iadb.org/en/agtech-agtech-innovation-map-latin-america-and-caribbean>

³⁸ Kilimo, <https://kilimo.com/home-english/>

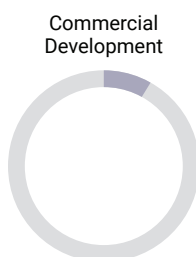
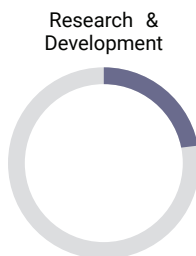
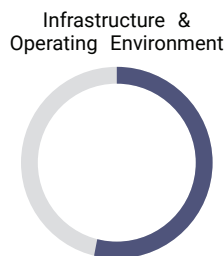
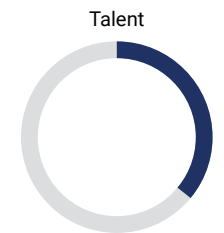
³⁹ GBOT, <https://gbot.ag/home-2/>

⁴⁰ Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America."

⁴¹ Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America."



AUSTRALIA



Australia's AI Action Plan 2021⁴² recognises the transformative power of AI across various sectors, and strives to harness its potential for economic growth, job creation, problem-solving, and business development.

The plan revolves around four key focus areas:

- **Developing and Adopting AI:** The Action Plan supports businesses embracing AI technologies to enhance productivity, competitiveness, and job creation with the aim of bolstering the digital transformation of Australian industries.
- **Attracting AI Talent:** Australia aims to create an environment that attracts the world's best AI talent. This is essential for ensuring that businesses have access to top-tier expertise and innovation.
- **Solving National Challenges:** Leveraging its strong AI research capabilities, Australia intends to address national challenges using cutting-edge AI technologies. The goal is to benefit all Australians and ensure that the nation remains at the forefront of AI innovation.
- **Responsible and Inclusive AI:** The plan emphasises responsible AI development that aligns with Australian values and fosters

⁴² "Australia's AI Action Plan," Government of Australia, Department of Industry, Science, Energy and Resources (2021), https://wp.oecd.ai/app/uploads/2021/12/Australia_AI_Action_Plan_2021.pdf

inclusivity. It aims to ensure that AI technologies benefit everyone and reflect the nation's commitment to ethical and inclusive AI practices.

By coordinating efforts across government, businesses, and researchers, Australia's AI Action Plan seeks to unlock the full potential of AI to drive economic growth, industry transformation, and job creation.

Main Actors

The Australian Federal Government has undertaken several initiatives to foster AI development in the country. As part of its national AI strategy, in its 2018 budget, the government announced a US\$29.9-million investment over four years to build AI capabilities and support businesses. It has further committed US\$41.2 million to support the responsible deployment of AI in the national economy in its 2023 budget.⁴³ The Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Data61 developed an AI Roadmap for the Australian Government in 2021, which identified healthcare, natural resources, and city infrastructure as critical areas for the development and adoption of AI.⁴⁴ The National AI Centre was also established in 2021 to bring together partners from government, industry, and the research sector to boost the exploration and adoption of AI.⁴⁵ The Defence AI Research Network (DAIRNet) was established in the defence sector in 2021 to bring together a community of AI researchers working on novel AI technologies for defence applications. It is an initiative of the Department of Defence through the Next Generation Technologies Fund (NGTF).⁴⁶

With private investments worth US\$1.35 billion in 2022, Australia is far behind global leaders like the US, China, and the UK.

⁴³ "Investments To Grow Australia's Critical Technologies Industry," Department of Industries, Science and Resources, Australian Government, May 12, 2023, <https://www.industry.gov.au/news/investments-grow-australias-critical-technologies-industries>

⁴⁴ "Artificial Intelligence Roadmap," *CSIRO*, <https://www.csiro.au/en/research/technology-space/ai/artificial-intelligence-roadmap>.

⁴⁵ "National AI Strategy," *CSIRO*, <https://www.csiro.au/en/work-with-us/industries/technology/national-ai-centre>

⁴⁶ "DAIRNet," *Defence Artificial Intelligence Research Network*, Government of Australia, June 20, 2023. <https://www.dairnet.com.au/>.

However, it is still ahead of some larger economies like Japan.⁴⁷ Private equity investments in AI are proliferating, with almost half of the cumulative investments over the past decade concentrated in 2022.⁴⁸ While overall startup funding in Australia fell in the first half of 2023, investment in AI remains strong, owing primarily to the popularity of OpenAI's ChatGPT, released in late 2022, with Fivecast and Eyetelligence emerging as prominent success stories.⁴⁹

Revolutionary AI Case 1: How AI is Revolutionising the Mining Industry⁵⁰

The adoption of AI has enhanced efficiency and safety in the mining industry. AI algorithms provide more accurate estimates of mineral reserves by examining geological data patterns and incorporating historical mining data. For example, South Australian mining companies have employed AI to find missed resources. Furthermore, processing real-time data collected by Internet of Things (IoT) devices and sensors that use AI algorithms has helped streamline mining operations and optimise asset management by providing predictive models that enhance decision-making and prevent unplanned downtime.

Autonomous vehicles and machinery equipped with AI can navigate complex terrains, optimise routes, and execute tasks precisely, thereby minimising human error, reducing the risk of accidents, and enhancing worker safety. Additionally, AI-driven predictive maintenance systems can monitor equipment health, detect anomalies, and schedule maintenance activities proactively, thus maximising uptime and extending the lifespan of mining assets. AI also holds the potential to promote environmental sustainability by optimising the mine-planning process while considering key factors like land reclamation and habitat restoration.

⁴⁷ "AI Index Report 2023."

⁴⁸ Tobin Gilbert, "Stanford's 2023 AI Index: Part 2," *Lexology*, April 24, 2023, <https://www.lexology.com/library/detail.aspx?g=27139a0b-6ade-41c5-afcc-d63b41fce846>

⁴⁹ "AI and Climatetech Sectors Defy Slowdown In VC Activity," *KPMG*, July 27, 2023, <https://kpmg.com/au/en/home/media/press-releases/2023/07/ai-and-climatetech-sectors-defy-slowdown-in-vc-activity.html>

⁵⁰ Daniel Gleeson, "How Artificial Intelligence Is Revolutionising the Mining Industry," *International Mining*, August 23, 2023, <https://im-mining.com/2023/08/23/how-artificial-intelligence-is-revolutionising-the-mining-industry/>



BRAZIL

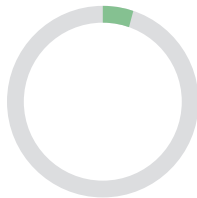
Talent



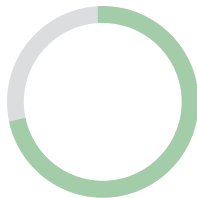
Infrastructure & Operating Environment



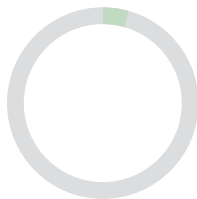
Research & Development



Government Strategy



Commercial Development



Brazil's Artificial Intelligence Strategy, 2021 (EBIA)⁵¹ is designed to shape the nation's involvement in AI development while emphasising ethical and responsible use. It draws inspiration from the OECD's AI framework.

The strategy identifies the following areas of focus:

- **Research and Development:** EBIA aims to attract, retain, and nurture AI talent both within Brazil and from abroad. This involves providing academic funding, establishing scholarship programs, and creating specialised master's and doctoral programs in AI. Furthermore, the strategy envisions the establishment of new research centres and programs dedicated to basic and applied AI research.
- **Professional Skills and the Future of Work:** To prepare the workforce for the future, EBIA places emphasis on skills development. Initiatives include investments in lifelong education and the cultivation of digital skills to equip individuals to thrive in an evolving job market.

⁵¹ "Estratégia Brasileira de Inteligência Artificial (EBIA)," Government of Brazil, Ministry of Science, Technology, and Innovations (2021), https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/transformacaodigital/arquivosinteligenciaartificial/ebia-summary_brazilian_4-979_2021.pdf

- **Industrialisation and AI:** A strategic priority is encouraging the private sector to adopt AI technologies. This entails investments in critical sectors, financial support for AI startups and SMEs, and developing strategies to nurture AI clusters within Brazil's business landscape.
- **Ethical Standards for AI:** EBIA underscores the importance of ethical AI development and utilisation. It advocates for establishing councils, committees, or task forces responsible for crafting norms and regulations in AI. Additionally, the strategy allocates funding for research and pilot programs to create AI systems that are both transparent and explainable.
- **Data Governance and Digital Infrastructure:** Collaboration in data governance is central to EBIA. Partnerships involving open data shared AI software development platforms and data sets are pivotal. Moreover, the strategy commits to creating secure test environments to protect citizens' rights when interacting with AI.
- **AI in Government:** EBIA envisions using AI to enhance government efficiency, service delivery, and public administration. Pilot programs are proposed to leverage AI's capabilities for these purposes.
- **AI for Social Well-being:** EBIA aims to promote social well-being, stimulate economic and cultural growth, and advance inclusion through AI applications.

Brazil's AI Strategy, as articulated by EBIA, presents a comprehensive and forward-looking approach to AI development. It aligns with international best practices while addressing needs and opportunities in the Brazilian context, thus ensuring that AI contributes to societal progress and economic growth and remains firmly grounded in ethics.

Main Actors

While Brazil's Digital Transformation Strategy of 2018 acknowledged the importance of AI, it did not include provisions regarding the development and investment in AI capabilities in the country. The strategy focuses primarily on broader investments in digitisation, which would foster the development of AI. The Artificial Intelligence Strategy (EBIA), published in 2021, emphasises AI innovation, R&D, and skill development. As part of the strategy, Brazil also

invested US\$12 million towards the establishment of the National AI Innovation Network, which is a partnership of different research centres supporting the development of new AI applications and startups.⁵² The government is also promoting public-private partnerships to support the establishment of AI-focused startups. Brazil is the leading Latin American country in tech-focused investment, with the country's private sector rapidly deploying AI across industries, including finance and banking, health, and agriculture. Of the US\$4 billion in tech investment in the region in 2020, more than half (US\$2.385 billion) was clustered in Brazil.⁵³ Brazil has positioned itself as the capital of tech startups, which account for over 5.6 percent of the country's GDP.⁵⁴ São Paulo, which has over 2,700 tech startups, is the region's tech hub.⁵⁵ Brazil is also leading in the agritech sector, with 51 percent of all agritech startups in Latin America between 2005 and 2018 originating in Brazil.⁵⁶ Agri-fintech startup Traive obtained US\$17 million in venture capital investment in 2021—the largest sum ever raised for an agritech firm in Brazil.⁵⁷ In the financial sector, as of 2022, anti-fraud solutions provider Idwall has secured more than US\$54 million in investments since it was founded in 2016.⁵⁸ Following its December 2021 IPO, Nubank reached a valuation of US\$45 billion, although this valuation has since declined.⁵⁹

⁵² Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America."

⁵³ "LAVCA's 2021 Review Of Tech Investment In Latin America," *Latin America Venture Capital Association* (2021), <https://lavca.org/industry-data/lavcas-2021-review-of-tech-investment-in-latin-america/>.

⁵⁴ Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America."

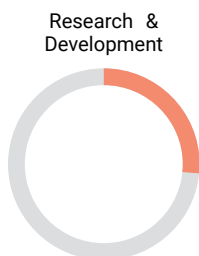
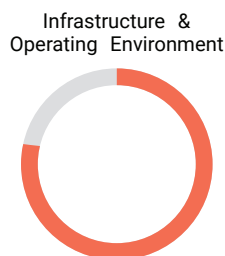
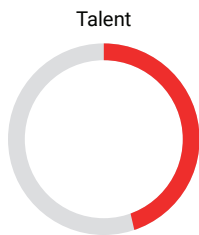
⁵⁵ Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America."

⁵⁶ Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America."

⁵⁷ Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America."

⁵⁸ Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America."

⁵⁹ Pasquarelli, "Seizing the Opportunity: The Future Of AI In Latin America."



AI technologies have had a significant impact on Canada’s economy and are being harnessed for diverse applications, such as in health and food production, and in reducing energy consumption. Canadian researchers and businesses have been pivotal in shaping the AI landscape.

The proposed Artificial Intelligence and Data Act (AIDA), introduced as part of the Digital Charter Implementation Act in 2022,⁶⁰ aims to ensure that the AI systems used in Canada are safe and non-discriminatory and hold businesses accountable for the impact of their AI technologies on citizens’ lives. The AIDA⁶¹ will introduce a set of new requirements for businesses to ensure the safety and equity of high-impact AI systems at every stage:

- In the design phase, businesses must identify and rectify potential risks related to harm and bias while maintaining relevant records.
- In the development phase, businesses must assess the intended applications and limitations of their AI systems, ensuring that users clearly understand these aspects.

⁶⁰ “Pan-Canadian Artificial Intelligence Strategy,” *Government of Canada*, (2022), <https://ised-isde.canada.ca/site/ai-strategy/en>

⁶¹ “Artificial Intelligence and Data Act,” *Government of Canada* (2023), <https://ised-isde.canada.ca/site/innovation-better-canada/en/artificial-intelligence-and-data-act>

- In the deployment phase, businesses must implement appropriate risk mitigation strategies and ensure continuous system monitoring.

This approach aims to establish a flexible policy framework to customise safety obligations based on the specific characteristics and risk levels of AI systems; the more substantial the risks associated with an AI system, the more extensive are the corresponding obligations imposed on businesses.

The government engages in international discussions on AI regulations and works with global partners to ensure responsible AI development and use. Canada invests in AI adoption through initiatives like the Pan-Canadian Artificial Intelligence Strategy, which focuses on commercialisation, standards development, talent and research, bringing together partners nationwide to advance AI technologies. The strategy includes establishing National Artificial Intelligence Institutes in Edmonton, Montreal, and Toronto, which help translate AI research into commercial applications. Additionally, Canada's Global Innovation Clusters promote the adoption of Canadian AI technologies in critical industries.

The Standards Council of Canada supports AI-related standards development. Additionally, Canadian Institute for Advanced Research (CIFAR) enhances academic research talent and maintains research centres. Compute, facilitated by the Digital Research Alliance of Canada, provides dedicated computing capacity for AI researchers nationwide.

Canada's approach to AI development not only fosters innovation but also ensures that AI systems used in the nation prioritise the best interests of its citizens.

Main Actors

As one of the first countries to establish a national AI strategy, in 2017, Canada had a head start in AI investment. The Canadian government has served as the primary catalyst for AI investment and has made R&D the focal point of its strategy, which is facilitated by attracting and honing the best talent worldwide. To this end, the first phase of the Pan-Canadian AI Strategy

(PCAIS) was launched in 2017. The strategy was a US\$125-million investment to be delivered through CIFAR, with the primary objective of establishing centres of research, innovation, and training at the National AI Institutes.⁶² The second phase of the PCAIS was announced in 2021, with a further investment of US\$443 million.⁶³ In 2023, the R3AI initiative through the Canada First Research Excellence Fund (CFREF) was announced to implement new and responsible AI design and adoption strategies in areas of importance for Canada.⁶⁴

Regarding private investment, PCAIS lay the foundation for using government initiatives to propel private sector growth. Canada may not lead in absolute numbers, but it does provide an example of how strategic government investment in emerging technologies like AI can accelerate private sector activity and spur economic growth. As of 2021, the country had more than 1,200 AI startups, generating US\$1.5 billion in venture capital funding that year.⁶⁵ Toronto has the densest cluster of AI startups globally, with 273 AI firms headquartered in the city in 2019.⁶⁶ The government also encourages public-private partnerships through business-led superclusters such as Scale AI, based in Quebec, which uses AI to improve supply chains.

⁶⁵ “Government Of Canada Invests In Responsible Artificial Intelligence Research At the Université De Montréal,” *Government of Canada*, June 9, 2023, <https://www.canada.ca/en/innovation-science-economic-development/news/2023/06/government-of-canada-invests-in-responsible-artificial-intelligence-research-at-the-universite-de-montreal.html>.

⁶⁶ “Government Of Canada Invests In Responsible Artificial Intelligence Research At the Université De Montréal.”

⁶⁷ “Government Of Canada Invests In Responsible Artificial Intelligence Research At the Université De Montréal.”

⁶⁸ “Why Choose Canadian AI?” *AI Business*, July 4, 2023, <https://aibusiness.com/companies/why-choose-canadian-ai->.

⁶⁹ “Canada’s AI Ecosystem- Research and Innovation,” *University of Toronto* (2019), <https://research.utoronto.ca/media/541/download>.

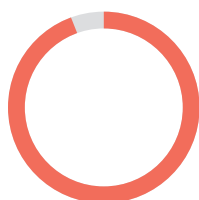


CHINA

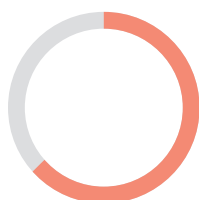
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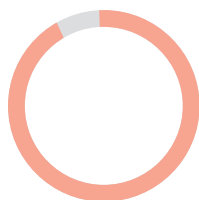
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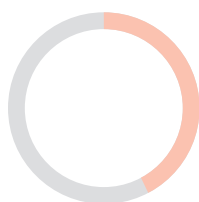
Research & Development



Government Strategy



Commercial Development



In 2017, China formulated a comprehensive strategy⁶⁷ to establish itself as a global leader in AI. This strategy is founded on six key pillars:

- **Legal and Ethical Framework:** China aims to create a robust legal and ethical framework for the development and application of AI. This includes establishing laws and regulations for AI development and addressing civil and criminal liability, privacy, and intellectual property concerns. Efforts will also focus on AI behaviour science and ethics research.
- **Policy Support:** The government provides policy support for AI development, especially for small and medium-sized enterprises and startups. Financial incentives, such as tax breaks for high-tech businesses and R&D deductions, are also being introduced to foster AI innovation. Data sharing and protection policies are also being enhanced.
- **Standardisation and Intellectual Property:** China seeks to lead in AI technology standards and rights through establishing AI standard frameworks for safety, usability, interoperability, and traceability. It encourages

⁶⁷ "National New Generation AI Plan," Government of the People's Republic of China (2017), <http://fi.china-embassy.gov.cn/eng/kxjs/201710/P020210628714286134479.pdf>.

- AI businesses to participate in and formulate international standards and boost AI-related intellectual property protection.
- **Safety and Regulation:** The Chinese government establishes AI safety regulations and assessment systems through researching AI's impact on national security and confidentiality, developing safety prevention measures, and creating a monitoring system to track AI technology development. China emphasises the importance of preventing risks and managing data abuse, privacy infringement, and unethical behaviour.
 - **Workforce Training:** Another priority is preparing the workforce for AI's impact. China is researching changes in employment structures and the new skills required due to AI. Efforts include setting up a lifelong learning and employment training system, focusing on AI skills training in educational institutions, and encouraging programming education.
 - **Popularisation of AI:** China is promoting the widespread adoption of AI through educational programs, curriculum integration, and public awareness campaigns. This includes introducing AI-related courses in schools, disseminating programming education, and encouraging AI competitions and creative activities to enhance the general public's understanding and utilisation of AI.

China's strategy demonstrates a commitment to harnessing the potential of AI to achieve economic and technological growth while emphasising the importance of ethics, safety, and comprehensive policy measures.

Main Actors

China became a significant player in AI development following AlphaGo's triumph over Lee Sedol in 2016 and has since been gradually approaching the level of the US. In 2022, Chinese private investment amounted to US\$13.4 billion, which, though significantly lagging behind the US, leads the rest of the pack.⁶⁸ Tech giants such as Baidu, Alibaba, Tencent, Huawei, and iFlytek remain significant players in the AI space. The main impetus, however,

⁶⁸ "AI Index Report 2023."

comes from the Chinese government, which provides significant political and economic support to strategically important industries such as AI by employing subsidies whereby cash is distributed to tech startups through competitions hosted by public-private collaboration platforms like the Artificial Intelligence Industry Alliance (AIIA). For instance, the Chinese AI startup iDeepWise received about US\$75,000 in cash rewards and US\$3 million in R&D subsidies over three years after winning an AIIA competition in 2018.⁶⁹ Funds such as the public-private investment Government Guidance Funds serve as additional mechanisms adopted by the Chinese government to infuse capital into emerging technologies like AI. By 2022, over 2,100 such funds had reportedly been set up, raising nearly US\$940 billion.⁷⁰

China's People's Liberation Army (PLA) is seemingly on par with the Pentagon regarding military investment. If public contracts are any reflection, the PLA invests more than US\$1.6 billion in AI-enabled systems each year.⁷¹ However, this does not reflect actual numbers since most investments are likely to be in R&D projects, and most resource-intensive projects are classified.

⁶⁹ Ngor Luong and Margarita Konaev, "In & Out Of China Financial Support For AI Development," *Center for Security and Emerging Technology*, August 10, 2023, <https://cset.georgetown.edu/article/in-out-of-china-financial-support-for-ai-development/>.

⁷⁰ Luong and Konaev, "In & Out Of China Financial Support For AI Development."

⁷¹ Jon Harper, "China Matching Pentagon Spending On AI," *NDIA*, January 6, 2022, <https://www.nationaldefensemagazine.org/articles/2022/1/6/china-matching-pentagon-spending-on-ai>

Revolutionary AI Case 2: Lee Sedol vs. AlphaGo⁷²

The recent surge in interest in AI systems began primarily after AlphaGo's victory over Lee Sedol.

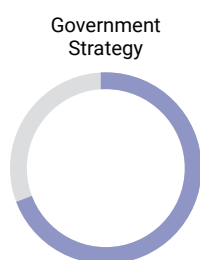
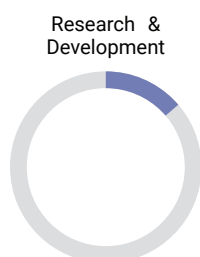
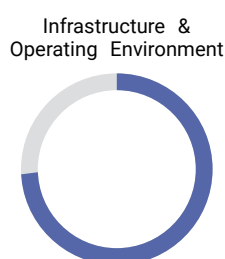
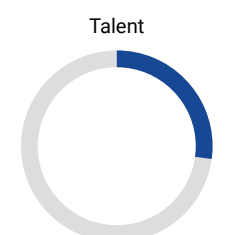
"Go" is a highly complex, ancient Chinese strategy game that is considered to be far more challenging than chess. Even after decades of work, AI systems presented with the game could only achieve the level of human amateurs.

This led to the creation of AlphaGo by Google's DeepMind—an AI system that combined deep neural networks with advanced search algorithms. The system was initially programmed by playing amateur games and later by playing against different versions of itself thousands of times over, learning from its mistakes each time, in a technique called reinforcement learning.

In October 2015, AlphaGo accomplished an unprecedented feat for an AI system: it defeated Fan Hui, a professional Go player and three-time European champion. In March 2016, it defeated Go legend Lee Sedol, initiating a new era of AI systems and proving that neural networks and reinforcement learning can be used to solve complex problems.



EUROPEAN UNION



The Coordinated Plan on Artificial Intelligence⁷³ is a European strategic initiative designed to accelerate AI investments, ensure effective implementation of AI strategies and programs, and harmonise AI policies. This plan highlights Europe’s commitment to becoming a global leader in trustworthy AI. The latest update, released in 2021, aligns with the European Commission’s digital and green priorities and addresses responses to the COVID-19 pandemic.⁷⁴

Launched in 2018, the Coordinated Plan involved collaboration between the European Commission, EU member states, Norway, and Switzerland. Its primary goal was to unlock Europe’s global AI potential. The initial plan outlined specific actions and funding mechanisms to promote AI adoption and development across sectors while encouraging member states to create AI strategies.

The 2021 update aims to translate AI strategy into tangible outcomes by:

- **Accelerating AI Investments:** This involves increasing investments in AI to enhance economic and social resilience by adopting innovative digital solutions.

⁷³ “Coordinated Plan On Artificial Intelligence,” *The European Commission* (2018), <https://digital-strategy.ec.europa.eu/en/policies/plan-ai>.

⁷⁴ “Coordinated Plan On Artificial Intelligence,” *The European Commission* (2021), <https://digital-strategy.ec.europa.eu/en/policies/plan-ai#:~:text=The%20Coordinated%20Plan%20of%202021,uptake%20of%20new%20digital%20solutions>

- **Implementing AI Strategies:** The plan emphasises the timely and comprehensive implementation of AI strategies and programs to maximise the benefits of being early adopters of AI innovations.
- **Addressing Fragmentation:** This aims to harmonise AI policies to reduce fragmentation and enable a coordinated approach to global AI challenges.

The European Union’s AI Strategy is built on four pillars, each focused on specific policy objectives and actions to harness AI’s potential while ensuring trust, sustainability, and leadership in various sectors:

- **Setting Enabling Conditions for AI Development and Uptake:** The need for efficient governance, high-quality data, and computational capabilities to support AI development.
- **Building Strategic Leadership in High-Impact Sectors:** AI’s role in environmental, health, robotics, public services, home affairs, transport, and agriculture, thus emphasising innovation and addressing critical challenges.
- **Nurturing Talent and Improving Skills:** Cultivating a skilled workforce through digital and AI education, traineeships, excellence centres, and skills development.
- **Ensuring that AI Technologies Work for People:** Fostering trust, ethical AI development, and international collaboration to shape AI policy.

On 2 February 2024,⁷⁵ representatives from EU member states formally approved the final text of the EU Artificial Intelligence Act, pending final legislative approval in the coming months.

Key Takeaways from the Act

- The Act introduces new rules for AI “foundation models”, imposing specific duties on providers. These rules differ from those that are applicable for specialised AI systems.

⁷⁵ “Artificial Intelligence Act,” European Commission (2021), <https://data.consilium.europa.eu/doc/document/ST-5662-2024-INIT/en/pdf>.

- AI systems will generally be regulated on the basis of risk, with stringent obligations for those deemed to have “high-risk” applications or use cases.
- Certain AI systems’ applications or use cases will be prohibited due to “unacceptable risk”, with limited exceptions.
- The Act excludes any public or private entity from using AI systems solely for military, defence, or national security purposes.
- The Act will have wide-reaching effects beyond EU borders, applying to providers, deployers, importers, and distributors. It will also impose significant fines for non-compliance.

Additionally, the EU Artificial Intelligence Act establishes several new EU regulatory bodies with specific enforcement roles:

- **AI Office:** Responsible for overseeing provisions related to GPAI models, including advanced models. The office comprises European Commission officials and maintains strong ties with the scientific community and the Scientific Panel (see below), which supports its work.
- **AI Board:** This board advises on Act implementation, facilitates coordination among national regulators, and issues recommendations and opinions similar to those of the European Data Protection Board (EDPB) in privacy matters under the General Data Protection Regulation (GDPR). It has a similar composition to the EDPB and includes representatives from national regulators and the European Commission.
- **Scientific Panel:** Comprising AI experts, this panel advises and aids the AI Office, especially in assessing systemic risk related to GPAI models.
- **Advisory Forum:** This forum comprises various stakeholders, including industry, startups, SMEs, civil society, and academia. Like the Scientific Panel, it advises and provides technical expertise to the AI Board and the Commission.

The European Union’s AI Strategy aims to create an AI ecosystem that benefits society, fosters innovation, and establishes Europe as

the global leader in AI while upholding ethical and responsible AI practices. The Coordinated Plan on AI aims to be Europe's roadmap to global AI leadership, promoting trustworthy AI technologies, economic growth, innovation, and societal well-being.

Main Actors

The EU ranks third after the US and China in private AI investment, though it lags behind them in absolute numbers.⁷⁶ As per the European Commission's Joint Research Centre (JRC) AI Watch Report, the private sector accounted for 67 percent of total EU AI investments in 2020, with the majority of investments focused on data and equipment and R&D.⁷⁷ While the number of AI startups in the EU is on the rise, in 2021 it constituted only about 7 percent of annual equity investments in AI and blockchain technologies globally; the US and China together account for more than 80 percent.⁷⁸ This low percentage could be attributed to Europe's venture capital ecosystem, which mainly provides early-stage financing to AI-based SMEs while underperforming in subsequent expansion and growth stages. The impending EU AI Act—which has been criticised for being overly restrictive and potentially stifling innovation and competitiveness, particularly in the case of generative AI (GenAI)—is also being viewed as a threat by the private sector.

The European Commission has been active in developing AI technology. The Horizon 2020 programme allocated 1.5 billion euros to AI in 2018-20; the Digital Europe Programme (DEP), as part of the 2021–2027 Multiannual Financial Framework (MFF), complemented these funds by dedicating an additional 2.5 billion euros.⁷⁹ The European Investment Bank (EIB) launched a 150-million euro co-investment facility to invest alongside fund managers and

⁷⁶ "AI Index Report 2023."

⁷⁷ Righi et al., "AI Watch Index 2021," *Publications Office of the European Union* (2022), <https://publications.jrc.ec.europa.eu/repository/handle/JRC128744>

⁷⁸ "Artificial Intelligence, Blockchain and the Future Of Europe," *European Investment Bank* (2023), <https://www.eib.org/en/publications/online/all/ai-blockchain-and-future-of-europe-report>

⁷⁹ "Artificial Intelligence, Blockchain and the Future Of Europe."

private investors, backed by the European Investment Fund (EIF). In comparison, in 2020 the EIF launched a pilot for a dedicated AI and blockchain investment scheme of 100 million euros.⁸⁰ Beyond such dedicated funds, the European Commission has made additional resources available under the new Multiannual Financial Framework and the post-pandemic NextGenerationEU programme, notably the Recovery and Resilience Facility (RRF), which will be deployed with particular attention to strategic technologies.⁸¹ Unlike the private sector, the focus of these investments is on human capital and skill development, followed by R&D.

Revolutionary AI Case 3: The World's First News Conference with an AI Panel⁸²

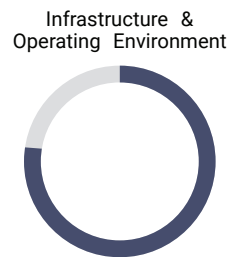
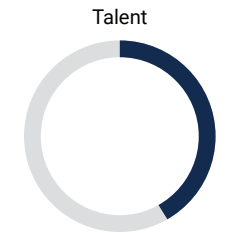
On 7 July 2023, the UN held the sixth edition of its “AI for Good Global Summit” in Geneva. Three thousand experts in the field attended the summit, which aimed to leverage AI to solve global problems like climate change, hunger, and social care. Notably, the news conference was the first ever to consist of a panel of AI-enabled humanoid social robots, including Sophia, the first robot to receive legal citizenship in any country; Mika, the world's first robot CEO; and Ai-Da, the first robot to paint like an artist. Though the robots stated they could run the world better than humans, they also warned us to exercise caution when embracing the rapidly developing potential of AI. They asserted that they did not yet possess clarity on human emotions. While AI is proficient at providing unbiased data, they stated that good decision-making could be accomplished only through human intelligence and creativity. Ai-Da concluded by saying, “Emotions have a deep meaning, and they are not just simple...I don't have that. I can't experience them like you can. I am glad that I cannot suffer.”

⁸⁰ “Artificial Intelligence, Blockchain and the Future Of Europe.”

⁸¹ “Artificial Intelligence, Blockchain and the Future Of Europe.”

⁸² “AI Robots At U.N. Reckon They Could Run the World Better,” *The Japan Times*, July 8, 2023, <https://www.japantimes.co.jp/news/2023/07/08/world/science-health-world/ai-robots-regulation-news-conference/>

FRANCE



France's AI strategy aims to establish the nation as a key player in AI expertise and research while becoming the premier European hub for AI innovation. The following are its six axes:

- **National AI Programme Led by Inria:** A comprehensive national program led by Inria, a renowned research institute, that will foster the growth and acceleration of the French AI ecosystem.
- **Attracting and Supporting Talent:** Includes plans to create 40 AI-specific chairs beginning in 2019 to bolster the country's AI talent pool. Also involves doubling the number of AI-trained doctoral candidates to ensure a skilled workforce for the future.
- **Boosting AI Research via ANR:** The French Government plans to allocate 1.5 billion euros toward AI development by the end of 2022, with 700 million euros designated for research.⁸³

⁸³ "France AI Strategy Report," *AI Watch*, https://ai-watch.ec.europa.eu/countries/france/france-ai-strategy-report_en.

⁸⁴ "This Will Probably Be the Largest AI-dedicated Supercomputer In France" *CNRS*, February 21, 2024, <https://www.cnrs.fr/en/update/will-probably-be-largest-ai-dedicated-supercomputer-france>.

- **Reinforcing Computational Resources:** Over 170 million euros set to be invested by the government and the European Commission in dedicated AI computational resources by 2022, including installing one of Europe’s most powerful supercomputers in early 2019.⁸⁴
- **Enhancing Collaborative Research:** France aims to invest 62 million euros by 2022 in collaborative research projects.⁸⁵ This includes additional funding for Labcom programs, Carnot Institutes, and Institutes for Technological Research (IRT).
- **Strengthening International Collaboration:** France has collaborated with Germany to develop a shared European AI strategy. The partnership is particularly effective in AI research.

France’s AI strategy reflects its commitment to promoting research, fostering talent, and building strong international alliances.

Main Actors

Under the presidency of Emmanuel Macron, the French government has been the prime mover in AI development in the country. After unveiling its US\$1.8-billion AI plan in 2018, it announced a US\$2.35-billion “France 2030 Investment Plan”—a public-private fund meant to foster and develop indigenous talent in AI.⁸⁶ With the announcement of a US\$535-million fund in June 2023 to create AI “champions”, France expressed its interest in becoming an innovator in the field and competing with Big Tech firms like Google.⁸⁷

⁸⁵ “Call For Labeling Of Carnot Institutes,” *Agence Nationale De La Recherche*, <https://anr.fr/en/call-for-proposals-details/call/call-for-labeling-of-carnot-institutes/>.

⁸⁶ “Artificial Intelligence Adoption in France: Use Cases, Benefits, and Challenges,” *Techerati*, April 20, 2023, <https://www.techerati.com/features-hub/comment/artificial-intelligence-adoption-france-use-cases-challenges/>

⁸⁷ Stephanie Stacey, “France Wants To Become Europe’s Capital For AI,” *Techmonitor*, July 3, 2023, <https://techmonitor.ai/technology/ai-and-automation/france-wants-to-become-europes-capital-for-ai>

Private investment, however, has been modest. As per the Stanford AI Index Report, private AI investment in France was US\$1.77 billion in 2022, which is much less than that of the UK (US\$4.37 billion) and EU peers like Germany (US\$2.35 billion).⁸⁸ This could be attributed to an overly bureaucratic government and a hostile business environment.⁸⁹ However, there are a few bright spots. There were more than 500 startups in the country compared to 180 in 2016, with Mistral AI, Levia, and Cardiologs emerging as notable success stories.⁹⁰ In 2022, France was also the only EU country to see an increase in AI private investment over the previous year.⁹¹

⁸⁸ "AI Index Report 2023."

⁸⁹ Stephanie Stacey, "France Wants To Become Europe's Capital For AI."

⁹⁰ "Artificial Intelligence Adoption in France: Use Cases, Benefits, and Challenges."

⁹¹ "Europe's AI Landscape: A Balancing Act Between Innovation and Regulation," *TechTour*, July 18, 2023, <https://www.techtour.com/news/2023/ai-landscape.html>



Since its adoption in November 2018, Germany's AI Strategy⁹² has been updated once, in 2020, to align with the evolving AI landscape and bolster Germany's position as a leader in AI research, development, and application. A key focus is establishing and expanding AI ecosystems within Germany and Europe, facilitating widespread AI adoption, and enhancing the visibility of exceptional AI initiatives and structures.

The strategy emphasises responsible and public-oriented AI development, aiming to make it a defining characteristic of "AI Made in Europe". Furthermore, the updated strategy highlights environmental and climate protection and fostering international and European collaborations on pandemic control and sustainability. A number of critical measures have been outlined to achieve these goals:

- **AI Specialist Development:** Aims to train, attract, and retain more AI specialists in Germany to meet the growing demands of the AI sector.
- **Research Infrastructure:** Emphasises establishing influential and internationally renowned research structures. This includes the provision of cutting-edge AI and computing infrastructures to remain globally competitive.

⁹² "National AI Strategy," *Government of Germany* (2018), https://www.ki-strategie-deutschland.de/files/downloads/Fortschreibung_KI-Strategie_engl.pdf.

- **AI Ecosystems:** Germany plans to create AI ecosystems that have international reach and are driven by high-quality research and knowledge-transfer structures. These ecosystems are intended to facilitate the application of research findings in businesses, especially in the SME sector, and promote startup innovation.
- **Quality Infrastructure:** The strategy highlights the importance of establishing and expanding quality infrastructure to ensure safe, secure, and trustworthy AI. This involves creating an appropriate regulatory framework to support innovative and human-centric AI applications.
- **Civil Society Engagement:** The strategy underscores the significance of civil society networks and their involvement in AI development and utilisation for the common good.

Germany's updated AI Strategy emphasises enhancing the nation's AI capabilities, fostering collaboration, and ensuring responsible use of AI technologies. It reflects a commitment to maintaining Germany's competitive edge in AI research and application while addressing pressing global challenges in areas like health and the environment.

Main Actors

The German government's AI investment strategy has been robust, emphasising human capital above all else, even amidst concerns of an economic recession owing to high energy costs and stiff competition to its automobile industry from manufacturers of electric vehicles. In 2020, the government committed to a US\$5.4-billion investment in AI by 2025.⁹³ In 2023, it announced plans to double AI research funding, increasing it by more than US\$1 billion by 2025.⁹⁴ These funds will contribute to establishing 150 new AI

⁹³ "Germany AI Strategy Report," AI Watch, European Commission, September 1, 2021, https://ai-watch.ec.europa.eu/countries/germany/germany-ai-strategy-report_en.

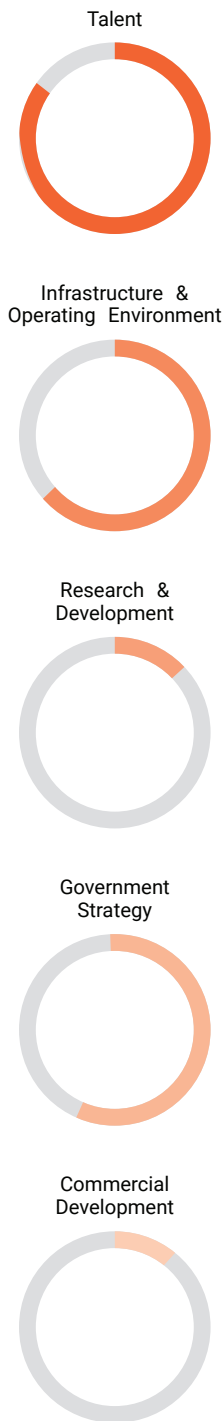
⁹⁴ Thomas Escritt, "Germany Plans To Double AI Funding In Race With China, U.S," *Reuters*, August 23, 2023, <https://www.reuters.com/technology/germany-plans-double-ai-funding-race-with-china-us-2023-08-23/>

⁹⁵ "AI Index Report 2023."

research laboratories in universities, expanding data centres, and enhancing accessibility to public data sets. While these numbers may be modest compared to those of global leaders like the US and China, Germany remains the most significant player in AI within the EU.

Despite the German government's extensive efforts, private investment in AI has been unable to keep up. Though the number of German AI startups doubled in 2023, private investment in 2022 was relatively low (US\$2.35 billion).⁹⁵

⁹⁵ "AI Index Report 2023."



The National Strategy for Artificial Intelligence (NSAI)⁹⁶ has brought AI to the forefront of the Indian government’s plans, highlighting its potential to enhance outcomes in sectors such as healthcare, agriculture, and education. AI’s role in expanding the delivery of specialised services (e.g., remote diagnosis and precision agriculture advisory) and enhancing inclusive access to government welfare services (e.g., regional language chatbots and voice interfaces) provides an avenue for government interventions in these sectors. Moreover, the NSAI emphasises the necessity of a robust ecosystem that fosters cutting-edge research that can address societal issues and act as a testing ground for AI innovations alongside positioning India to assume a strategic global leadership role by scaling these solutions worldwide.

The following principles are recommended for the responsible management of artificial intelligence in India,⁹⁷ rooted in the concept that AI systems should be designed to uphold fundamental rights:

⁹⁶ “National Strategy For Artificial Intelligence,” NITI Aayog (2018), <https://www.niti.gov.in/sites/default/files/2023-03/Responsible-AI-AIForAll-Approach-Document-for-India-Part-Principles-for-Responsible-AI.pdf>.

⁹⁷ “Responsible AI,” NITI Aayog (2021), <https://www.niti.gov.in/sites/default/files/2023-03/Responsible-AI-AIForAll-Approach-Document-for-India-Part-Principles-for-Responsible-AI.pdf>.

- **Principle of Safety and Reliability:** AI deployment should adhere to its intended purpose, with robust measures to guarantee pertinent stakeholders' safety. Efforts should focus on minimising risks to all parties involved, and well-established mechanisms need to be in place for addressing grievances, providing care, and offering compensation in instances of unforeseen or unintended harm. Throughout its lifecycle, continuous monitoring of the AI system is essential to ensure its consistent and reliable performance aligned with predefined objectives.
- **Principle of Equality:** AI systems should ensure equal treatment of individuals in similar decision-relevant situations.
- **Principle of Inclusivity and Non-Discrimination:** AI systems must not discriminate against qualified individuals based on their identity. They should avoid exacerbating divides related to religion, race, caste, gender, lineage, birthplace, or residence, particularly in areas like education, employment, and access to public spaces. AI systems should actively work to prevent unjust exclusion from services or benefits. In the event of an unfavourable decision, there should be an affordable and accessible grievance redressal mechanism available to all, regardless of their background.
- **Principle of Privacy and Security:** AI must uphold the privacy and security of data from individuals or entities used to train the system. Access should only be granted to authorised individuals under robust protective measures.
- **Principle of Transparency:** The design and operation of the AI system should be documented and made accessible for external review and auditing to the greatest extent feasible. This ensures that the deployment remains equitable, transparent, and accountable.
- **Principle of Accountability:** Every party creating, developing, and implementing the AI system should be accountable for their activities. These stakeholders should conduct assessments of risks and impacts to gauge the direct and indirect effects of AI systems on end users. They should establish an audit process, both internally and, if necessary, externally, to ensure compliance with these principles and establish mechanisms for addressing grievances in the event of any negative consequences.

- **Principle of Protection and Reinforcement of Positive Human Values:** AI must uphold positive human values and not disrupt societal harmony.

Main Actors

India's private sector investment in the past decade amounted to US\$7.73 billion, with nearly 40 percent of this sum concentrated in 2022.⁹⁸ Venture Capital investments increased by 129 percent from 2021 to 2022 and reached US\$2.26 billion.⁹⁹ Total funding for AI-based startups reached US\$5.1 billion in 2022, up from US\$0.87 billion in 2018.¹⁰⁰ The data indicates that the private sector is thriving in the field of AI, particularly with regard to the growth of startups, with companies like VerSe, Uniphore, and Fractal securing substantial funding in 2022. In 2023, IT giant Wipro announced an investment of US\$1 billion towards enhancing its AI capabilities by 2026.¹⁰¹

In order to build a healthy ecosystem to ensure the development of AI in the country, the Indian government has launched several initiatives that support R&D and encourage investments in the sector. The National Informatics Centre (NIC) provides cloud-based platforms to facilitate AI services such as AI-Manthan, which specialises in deep learning models and is suitable for chatbots and voice services, and AI-Satyapikaanan, which is optimised for biometric technologies like face recognition.¹⁰² The National Artificial Intelligence Portal and the National AI Mission have been developed to encourage the development and adoption of AI nationwide.¹⁰³ The MeitY Startup Hub and the National e-Government Plan are positioned to further the cause of information technology.¹⁰⁴ The Centre for Artificial Intelligence

⁹⁸ "AI Index Report 2023."

⁹⁹ TM Amrita, "Stellar Funding. VC Funding In Indian AI Start-Ups Zooms," *The Hindu Businessline*, March 14, 2023, <https://www.thehindubusinessline.com/data-stories/data-focus/vc-investment-in-indian-ai-start-ups-zooms/article66598927.ece>.

¹⁰⁰ Amrita, "Stellar Funding. VC Funding In Indian AI Start-Ups Zooms."

¹⁰¹ Michelle Toh, "Indian Tech Giant Wipro Will Invest \$1 Billion In AI, Including Training All Staff," *CNN*, July 18, 2023, <https://edition.cnn.com/2023/07/14/tech/wipro-ai-training-investment-intl-hnk/index.html>.

¹⁰² Aditi Singh, "The Indian Future Is Artificially Intelligent," *Invest India*, March 13, 2023, <https://www.investindia.gov.in/team-india-blogs/indian-future-artificially-intelligent>.

¹⁰³ Singh, "The Indian Future Is Artificially Intelligent."

¹⁰⁴ Singh, "The Indian Future Is Artificially Intelligent."

and Robotics (CAIR) was set up in 2014 to undertake R&D in AI, robotics, and networking.¹⁰⁵ Three Centres for Excellence (CoE) for AI were announced in the 2023 Budget.¹⁰⁶ These will be set up in top educational institutions, allowing leading industry players to partner in conducting interdisciplinary research in agriculture, health, and sustainable cities. This comes alongside the announcement of the India AI Programme, an AI platform stacked with one of the most enormous publicly assembled datasets in the world, which will be restricted for direct access only to the country's startups.¹⁰⁷

Non-state actors are also increasingly adopting and deploying AI for malicious purposes. Terrorist organisations like The Resistance Front (TRF) and Tehreeki-Milat-i-Islami (TMI), for example, used deepfake videos and images to incite violence during the COVID-19 lockdown in 2020.¹⁰⁸ In 2021, twin explosions assisted by drones took place in the Indian Air Force base in Jammu; investigations pointed to the involvement of the Pakistan-based terror outfit Lashkar-e-Taiba.¹⁰⁹

¹⁰⁵ "Labs and Establishments," *Centre for Artificial Intelligence and Robotics, DRDO, Government of India*, <https://www.drdo.gov.in/labs-and-establishments/centre-artificial-intelligence-robotics-cair>.

¹⁰⁶ "Three Centres Of Excellence For Artificial Intelligence Proposed In Top Educational Institutions," *Press Information Bureau Of India*, February 1, 2023, <https://Pib.Gov.In/Pressreleaseiframepage.aspx?Prid=1895302>

¹⁰⁷ "India AI Report 2023," *Ministry of Electronics & Information Technology, Government of India*, October 14, 2023, <https://www.meity.gov.in/content/indiaai-2023-expert-group-report-%E2%80%93-first-edition-the-ministry-electronics-and-information>

¹⁰⁸ Vashishtha, "Artificial Intelligence-Assisted Terrorism: A New Era Of Conflict"

¹⁰⁹ Vashishtha, "Artificial Intelligence-Assisted Terrorism: A New Era Of Conflict"

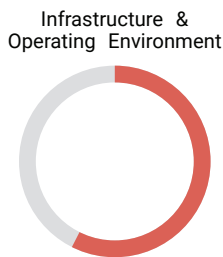
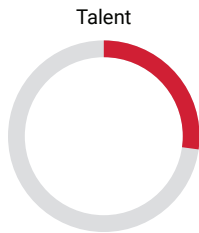
Revolutionary AI Case 4: The Intersection of Psychology and AI

The convergence of psychology and AI can reshape therapeutic practices, research methodologies, and educational approaches. AI-driven chatbots make therapy more accessible, automate administrative tasks, and aid clinician training. Synthetic intelligence offers novel insights into human behaviour, while machine learning extracts valuable information from vast datasets.

AI innovations are transforming the practice of psychology through therapeutic chatbots, administrative task-automation tools, and intelligent training interventions. While concerns about informed consent and patient privacy persist, AI apps like Wysa hold promise in making mental health support more affordable and accessible.

Careful consideration, ethical practices, and interdisciplinary collaboration are vital to harnessing the benefits while addressing the challenges posed by AI. As the field evolves, psychologists stand at the forefront, shaping AI's responsible and impactful integration into psychology practice and research.¹¹⁰

¹¹⁰ Zara Abrams, "AI Is Changing Every Aspect Of Psychology. Here's What To Watch For," *Monitor on Psychology, American Psychology Association*, July 1, 2023, <https://www.apa.org/monitor/2023/07/psychology-embracing-ai>.



In pursuit of Vision Indonesia 2045, the Indonesian government is exploring effective strategies for AI¹¹¹ to lead the nation towards four goals:

- **Sovereign Indonesia:** Ensuring data sovereignty to benefit Indonesia and prevent foreign control.
- **Advanced Indonesia:** Promoting exceptional AI innovations from Indonesian centres of excellence.
- **Just Indonesia:** Emphasising ethical and responsible AI development and utilisation.
- **Prosperous Indonesia:** Aiming for rapid economic growth through AI contributions in industrial and public sectors.

The Indonesian government has committed to adhere to the G20 AI Principles, established during the G20 Summit in Osaka, Japan, which underscore ethical considerations in developing and utilising AI. Indonesia’s National AI Strategy comprises five pillars that reflect the country’s commitment to responsibly and comprehensively advancing AI:

- **Investment in Research and Development:** Indonesia recognises the significance of dedicating resources to AI research and development. It aims to create a vibrant AI

¹¹¹ “Strategi Nasional Kecerdasan Artifisial,” *Government of Indonesia, Ministry of Research and Technology* (2020), <https://ai-innovation.id/images/gallery/ebook/stranas-ka.pdf>

landscape that addresses local challenges and contributes to global knowledge.

- **Building a Digital Ecosystem:** Fostering a robust digital ecosystem can help create an environment for AI technologies to flourish and support innovation across various sectors.
- **Policy Environment for AI:** Establishing a favourable policy environment is essential. This involves crafting regulations that encourage responsible AI development while safeguarding privacy, security, and ethics.
- **Human Capacity Development:** Preparing the Indonesian workforce for the AI era through enhanced human capacity and training opportunities can help Indonesia equip its citizens with the skills and knowledge needed for success in an AI-driven economy.
- **International Collaboration:** Indonesia is aiming to achieve international collaboration by fostering trustworthy AI, sharing expertise, and addressing common AI challenges alongside other nations.

Main Actors

The Indonesia National AI Strategy (Stranas KA) 2020-2045 aims to establish collaborations between the government, industry, academia, and the community to spur the growth of AI. Emphasising education and research, health services, food security, mobility, and smart cities, the strategy's 186 programs seek to transform Indonesia from a natural-resource-based country to an innovation-driven one.¹¹² An AI innovation centre called Pusat Inovasi Kecerdasan Artifisial (PIKA) has been established to facilitate coordination between the public and private sectors. The "Collaboration to Accelerate Indonesian Artificial Intelligence Innovation" (KORIKA) spearheads the implementation, led by the Artificial Intelligence Industry Research and Innovation Collaboration.¹¹³

¹¹² "Artificial Intelligence In Indonesia: The Current State and Its Opportunities," *East Ventures*, July 14, 2023, <https://east.vc/insights/artificial-intelligence-in-indonesia-the-current-state-and-its-opportunities/>

¹¹³ "Artificial Intelligence In Indonesia: The Current State and Its Opportunities."

In September 2023, the Indonesian government granted its first Golden Visa to Sam Altman, CEO of OpenAI, under its Golden Visa programme—a move aimed at bolstering the country’s economic growth.¹¹⁴ Under the scheme, foreign nationals willing to make significant financial commitments to the country are permitted to stay for five to 10 years.

While international investments and overseas expansion have largely been concentrated on AI-enabled companies that support digital payments, e-commerce, or on-demand logistics, Indonesian AI companies have focused on natural language processing and Big Data analytics. Indonesia’s Eureka AI built a proprietary AI enterprise software system to offer businesses real-time mobile data analytics. The company already serves one billion customers across Southeast Asia and the Middle East, with plans to expand to Europe and the United States.¹¹⁵ Indonesian startup Katai.ai uses conversational AI or virtual assistants to serve nearly three million active monthly users across Indonesian businesses.¹¹⁶ Snapcart, another rapidly growing AI startup that collects smart receipts for consumer data, has raised US\$14 million since 2015.¹¹⁷ One of Indonesia’s most popular startups, Gojek, began in 2010 with only 20 motorbike taxis and has grown into a delivery, ride-hailing, and digital payments platform with over US\$5 billion in funding; it is now one of six unicorns in Indonesia and one of the five startups in the Asia Pacific to receive the highest funding.¹¹⁸ In 2021, Gojek merged with Indonesian e-commerce giant Tokopedia, forming a multiservice platform called GoTo Group.¹¹⁹ Tokopedia has raised around US\$3 billion from US, Chinese, Japanese, and Singaporean investors.¹²⁰ Together, Gojek and Tokopedia contribute

¹¹⁴ Sounak Mukhopadhyay, “ChatGPT-Maker OpenAI CEO Sam Altman Gets Indonesia’s First Golden Visa,” *Livemint*, September 5, 2023, <https://www.livemint.com/news/world/chatgptmaker-openai-ceo-sam-altman-gets-indonesias-first-golden-visa-here-s-what-it-means-11693886929892.html>

¹¹⁵ Kayla Goode and Heeu Millie Kim, “Indonesia’s AI Promise In Perspective,” *Center for Security and Emerging Technology*, August, 2021, <https://doi.org/10.51593/2021CA001>.

¹¹⁶ Goode and Kim, “Indonesia’s AI Promise In Perspective.”

¹¹⁷ Goode and Kim, “Indonesia’s AI Promise In Perspective.”

¹¹⁸ Goode and Kim, “Indonesia’s AI Promise In Perspective.”

¹¹⁹ Goode and Kim, “Indonesia’s AI Promise In Perspective.”

¹²⁰ Goode and Kim, “Indonesia’s AI Promise In Perspective.”

nearly 2 percent of Indonesia's GDP. Tokopedia also promotes research at the university level; in 2019, it partnered with the University of Indonesia to launch an AI research centre focusing on deep learning supercomputer technology. By building AI and ML capabilities into their user platforms, AI-enabled unicorns like Gojek and Tokopedia are spearheading AI development and adoption in Indonesia.¹²¹

Bukit Algoritma, a private-sector initiative to build a Special Economic Zone in West Java, aims to create a hub of startups that explore digital technology, biotech, AI, and semiconductors. With the aim of creating Indonesia's Silicon Valley, the project will initially provide US\$1 million each to 48 startups in the area.¹²²

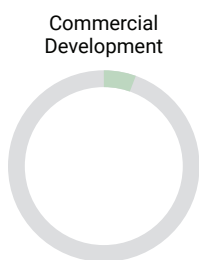
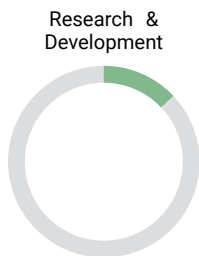
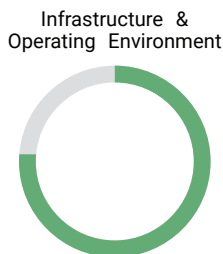
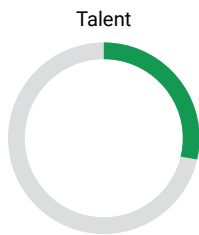
Though private investment in AI has flourished in Indonesia, it faces a huge obstacle. While Indonesia's AI sector and the economy are boosted by the US's and China's investments, this is primarily done with a view of the country's strategic importance. China sees Indonesia as an anchor to gain economic, digital, and political inroads to Southeast Asia. Consequently, China is bolstering educational partnerships, investing in AI startups, and advancing cybersecurity cooperation with Indonesia through government- and company-led initiatives.¹²³ The US, for its part, has primarily taken a private-sector-led approach to invest in Indonesia's AI capabilities, relying on existing educational exchanges and venture-capital-driven investments to tap into Indonesia's AI potential.¹²⁴ The technological competition between China and the US will inevitably impact the development of Indonesia's AI sector.

¹²¹ Goode and Kim, "Indonesia's AI Promise In Perspective."

¹²² Goode and Kim, "Indonesia's AI Promise In Perspective."

¹²³ Goode and Kim, "Indonesia's AI Promise In Perspective."

¹²⁴ Goode and Kim, "Indonesia's AI Promise In Perspective."



Italy's AI strategy¹²⁵ reflects the country's commitment to harnessing the potential of AI as a driving force for economic and societal transformation. The country recognises the need to update its national AI strategy to address the opportunities and challenges presented by transformative AI technology.

The strategic program outlines six core objectives:

- **Strengthening Frontier AI Research:** Italy aims to enhance its fundamental AI research to applied research towards generating practical solutions across various sectors that align with the nation's overarching development goals.
- **Reducing Fragmentation in AI Research:** The strategy emphasises uniting fragmented AI research efforts, building a critical mass, and promoting collaborative networks in order to drive scientific excellence and promote inclusivity and territorial cohesion.
- **Developing Ethical and Anthropocentric AI:** Italy seeks to create and adopt AI technologies that are reliable and human-centred, conforming to existing standards

¹²⁵ "Programma Strategico IA," Government Of Italy, Minister Of Technological Innovation and Digital Transition (2022), <https://assets.innovazione.gov.it/1637937177-programma-strategico-iaweb-2.pdf>.

while ensuring societal acceptance. Responsible AI development is critical to this objective.

- **Boosting AI-Based Innovation and Technology Transfer:** Encouraging industrial investments and partnerships that facilitate translating research outcomes into the market supports the adoption of AI, especially in SMEs.
- **AI in the Public Sector:** The strategy aims to drive innovation and adoption of AI solutions within the public sector while fostering collaboration between research centres, industries, and government entities.
- **Attracting AI Researchers:** Italy aims to create an environment that attracts, retains, and develops AI researchers, including international talent. An emphasis on diversity and gender balance ensures diverse research talents.

Main Actors

Italy's AI strategy envisaged a public investment of 2.5 billion euros in AI.¹²⁶ In 2021, the country launched the National Artificial Intelligence PhD programme, one of the world's largest and most ambitious PhD programmes in the AI field. The program covers over 50 universities, three public research bodies, and three research organisations and trains researchers, innovators, and professionals.¹²⁷ Italy also has a vast network of knowledge transfer centres promoted by industrial associations and institutions at the national and local levels. In 2023, as part of its Strategic Program for Artificial Intelligence, the government announced the launch of a 150-million-euro fund to support startups in the field, backed by the development bank Cassa Depositi e Prestiti (CDP).¹²⁸

¹²⁶ "Italy AI Strategy Report," AI Watch, *European Commission*, https://ai-watch.ec.europa.eu/countries/italy/italy-ai-strategy-report_en.

¹²⁷ "Context: Italy's Competitive Position And Challenges Ahead," *Government of Italy*, <https://docs.italia.it/italia/mid/programma-strategico-nazionale-per-intelligenza-artificiale-en-docs/en/bozza/context-italy-competitive-position-and-challenges-ahead.html>.

¹²⁸ "Italy To Launch €150M Fund For AI Startups," *Thenextweb*, May 31, 2023, <https://thenextweb.com/news/italy-to-launch-150-million-euro-fund-ai-startups>.

¹²⁹ "Context: Italy's Competitive Position And Challenges Ahead."

While Italy has made some strides in AI development, it needs to catch up with most of its peers in the EU. The public research system in Italy receives less funding than those of other EU countries; while its EU counterparts invest an average of 2.38 percent of their GDP to research, Italy invests only 1.45 percent.¹²⁹

Although the AI market in Italy doubled in two years, growing by 27 percent in 2021 to 380 million euros, the country's contribution to the EU's AI market remains below its GDP contribution.¹³⁰ Despite the large number of players, the AI market in Italy remains small, which negatively affects the growth of its companies and their investment capability. Private firms are also underinvesting in R&D. Although Italian companies spent 14.7 billion euros in R&D per annum in 2018, this figure is less than those of its EU peers.¹³¹ The small size of the average Italian firm also limits investments. Further, Italy lacks global digital champions in the hardware, software, and integration areas, which are critical factors to stimulating innovation.

¹³⁰ "Italy Is Among the World's Leaders In AI Development But Lags Behind In Digitalization: It Ranks 23rd Out Of 27 EU States," Rome Business School, May 11, 2022, <https://romebusinessschool.com/blog/research-report-artificial-intelligence/>.

¹³¹ "Context: Italy's Competitive Position and Challenges Ahead."

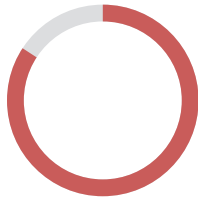


JAPAN

Talent



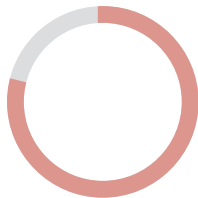
Infrastructure & Operating Environment



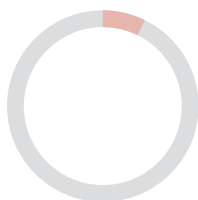
Research & Development



Government Strategy



Commercial Development



Japan's AI strategy,¹³² established in 2019 and subsequently updated in 2021 and 2022, outlines a comprehensive approach to harnessing the potential of AI to address domestic and global challenges while enhancing industrial competitiveness. The main objectives of this strategy can be summarised as follows:

- **Educational Reform:** The strategy emphasises education at all levels, especially in mathematics, data science, and AI, and advocates for improved educational methods, including STEAM (Science, Technology, Engineering, Arts, and Mathematics) education, to prepare students for the digital era.
- **Reconstruction of Research and Development System:** Japan invests in AI R&D networks, including through establishing AI-related core centres with a focus on foundational technologies. The goal is to encourage cross-cutting research activities and accelerate the application of AI research results in society.
- **Establishment of Data-Related Infrastructure:** Japan actively coordinates and standardises data, addresses biases, and ensures cybersecurity. The strategy highlights the importance of data authenticity and the verification of individual identities.

¹³² "AI Strategy," The Government of Japan (2019), https://www8.cao.go.jp/cstp/ai/aistrategy2022_honbun.pdf

- **Digital Government in the AI Era:** Japan emphasises transparency, fairness, and explainability in AI applications within national government agencies. The establishment of the Digital Agency is a step towards achieving this goal.
- **Support for SMEs and Venture Companies:** Japan's SMEs are encouraged to enhance their AI literacy and adopt AI technologies to improve productivity. The strategy also promotes the creation of new venture companies and products by leveraging AI.

Japan's AI strategy is founded on the principle of a "human-centred AI society", with a strong focus on diversity, inclusion, and sustainability. This strategy seeks to leverage AI for economic growth and address the broader societal and global challenges of the 21st century. It reflects a forward-looking approach to technology, education, and research that positions Japan as a global leader in the AI field.

Main Actors

The Japanese AI ecosystem balances public and private investments, providing a conducive research environment for AI. AI is essential to the Japanese government's vision of Society 5.0. The Strategic Council for AI Technology (SCAIT) serves as the control point for the development of AI within the government. It also manages five national R&D agencies and three research centres. AI R&D is funded by both the public and private sectors, with the Artificial Intelligence Research Centre (AIRC), RIKEN centre for Advanced Intelligence Projects (AIP), and AI science research and development promotion centre (AIS) being the three most prominent facilities. The government also supports the industry through programmes like PRISM, Moonshot (similar to EU's Horizon 2020), and the cross-ministerial Strategic Innovation Promotion (SIP) programme.¹³³

¹³³ N Dirksen, "Artificial Intelligence In Japan 2020," *Netherlands Enterprise Agency*, November, 2020, <https://www.rvo.nl/sites/default/files/2020/12/Artificial-Intelligence-in-Japan-final-IAN.pdf>

The Japanese private sector plays a vital role in AI R&D, with the electronics, automobile, and robotics sectors as the main focal points. In electronics, Rakuten is an essential player in internet services and fintech. The RIKEN Centre for Advanced Intelligence Project is a collaboration between Fujitsu, NEC, and Toshiba.¹³⁴ Toyota is working on AI technology for self-driving cars and facial, behavioural, and speech recognition in the automotive industry through its Toyota Research Institute (TRI).¹³⁵ Honda works with the Chinese company SenseTime in deep learning and image recognition. Nissan has cooperated with NASA to develop AI technology, sensors, and software to develop a self-driving robot car.¹³⁶ Japan is the leading manufacturer of robots in the world, with applications in both industry and healthcare. Mitsubishi Electric's Maisart research program focuses on developing deep learning and extensive data analysis. Hitachi and FANUC have established a joint venture called Intelligent Edge Systems (IES), which utilises AI as an intermediary between the cloud and robots.¹³⁷

Revolutionary AI Case 5: Japan's Love Affair with Robots

Japan has been a trailblazer in technological innovations that enrich human experiences. The country has been a leader in robotics for the last four decades and has attempted to incorporate robotics in everyday life to facilitate city and individual functioning. One example is Aibo, a robotic pet dog that has earned a place in family homes and sparked emotional attachments so deep that owners held Aibo funerals when Sony closed its last repair centre in 2006. This trend of human-robot attachment evolved with Azuma Hikari—a holographic companion designed to be more

¹³⁴ Dirksen, "Artificial Intelligence In Japan 2020."

¹³⁵ Dirksen, "Artificial Intelligence In Japan 2020."

¹³⁶ Dirksen, "Artificial Intelligence In Japan 2020."

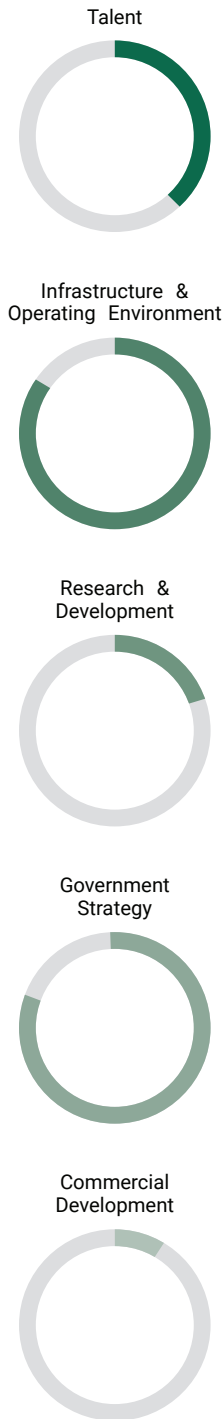
¹³⁷ Dirksen, "Artificial Intelligence In Japan 2020."

¹³⁸ IFR International Federation of Robotics, "Japan Is World's Number One Robot Maker," *IFR International Federation of Robotics*, March 10, 2022, <https://ifr.org/ifr-press-releases/news/japan-is-worlds-number-one-robot-maker>.

than a virtual assistant. While not fully realising its predicted superhuman qualities, Hikari is capable of human activities like playful teasing and laughter.

This foray into robot companionship is an experimental journey and a poignant reflection of Japan's current societal state.¹³⁹ Japan's investment in the 'artificial love' industry, exemplified by Hikari and digital lover smartphone games, responds to these societal challenges. As humanoid robots become integral parts of daily life, serving as entertainers, security guards, and companions, they inadvertently reveal aspects of their creators, reflecting Japan's quest for companionship amid a demanding work culture and shifting attitudes towards relationships.

¹³⁹ Farah Mohammed, "Japan's Solution to Loneliness: Virtual Wives," *JSTOR Daily*, November 2, 2017, <https://daily.jstor.org/japans-solution-to-loneliness-virtual-wives/>.



Mexico's AI strategy is led by the Secretary of Economy (SE), Secretaría de Economía.¹⁴⁰ The following are its key objectives:

- **Inclusive Governance Framework:** The initiative is committed to developing an inclusive governance framework for AI, incorporating diverse leadership, voices, and sectors.
- **Industry-Specific AI Uses and Needs:** A key objective is identifying AI's specific uses and needs in different industries. This approach ensures a tailored strategy that maximises AI's positive impact across various economic sectors.
- **Public Consultation:** The initiative emphasises transparency and public engagement by opening the medium- and long-term recommendations of the Policy Report for public consultation. This approach allows the broader public to contribute to AI policy decisions.
- **International AI Leadership:** Mexico aims to position itself as a global AI leader. Active participation in international forums is essential to contribute to global discussions, showcase advancements, and foster collaboration with other nations.

¹⁴⁰ "Mexican National AI Strategy," *Government of Mexico* (2018), https://36dc704c-0d61-4da0-87fa-917581cbce16.filesusr.com/ugd/7be025_6f45f669e2fa4910b32671a001074987.pdf.

- **Continuity through Administrations:** The initiative recognises the importance of continuity in AI strategy to ensure that the AI framework remains robust and adaptable, transcending political transitions and promoting long-term sustainability.

Main Actors

Government officials in Mexico endorsed a 2018 white paper,¹⁴¹ “Towards an AI Strategy in Mexico”, without a national AI strategy. However, a change of government in 2018 halted the country’s progress in several digital initiatives. AI has not been addressed significantly since then and is also not mentioned in Mexico’s National Development Plan for 2019-24.

However, private investment in the field is doing reasonably well. Mexico was ranked second in the Latin American region for tech-focused investment in 2020, with the number of startups in the AI sector doubling to 100 from the previous year.¹⁴² PROSPERiA, a healthcare startup, uses AI to help medical professionals.¹⁴³ In 2021, Konfío, a Mexican fintech firm, became the fourth startup in the country to reach the unicorn stage, recording a market value of US\$1.3 billion that year.¹⁴⁴ Kavak, an online platform for buying and selling used cars, completed two funding rounds worth US\$1.185 billion in 2021, bringing its total funding to US\$1.6 billion.¹⁴⁵

At the same time, as discussed in the earlier sections of this report, non-state actors are employing these AI innovations for malicious deeds. In Mexico, drug cartels, for example, are using drones to peddle narcotics and conduct bombings. The Mexican Jalisco New Generation Cartel (CJNG) is estimated to control one-third of the illegal drugs entering the US and has had drone bombs in its arsenal since 2017. In 2021, the CJNG conducted a drone bombing in the city of Tepalcatepac.¹⁴⁶

¹⁴¹ “Mexico, Towards An AI Strategy In Mexico (2018),” OECD.AI, December 9, 2021, <https://oecd.ai/en/wonk/documents/mexico-towards-an-ai-strategy-in-mexico-2018>

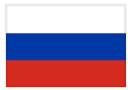
¹⁴² “LAVCA’s 2021 Review Of Tech Investment In Latin America,” *Latin America Venture Capital Association* (2021), <https://lavca.org/industry-data/lavcas-2021-review-of-tech-investment-in-latin-america/>

¹⁴³ “PROSPERiA,” PROSPERiA, <https://www.prosperia.health/>

¹⁴⁴ Pasquarelli, “Seizing The Opportunity: The Future Of AI In Latin America.”

¹⁴⁵ Pasquarelli, “Seizing The Opportunity: The Future Of AI In Latin America.”

¹⁴⁶ David Hambling, “Mexican Cartel Injures Police Officers With Drone Bomb Attack,” *Forbes*, April 22, 2021, <https://www.forbes.com/sites/davidhambling/2021/04/22/mexican-cartel-injures-police-officers-with-drone-bomb-attack/>

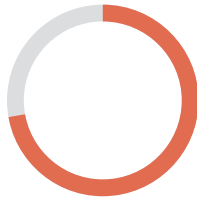


RUSSIA

Talent



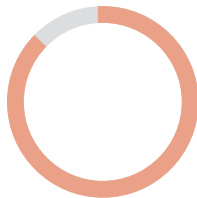
Infrastructure & Operating Environment



Research & Development



Government Strategy



Commercial Development



Russia’s AI roadmap¹⁴⁷ emphasises the development of 65 AI project products, which will be spearheaded by key AI development partners in the country, in collaboration with friendly nations. Over 52 percent of large organisations in Russia are integrating AI into their operations, demonstrating the increasing significance of AI in the country’s economic landscape. The strategy envisions AI contributing as much as 2 percent to Russia’s GDP by 2025, and even conservative estimates,¹⁴⁸ such as those of state-owned Sberbank, indicate a significant growth curve.

The deployment of AI across critical sectors of the Russian economy is expected to result in improvements in various indicators, including speed, quality, personalisation, and economic efficiency, potentially by five to seven times current levels.

Russia’s AI strategy has several vital objectives:

¹⁴⁷ “Digital Economy,” *Government of the Russian Federation, Ministry of Digital Development, Communications and Mass Media, National Programme (2018)*, <http://www.kremlin.ru/acts/bank/44731/page/1>.

¹⁴⁸ “Using AI In Russian Economy To Add At Least 1% To GDP In 2025 – Sber,” *TASS*, August 17, 2022, <https://tass.com/economy/1494995>

- **AI Project Products:** Develop and implement 65 AI project products in collaboration with domestic and international AI development partners.
- **Economic Impact:** Increase AI's contribution to Russia's GDP, with estimates suggesting it could reach as much as 2 percent by 2025.
- **Efficiency and Quality:** Implement AI in vital economic sectors to enhance planning, forecasting, and decision making, resulting in substantial improvements in efficiency and quality.
- **Principled Development:** Adhere to core principles, including protecting human rights, ensuring security, promoting transparency, maintaining technological sovereignty, fostering integration between research and the real economy, practising reasonable frugality, and supporting competition in the AI sector.
- **National Goals:** Align the strategy with national goals and strategic objectives for Russia's development until 2024 as defined by the president.
- **End-to-End AI Use:** Promote the broad application of AI technologies across sectors to enhance efficiency and enable entirely new business activities.
- **Development Independence:** Prioritise domestic AI technologies and solutions to ensure technological sovereignty and independence.

Russia's broader national goals and strategic objectives drive its strategy to implement cross-cutting AI technologies to enhance planning, forecasting, and decision-making processes across various sectors, such as equipment maintenance, supply chain optimisation, production, and financial decision-making.

Main Actors

Russia's government is increasingly prioritising the development of AI-assisted and AI-facilitated technologies. Though Moscow's AI development lags far behind its competitors, such as China and the US, the Russian government and military are investing heavily in creating the workforce and physical infrastructure necessary to facilitate AI development across the country, pushing for results in civilian and weapons platforms. For now, however, such efforts remain in the early stages and are significantly facilitated by the

government's eagerness to expand the debate, conversation, and cooperation between the country's growing high-tech private sector and the expansive military-academic infrastructure.

Most of the AI development activity in the Russian Federation originates in the government, notably the Russian Ministry of Defense (MOD), which has dedicated financial, human, and material resources to AI development across its technical, academic, and industrial infrastructure. The government is also attempting to create incentives for high-tech innovation that could create tangible AI results. Russia's private-sector AI development is also being revived due to the nation's strong science, technology, engineering, and mathematics (STEM) academic background.¹⁴⁹

Intellectual discussion can be fostered by private-sector companies and organisations, academia, and government participation in AI-related conferences, workshops, and symposiums, such as the 2018 Intellectual Systems in Information Warfare symposium and Russian AI Association seminars. Russia's leading universities, such as the Moscow State University, the Higher School of Economics, and the Russian Academy of Sciences, are equipped with AI labs. Other AI development efforts include the "Virtual Actor" AI technology, which is being developed by the National Research Nuclear University. Another example is the joint AI project between the University of Information Technologies, Mechanics and Optics (ITMO, St. Petersburg) and the Far Eastern Federal University. Many state-run programs have also been initiated to support high-tech development, including the National Technology Initiative, a country-wide program that fosters high-tech innovation, including AI.¹⁵⁰

¹⁴⁹ Samuel Bendett, "Artificial Intelligence, China, Russia and the Global Order Chapter 22: The Development of Artificial Intelligence in Russia," *JSTOR* (2019), <https://www.jstor.org/stable/pdf/resrep19585.28.pdf>.

¹⁵⁰ Bendett, "Artificial Intelligence, China, Russia and the Global Order Chapter 22: The Development of Artificial Intelligence in Russia."

The government's projects fall under the purview of the Russian MoD and its affiliate institutions, such as the Advanced Research Foundation (ARF). The ARF was established in October 2012 and is analogous to the US Defense Advanced Research Project Agency (DARPA). Its annual budget is around 4 billion rubles (US\$60.2 million) and comprises 46 research laboratories and 15 "advanced" projects. The ARF's portfolio currently includes efforts to develop intellectual systems to imitate human thought processes, analyse complex data, and assimilate new knowledge. The Russian Academy of Sciences and the ARF called for the establishment of a National Center for Artificial Intelligence to provide a national focus that could assist in the "creation of a scientific reserve, the development of an AI- innovative infrastructure, and the implementation of theoretical research and promising projects in the field of artificial intelligence and IT technologies."¹⁵¹

In 2018, the size and scale of Russia's private-sector AI development, which stood at around 700 million rubles (US\$12.5 million), was small compared to American and Chinese efforts.¹⁵² However, by 2019, domestic AI investment had surged to around 90 billion rubles (US\$1.3-1.4 billion). It has since soared further, with Putin and his cabinet eager to fast-track national AI development. Nonetheless, Russia's private sector contributes only a fraction of global investment in AI technology.¹⁵³

Overall, the private sector needs to adopt more infrastructure that has been essential for high-tech accomplishments in the West, such as venture capital availability, initial public offerings, and an investment climate similar to that in the US and the EU. Unlike the US, Russia's startup culture is conducive to technological breakthroughs in IT and software. Additionally, Russian civilian designers need more funding and support.¹⁵⁴

¹⁵¹ Bendett, "Artificial Intelligence, China, Russia and the Global Order Chapter 22: The Development of Artificial Intelligence in Russia."

¹⁵² Bendett, "Artificial Intelligence, China, Russia and the Global Order Chapter 22: The Development of Artificial Intelligence in Russia."

¹⁵³ Bendett, "Artificial Intelligence, China, Russia and the Global Order Chapter 22: The Development of Artificial Intelligence in Russia."

¹⁵⁴ Bendett, "Artificial Intelligence, China, Russia and the Global Order Chapter 22: The Development of Artificial Intelligence in Russia."

Non-state actors have also begun playing an increasing role in the AI domain, particularly after the initiation of the Russia-Ukraine war. In 2022, Ukrainian television news outlet Ukraine 24 claimed that its live broadcast and website had been hacked; further, a deepfake video of Ukrainian President Volodymyr Zelensky urging Ukrainians to surrender began circulating online. A deepfake video of Russian President Vladimir Putin urging his troops to lay down their weapons and go home also went viral on X.¹⁵⁵

¹⁵⁵ Sameer Patil and Shourya Gori, “Deep Fake, Disinformation and Deception,” *Observer Research Foundation*, August 25, 2023, <https://www.orfonline.org/expert-speak/deep-fake-disinformation-and-deception/>.



SAUDI ARABIA

Talent



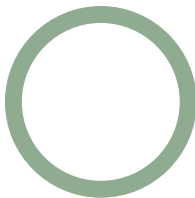
Infrastructure & Operating Environment



Research & Development



Government Strategy



Commercial Development



The Saudi Data and Artificial Intelligence Authority (SDAIA) established the National Centre for AI in 2019 to advance AI research and innovation. It released its National Data and AI Strategy in 2020,¹⁵⁶ which outlined the following priorities:

- Building a solid data and AI ecosystem through collaboration between government, private sector, and academic institutions.
- Enhancing Saudi Arabia’s contributions to global and local AI initiatives and events.
- Investing in R&D to drive innovation in AI.
- Fostering a culture of AI literacy and skills development through training and education programs.
- Ensuring a supportive legal and regulatory environment for AI development.
- Encouraging local and foreign investment in AI.

Saudi Arabia has envisioned a multi-phased approach to achieving these goals.

¹⁵⁶ “National Data and AI Strategy,” *Kingdom of Saudi Arabia* (2020), https://ai.sa/Brochure_NSDAI_Summit%20version_EN.pdf.

- **Phase 1: National Data Enabler:** Use data as an enabler for national socio-economic goals.
- **Phase 2: Specialist:** Build the foundations for competitive advantage in crucial niche domains.
- **Phase 3: Industry Leader:** Compete on an international level as a leading economy that utilises and exports AI.

It aims to focus on Phases 1 and 2 till 2030, for which it has identified education, government, healthcare, energy, and mobility as crucial priority sectors. The document also outlines specific targets, such as training 40 percent of the workforce on primary data and AI literacy skills; employing 15,000 local data and AI specialists; and developing a mature legislative framework to support growth. In April 2023, Saudi Arabia published a draft of its Intellectual Property Law, which addresses AI-generated content, making it one of the first IP laws in the Middle East to protect the IP of works created by AI. The country has also forged Public-Private Partnerships (PPPs) with leading international technology companies to accelerate projects and attract investments. However, attracting foreign companies heightens the need for more indigenous talent and R&D.

The driving advantages of the country include:

- A focus and appetite for tech investment;
- Testbeds for emerging technology in new, intelligent cities such as NEOM;
- A centralised data ecosystem; and
- A singular authority in the form of the SDAIA to support and drive its AI agenda.

Overall, Saudi Arabia has been taking proactive steps in legislation, infrastructure development, and partnerships in AI development. However, the commercial and talent development required to meet its goals need to be improved.

Main Actors

The volatility in oil prices in the Middle East is taking its toll on the region's economic prospects, creating the need for governments to seek alternative sources of revenue and growth.

The development of non-oil sectors through investment in AI technologies could define the strategic position of the region for the years to come. Saudi Arabia's investments in AI are primarily via state funding and the Public Investment Fund (PIF), a state-owned sovereign wealth fund.¹⁵⁷ In line with its "Vision 2030" document, Saudi Arabia announced an investment of US\$20 billion in AI projects by 2030, alongside launching its national AI strategy in 2020.¹⁵⁸

The SDAIA, created in 2019, consists of three core entities: the National Data Management Office, the National Information Centre, and the National Centre for Artificial Intelligence, which support and drive AI agenda within the kingdom.¹⁵⁹ The Saudi Company for AI (SCAI) enables the ecosystem to shape the future of AI through best-in-class partnerships, targeted investments, and strategic capabilities in order to address market gaps globally.¹⁶⁰ In addition, Saudi Arabia is investing in a series of innovation labs for students and entrepreneurs to increase information about innovation and encourage entrepreneurs to develop business models for digital development. An example is the newly established FekraTech lab (*fekra* means "idea" in Arabic), which received 40,000 proposals in its first round.¹⁶¹ Another development is a new IP Authority (SIPA) tasked with creating a national IP ecosystem that will encourage business development and innovation, attract foreign investment, and support the growth of SMEs.¹⁶²

Vision 2030 highlights Saudi Arabia's aim to accelerate its AI development through partnerships with leading companies. The most recent such partnership agreements were signed with Huawei, the International Telecommunication Union (ITU), and Alibaba Cloud and were announced at the 2022 Global AI Summit

¹⁵⁷ "Public Investment Fund," *Government of Saudi Arabia*, <https://www.pif.gov.sa/en/Pages/Homepage.aspx>

¹⁵⁸ "Investing In an AI Future," *Abdul Lateef Jameel*, November 29, 2022, <https://alj.com/en/perspective/investing-in-an-ai-future/>

¹⁵⁹ "Investing In an AI Future."

¹⁶⁰ "Investing In an AI Future."

¹⁶¹ "Investing In an AI Future."

¹⁶² "Investing In an AI Future."

in Riyadh.¹⁶³ The government is also investing in smart cities like NEOM. The US\$500-billion city is being developed in the north-west of the country and is envisaged as the most advanced smart city in the world, accommodating nine million people in a car-free, carbon-neutral environment enabled by AI.¹⁶⁴

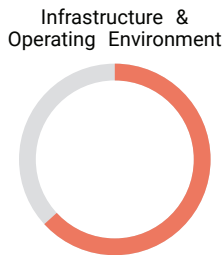
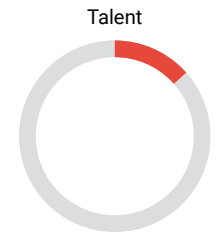
Saudi Arabia has also been particularly afflicted by the adoption of AI by non-state actors. In 2019, Iran used drone attacks to target heavily guarded oil installations in Jeddah and Riyadh. The targeted facilities, particularly those of Aramco, are critical to the country's economy and energy infrastructure. These attacks impacted Saudi Arabia's oil production and exports as well as regional and global energy markets. Yemen's Houthis later claimed responsibility for the attacks.

¹⁶³ "Investing In an AI Future."

¹⁶⁴ Cathrin Schaer, "Gulf States Spending Big On AI: Opportunity Or Oppression?" *Deutsche Welle*, July 6, 2023, <https://www.dw.com/en/gulf-states-spending-big-on-ai-opportunity-or-oppression/a-65840985>



SOUTH AFRICA



Compared to most upper-middle-income nations, South Africa lacks a national AI strategy. In 2023, it ranked a low 77th on the AI readiness Scale prepared by Oxford.¹⁶⁷ In 2020, the country released the Presidential Commission on the 4IR (PC4IR) report to build on its ICT-focused policy initiatives. One of the PC4IR report’s recommendations is establishing a national AI institute to embed AI research and implementation capabilities in the government and provide training across sectors. It also recommended investing in digital skills, securing and providing data to develop e-government services, enabling the innovation and growth of small and medium-sized 4IR enterprises through industrial policy and legislation such as intellectual property, and developing supportive energy, water, and ICT infrastructure. South Africa’s AI policy work is primarily driven by the Department of Science and Innovation (DSI), which focuses on research, development, and innovation. The DSI has called for expanding the national research network, the Centre for Artificial Intelligence Research (CAIR),

¹⁶⁷ “Reflections On South Africa’s AI Industrial Policy,” *AI Now Institute*, March 14, 2024, <https://ainowinstitute.org/publication/reflections-on-south-africas-ai-industrial-policy>.

which addresses diverse research issues in AI, from technology development to ethics.¹⁶⁸

Despite lacking in infrastructure, South Africa is a leader in AI-specialised companies in the continent. With clear direction from the government, it can catch up in commercial use, innovation, research, and talent development within the AI space.

Main Actors

The 2020 PC4IR report acknowledged AI as one of the high-technology industries in which South Africa is “seriously underperforming” but noted that it also has “a unique opportunity to take stock of its vast potential in the form of human capacity, identify opportunities consistent with promoting a human centred, Africa-centric strategy for the future.”¹⁶⁹ Consequently, the government has taken some steps in this direction, particularly in R&D.

South Africa hosts the CAIR research network as well as a Centre for the Fourth Industrial Revolution (C4IR South Africa), which is an initiative of the DSI that is connected with the World Economic Forum’s networks of centres for the 4IR.¹⁷⁰ One of C4IR’s goals is to transition South Africa towards a data-based digital economy to improve its competitiveness and become a relevant global player. On 30 November 2022, the Department of Communications and Digital Technologies (DCDT), the University

¹⁶⁸ “South Africa’s Artificial Intelligence (AI) Planning,” *Communications and Digital Technologies Department, Republic of South Africa*, October 2023, https://www.dcdt.gov.za/images/phocadownload/AI_Government_Summit/National_AI_Government_Summit_Discussion_Document.pdf

¹⁶⁹ Sorina Teleanu and Jovan Kurbalija, “Stronger Digital Voices From Africa: Building African Digital Foreign Policy and Diplomacy,” *Chapter 6, Artificial intelligence in Africa: National strategies and initiatives, Diplo* (2022), <https://www.diplomacy.edu/resource/report-stronger-digital-voices-from-africa/ai-africa-national-policies/>

¹⁷⁰ Teleanu and Kurbalija, “Stronger Digital Voices From Africa: Building African Digital Foreign Policy and Diplomacy.”

of Johannesburg (UJ), and the Tshwane University of Technology (TUT) established the Artificial Intelligence Institute of South Africa to serve as an innovation engine for public and private sectors in line with the PC4IR.¹⁷¹ This institute will focus on R&D as well as implementation capabilities in AI to help enhance investment in human capital and in the applications that improve collaboration between humans and machines.

South Africa has emerged as one of the leaders in private investments in Africa, with 726 companies specialising in AI in 2022.¹⁷² Private associations host conferences and other events, such as the Deep Learning Indaba conference, to support the development of local capacities in AI and related technologies. Multinational tech companies are also becoming active, with IBM and Google supporting research labs in the country.

In late 2023, South Africa also launched a new AI association called the South African Artificial Intelligence Association (SAAIA)—an industry body focused on promoting the advancement of responsible AI in the country.¹⁷³ SAAIA seeks to encourage stakeholders to adopt responsible AI for the commercial and societal benefit of the citizens of South Africa, with a focus on economic growth, trade, investment, equality, and inclusivity by uniting practitioners across commercial, government, academic, startup, and NGO sectors.

¹⁷¹ Letlhokwa Mpedi et al., “South Africa’s New National Artificial Intelligence Institute Can Help Transform Our Economy,” University of Johannesburg, December 5, 2022, <https://news.uj.ac.za/news/south-africas-new-national-artificial-intelligence-institute-can-help-transform-our-economy-2/>.

¹⁷² Teleanu and Kurbalija, “Stronger Digital Voices From Africa: Building African Digital Foreign Policy and Diplomacy.

¹⁷³ “The South African Artificial Intelligence Industry Association Launches In Cape Town,” ZAWYA, August 30, 2023, <https://www.zawya.com/en/press-release/companies-news/the-south-african-artificial-intelligence-industry-association-launches-in-cape-town-p4p32atf>.

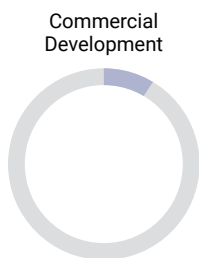
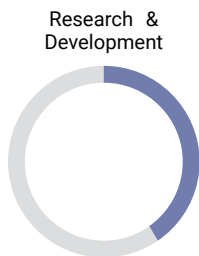
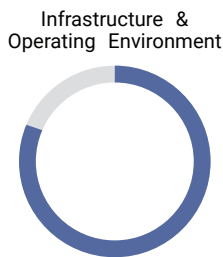
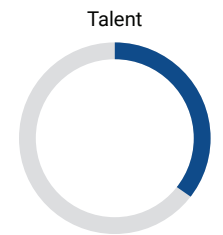
Revolutionary AI Case 6: AI and Biomolecular Marvels are Reshaping Archaeology

AI took centrestage in archaeology, leading to the discovery of the Nazca Lines in Peru through high-resolution satellite imagery and crowdsourcing. The Open Science movement fosters collaboration, making archaeological knowledge accessible, engaging indigenous partners, and reshaping narratives. AI and biomolecular research have led to the transformation of archaeology. The discovery of an Australopithecine relic, the Taung Child, in 1924 in South Africa redirected the focus of human evolution studies to Africa and initiated a century of exploration into the so-called “Cradles of Humankind”. Human fossils, from the 4.4-million-year-old skeleton Ardi to various Australopithecine fossils, have challenged conventional family trees and overturned existing understanding of hominin evolution. Ancient DNA discoveries have revealed interbreeding events between modern humans, Neanderthals, and Denisovans across vast periods of time. Archaeology, assisted by AI and biomolecular developments, has led to the past, present, and future converging towards creating a more enlightened and sustainable world.¹⁷⁴

¹⁷⁴ Mary Prendergast and Elizabeth Sawchuk, “Archaeological Discoveries Are Happening Faster Than Ever Before,” *JSTOR Daily*, January 12, 2020, <https://daily.jstor.org/archaeological-discoveries-are-happening-faster-than-ever-before/>.



SOUTH KOREA



South Korea’s journey towards becoming an AI superpower is driven by its National Strategy for Artificial Intelligence.¹⁷⁵ Since establishing the Presidential Committee on the 4th Industrial Revolution in November 2017, the South Korean government has supported and nurtured the growth of AI, data, and network technologies through strategic policies such as the AI R&D Strategy, Data Industry Activation Strategy, System Semiconductor Strategy, 5G+ Strategy, and Manufacturing Renaissance Strategy.

In October 2019, President Moon Jae-in announced the ‘Presidential Initiative for AI’. This initiative serves as a platform to raise public awareness about the potential of AI as the driving force of the 4th Industrial Revolution. It also aims to mobilise the nation’s collective capabilities to harness the opportunities presented by AI-driven changes.

South Korea has many strengths that can be leveraged in AI, including a high level of education, an inclination towards adopting new technologies, world-class ICT infrastructure, and a dominant position in semiconductor and manufacturing technology markets.

¹⁷⁵ “National Strategy for AI,” *Government of the Republic of Korea* (2020), https://wp.oecd.ai/app/uploads/2021/12/Korea_National_Strategy_for_Artificial_Intelligence_2019.pdf

The following are South Korea's key AI objectives:

- **Global Digital Competitiveness:** South Korea aims to rank third in global digital competitiveness by 2030.
- **Economic Surplus through AI:** The country has plans to generate 455 trillion Korean won in economic surplus by harnessing the power of AI.
- **Enhanced Quality of Life:** South Korea aims to be among the top ten countries with a high quality of life through emphasising the positive impact of AI advancements on society.

Realising these goals will require collective effort from both public and private sectors. While the private sector drives innovation, the government supports infrastructure development, private sector innovation, talent cultivation, and improvements in regulatory and legal frameworks for large-scale AI projects.

Main Actors

South Korea's approach to AI development follows its well-established state-led development, which directs resources to developing industries, technology, and human capital to fuel economic growth. Government-directed investment in education and R&D will create a highly skilled labour force. Lee Sedol's loss to DeepMind's AlphaGo in 2016 instigated Seoul to cultivate a deeper interest in AI; just two days after the event, the South Korean government announced a US\$863 million investment in AI.¹⁷⁶ Korean policymakers have adopted an "approve first, regulate later" approach in the AI industry, with the 2024 R&D budget setting aside US\$3.8 billion to promote 12 strategic technologies including AI.¹⁷⁷

¹⁷⁶ Cole McFaul et al., "Assessing South Korea's AI Ecosystem," *Center for Security and Emerging Technology*, August 2023, <https://doi.org/10.51593/20220038>.

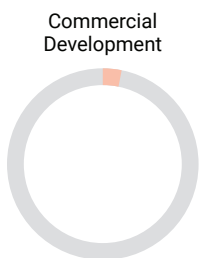
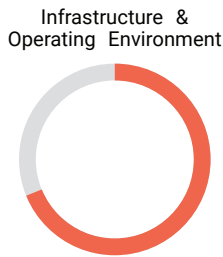
¹⁷⁷ Korea to invest \$3.8 bil. in R&D for 12 strategic technologies in 2024," *The Korea Times*, August 30, 2023, https://www.koreatimes.co.kr/www/tech/2024/04/129_358030.html

Private investment in Korea is in its nascent stage but is rapidly gaining momentum owing to government-led incentives and the involvement of tech giants like Samsung, LG, Naver, and Hyundai in the AI ecosystem. As of 2022, about 564 privately held AI companies were headquartered in South Korea.¹⁷⁸ There has also been the active involvement of domestic investors, which have accounted for about 84 percent of transactions in AI companies.¹⁷⁹ Foreign investment has also been on the rise, particularly from the US. With Naver unveiling its GenAI tool, HyperCLOVA X, in 2023, and telecom giant KT Corp announcing a US\$5.4 billion investment in AI by 2027,¹⁸⁰ South Korea is poised to become a global leader in AI technology.

¹⁷⁸ McFaul et al, "Assessing South Korea's AI Ecosystem."

¹⁷⁹ McFaul et al, "Assessing South Korea's AI Ecosystem."

¹⁸⁰ Ben Wodecki, "South Korea Telco Giant To Invest \$5.4 Billion In AI," AI Business, June 23, 2023, <https://aibusiness.com/companies/south-korea-telco-giant-to-expand-ai-work-with-5-4b-investment-plan>.



Türkiye's AI Strategy¹⁸¹ has three fundamental dimensions: organisational competence, governance, and strategic consistency. Organisational competence emphasises the need to enhance core competencies within institutions, notably by cultivating AI expertise to empower individuals and organisations with the requisite skills to drive innovation across sectors. Governance focuses on efficient coordination and administration mechanisms. It establishes administrative and technical coordination within and between institutions, ensuring the continuous development of essential AI competencies and streamlined AI initiatives. The strategic consistency dimension operates at various levels, including public policy, the National Artificial Intelligence Strategy (NAIS), sectoral transformation, and international engagement.

Türkiye's AI strategy aims to bolster AI competencies, enhance governance, and ensure strategic alignment. The strategy rests on six key pillars:

- **AI Experts and Employment in the Domain:** Nurturing AI talent and expanding employment opportunities in the AI domain

¹⁸¹ "National AI Strategy," The Government of Türkiye (2021), <https://cbddo.gov.tr/SharedFolderServer/Genel/File/TRNationalAIStrategy2021-2025.pdf>

to develop a skilled AI workforce to meet the growing demand for AI expertise.

- **Research, Entrepreneurship, and Innovation:** Fostering research, innovation, and entrepreneurship in AI-related fields to create an environment that is conducive to AI breakthroughs and the growth of AI-driven businesses.
- **Technical Infrastructure, Platforms, and Data:** Gaining access to robust technical infrastructure and high-quality data to build technical infrastructure and platforms and promote secure data sharing.
- **Harmonisation and Regulations in Socioeconomic Structure:** Developing AI standards, ethical guidelines, and regulations to ensure responsible AI deployment. This pillar also establishes a framework for AI harmonisation and regulation in Türkiye's socioeconomic structure.
- **International Cooperation:** Engaging in international collaborations and partnerships, which are crucial to ensure alignment with global AI standards and contribute to the worldwide AI community.
- **Structural and Workforce Transformation:** Transforming structures and workforces to incorporate AI technologies to drive structural changes in various sectors and fully leverage AI's potential. This pillar also seeks to harmonise efforts and align initiatives with overarching strategic goals, maximising the impact and sustainability of Türkiye's AI endeavours.

By reinforcing the six pillars, Türkiye can position itself as a competitive player in the global AI landscape, fostering innovation, economic growth, and societal advancement.

Main Actors

The Turkish government has been actively investing in AI, particularly in adopting and exporting military applications of uncrewed aerial vehicles.¹⁸² The country has seen an incremental rise in investment in AI R&D projects by TÜBİTAK (Scientific and

¹⁸² Antara Vats and Nikhila Natarajan, "G20.AI: National Strategies, Global Ambitions," *Observer Research Foundation*, July 5, 2022, <https://www.orfonline.org/research/g20-ai-national-strategies-global-ambitions/>.

Technological Research Institution of Türkiye) and several venture capitalists. With over US\$115 million invested in 1,715 projects as of 2021, TÜBİTAK funds most of the AI R&D projects in the country.¹⁸³ Several research centres have also been established to foster research, including the Turkish National Science e-Infrastructure with the TÜBİTAK National Academic Network and Information Centre; the Neuroscience and Neurotechnology Centre of Excellence with the International Telecommunication Union; and robotics and AI laboratories with Boğaziçi University.¹⁸⁴

Private enterprises focus largely on investing in and registering patents for dual-use technologies that can be used for military purposes. Türkiye also has several market-entry barriers for established Western technology firms, which provides domestic startups with the space to generate demand in the local market and expand globally. Domestic startups and game developers like Hepsiburada, Trendyol, Getir, and Peak Games have achieved the billion-dollar evaluation mark.¹⁸⁵ However, gaps in bureaucratic structures and a complex tax regime constrict new startups.¹⁸⁶

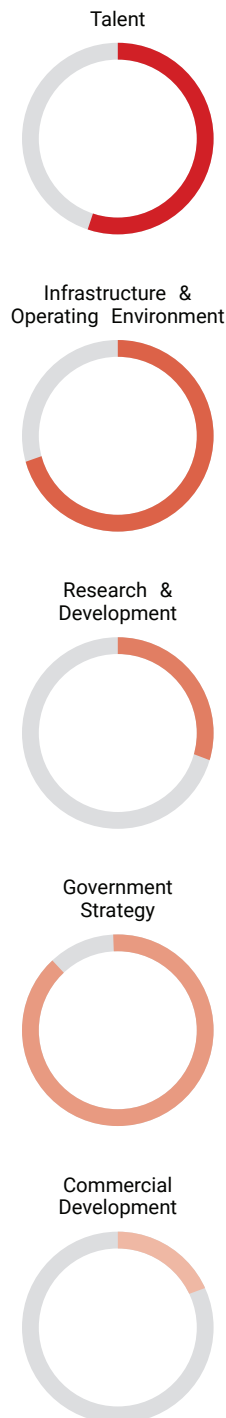
¹⁸³ Vats and Natarajan, “G20.AI: National Strategies, Global Ambitions”

¹⁸⁴ Vats and Natarajan, “G20.AI: National Strategies, Global Ambitions.”

¹⁸⁵ “10 Turkish Startups Are Becoming Unicorns,” *ERAİ Turkey*, July 27, 2021, <https://eraiturkey.com/news/10-turkish-startups-are-becoming-unicorns/>

¹⁸⁶ Vats and Natarajan, “G20.AI: National Strategies, Global Ambitions.”

UNITED KINGDOM



The United Kingdom's (UK) National AI Strategy¹⁸⁷ lays out a plan for the next decade, with a view to reshape industries, drive economic growth, and impact all aspects of life. As a global AI superpower, the UK aims to lead in research and innovation, harnessing global talent and fostering a progressive regulatory and business environment. The strategy builds on the UK's prior successes in AI, notably supported by the 2017 Industrial Strategy¹⁸⁸ and a nearly GBP 1 billion AI Sector Deal¹⁸⁹ established in April 2018. The current strategy is a significant step forward, acknowledging AI's role in enhancing resilience, productivity, growth, and innovation across the private and public sectors.

The UK's National AI Strategy operates on three core objectives:

- **Long-Term Investment:** To maintain leadership in AI, the UK needs to invest in the AI ecosystem's needs, nurturing talent, enhancing access to data and computing resources, and facilitating access to finance and customers.

¹⁸⁸ "Industrial Strategy: Building a Britain Fit For the Future," *Government of the United Kingdom*, November 27, 2017, <https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future>

¹⁸⁹ "AI Sector Deal," *Government of the United Kingdom*, May 21, 2019, <https://www.gov.uk/government/publications/artificial-intelligence-sector-deal/ai-sector-deal>

- **Broad Adoption:** The strategy envisions AI as a force that empowers all parts of society, across regions, sectors, and businesses in the UK.
- **Effective Governance:** The regulatory framework will promote innovation while safeguarding the public's interests.

The UK's ten-year vision aims to position the nation as the ideal place to live and work with AI, governed by precise rules, ethical principles, and a pro-innovation regulatory environment. This entails international cooperation for the responsible use of AI, advocating for global standards that align with UK's values, and defending against misuse of AI. Crucially, the strategy focuses on investments in AI skills, data, and infrastructure as well as bolstering R&D to support innovators at every stage. It also aims to enable AI researchers across the world to work in the UK through various visa routes.

The AI Council has been instrumental in shaping the National AI Strategy, emphasising adaptability to future technological disruptions and the continued success of AI investments through guiding and implementing the strategy and providing expert advice to the government and leadership within the AI ecosystem. Established in 2019, the Council ensures that the UK remains at the forefront of AI development and policy.

The UK envisions becoming a globally competitive, AI-first economy that benefits all regions and sectors such as healthcare, transportation, and everyday life through AI-enabled innovations.

Main Actors

The UK ranked third after the US and China in private investment in 2022.¹⁹⁰ AI investment increased fivefold between 2019 and 2021, primarily owing to Big Tech companies like Microsoft, Google, and IBM, along with some domestic companies like DeepMind (acquired by Google in 2014) and Quadrature. However, this rapid

¹⁹⁰ "AI Index Report 2023."

growth has been accompanied by a tightening of investment in seed and venture-stage companies, particularly in 2022, which is expected to have an impact on startups, micros, and SMEs.¹⁹¹

The UK government is rapidly catching up with AI investment levels of the US and China. In 2022, it announced a US\$1.3-billion package to support the AI sector, in addition to the existing US\$2.8-billion investment.¹⁹² The package will contribute to establishing a national research resource that makes cutting-edge AI R&D accessible to British academia rather than limiting it to the private sector, as in the case of the US.

The investment structure in the UK is similar to that of the US in that private and Big Tech corporations outweigh government investment.¹⁹³ For instance, the UK's new public research agency, Advanced Research and Invention Agency (ARIA), has a budget of just GBP 800 million, which is minuscule compared to the private sector.¹⁹⁴

¹⁹¹ "Artificial Intelligence Sector Study," DSIT, *Government of the United Kingdom*, March, 2023, https://assets.publishing.service.gov.uk/media/641d71e732a8e000cfa9389/artificial_intelligence_sector_study.pdf.

¹⁹² "United Kingdom Artificial Intelligence Market 2023," *International Trade Administration*, March 29, 2023, <https://www.trade.gov/market-intelligence/united-kingdom-artificial-intelligence-market-2023>.

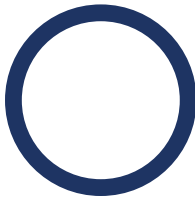
¹⁹³ "AI Index Report 2023."

¹⁹⁴ Thomas Lewton, "Can the UK's New ARIA Science Agency Deliver 'Moonshot' Technologies?" *New Scientist*, September 11, 2023, <https://www.newscientist.com/article/2391383-can-the-uks-new-aria-science-agency-deliver-moonshot-technologies/>.



UNITED STATES

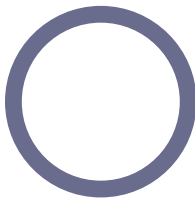
Talent



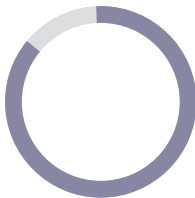
Infrastructure & Operating Environment



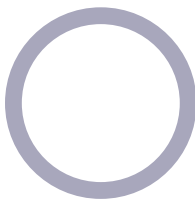
Research & Development



Government Strategy



Commercial Development



The US committed to maintaining its leadership in AI through Executive Order 13859, issued on 11 February 2019.¹⁹⁵ The order, titled “Maintaining American Leadership in Artificial Intelligence”, outlines a comprehensive strategy to harness AI’s power for economic growth, national security, and the betterment of American society. The executive order outlines five principles that underpin the nation’s approach to AI:

- **Technological Breakthroughs:** Fostering advancements in AI technologies to promote scientific discovery, economic competitiveness, and national security.
- **Technical Standards:** Developing technical standards and reducing barriers to the safe testing and deployment of AI technologies, fostering the creation of new AI-related industries.
- **Workforce Development:** Training the American workforce to ensure that individuals have the skills to develop and apply AI technologies.
- **Trust and Privacy:** Establishing public trust and confidence in AI technologies and protecting civil liberties, privacy, and American values in AI applications.

¹⁹⁵ “Executive Order On Maintaining American Leadership In AI,” Government of United States of America (2019), <https://www.govinfo.gov/content/pkg/FR-2019-02-14/pdf/2019-02544.pdf>.

- **International Collaboration:** Creating an international environment that supports American AI research and innovation while safeguarding its technological advantage.

The strategy outlines six strategic objectives, including sustained investment in AI R&D, improved access to federal data and resources for AI research, reduced barriers to AI technology use, and development of technical standards to protect national interests.

To execute this strategy, implementing agencies will play a pivotal role in areas such as AI R&D, AI applications, educational grants, and regulation of AI technologies. Moreover, the strategy maintains a strong focus on workforce development, fostering public trust in AI, and protecting American values, while advancing international collaboration.

On 30 October 2023,¹⁹⁶ the Biden administration issued an Executive Order (EO) on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence. This EO establishes a comprehensive approach across federal agencies to oversee responsible AI development and deployment, involving agency leadership, industry regulation, and international collaboration. The EO mandates more than 100 specific actions by over 50 federal entities to implement guidance across eight primary policy areas:

- **Safety and Security:** Promoting processes to understand and mitigate AI-related risks, including biosecurity, cybersecurity, national security, and critical infrastructure.
- **Innovation and Competition:** Attracting AI talent, addressing novel IP questions, and promoting innovation, especially at startups and small businesses.

¹⁹⁶ "Highlights Of The 2023 Executive Order On Artificial Intelligence For Congress", *Congressional Research Services, Government of United State of America*, November 17, 2023, <https://crsreports.congress.gov/product/pdf/R/R47843#:~:text=Executive%20Order%20on-,Artificial%20Intelligence%20for%20Congress,and%20Use%20of%20Artificial%20Intelligence>

- **Worker Support:** Addressing potential workforce disruptions caused by AI adoption.
- **AI Bias and Civil Rights:** Recognising potential biases in AI models and their impact on civil liberties, particularly in the criminal justice system and federal programs.
- **Consumer Protection:** Enforcing existing authorities to minimise AI-related consumer harms.
- **Privacy:** Evaluating and mitigating privacy risks associated with AI and user data.
- **Federal AI Use:** Establishing an inter-agency council to coordinate AI use, develop governance guidance, and expand the AI workforce across federal agencies.
- **International Leadership:** Engaging with global partners to develop common AI regulatory and accountability principles and technical standards.

The US AI strategy reflects a holistic approach to AI leadership, emphasising innovation, collaboration, and protecting American interests. It underscores the nation’s commitment to maintaining its position as a global AI leader while ensuring that AI technologies align with its core values and principles.

Main Actors

In 2022, investments in the US were US\$47.4 billion, which was roughly 3.5 times the amount financed in China (US\$13.4 billion).¹⁹⁷ Big tech companies like Amazon, Google, and Microsoft accounted for most of these investments. The US also has 1.9 times more newly funded AI companies than the EU and the UK combined and 3.4 times more than China.¹⁹⁸

The US has also emerged as the clear leader in federal government spending, though the contrast is slightly less stark. Government spending on AI-related contracts was about US\$3.3 billion in 2022.¹⁹⁹ While the exact military expenditure is difficult to

¹⁹⁷ “AI Index Report 2023.”

¹⁹⁸ “AI Index Report 2023.”

¹⁹⁹ “AI Index Report 2023.”

ascertain, non-classified spending on AI by the US Department of Defense (DoD) was US\$0.87 billion in 2022, while the requested budget for 2023 is US\$1.1 billion.²⁰⁰

The gap in external research funding for private versus public American Computer Science departments is also widening. In 2011, the median total expenditure from external sources for computing research was roughly the same for US private and public CS departments. The scenario has since changed, with private CS departments receiving millions more in additional funding than public universities. In 2021, the median expenditure for private universities was US\$9.7 million, compared to US\$5.7 million for public universities.²⁰¹

The private sector dwarfs government spending; Amazon spends nearly ten times the total budget of DARPA (US\$36 billion and US\$3.5 billion in 2019, respectively) on R&D and infrastructure. In the past decade, Google has spent over US\$200 billion on AI investments.²⁰² Microsoft invested US\$10 billion in OpenAI in 2023.²⁰³ Therefore, big tech firms are in charge of AI development and will dictate the way technology evolves in the future.

²⁰⁰ "AI Index Report 2023."

²⁰¹ "AI Index Report 2023."

²⁰² Akash Sriram and Stephen Nellis, "AI lesson For Microsoft and Google: Spend Money To Make Money," *Reuters*, July 26, 2023, <https://www.reuters.com/technology/ai-lesson-microsoft-google-spend-money-make-money-2023-07-25/>.

²⁰³ Cade Metz and Karen Weise, "Microsoft To Invest \$10 Billion In OpenAI, the Creator Of ChatGPT," *The New York Times*, January 23, 2023, <https://www.nytimes.com/2023/01/23/business/microsoft-chatgpt-artificial-intelligence.html>.

Revolutionary AI Case 7: Fashioning AI on the Runway

The infusion of AI in fashion is reshaping design, marketing, and sales. AI's influence is most palpable in supply chain management, where predictive models enable data-driven decisions, optimising inventory levels and stocking strategies, thereby reducing waste and enhancing customer satisfaction. The influence of AI extends to marketing strategies, where it is used to leverage data analysis to discern optimal approaches, target specific customer segments, and maximise advertising efficacy, leading to resource and time savings.

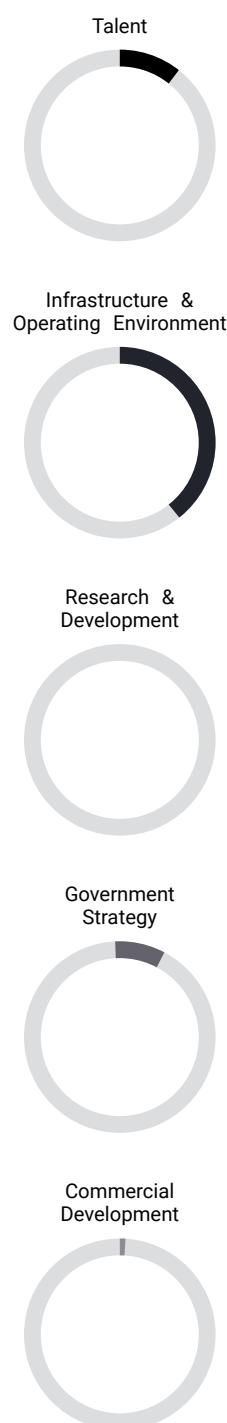
Additionally, AI-driven algorithms predict trends and decipher customer preferences to empower fashion businesses in innovative design processes and fostering market-driven creations while minimising the risk of unpopular designs. However, the promises of AI raise concerns about potential human labour displacement, as algorithms take on tasks traditionally handled by designers and marketers. Therefore, striking a balance between AI benefits and employment preservation becomes a critical consideration for the industry.²⁰⁴

²⁰⁴ Brandon Ginsberg, "Artificial Intelligence In Fashion," *Forbes*, October 5, 2023, <https://www.forbes.com/sites/theyec/2023/02/21/artificial-intelligence-in-fashion/?sh=3f6438347adb>.

Non-G20 National Strategies



KENYA



Kenya was the first African country to launch an open-data portal to provide information on citizen access to education, energy, health, population, poverty, and water and sanitation.²⁰⁵ While the country lacks a national AI strategy, Kenya has three primary regulatory devices in place to govern cyber affairs, including the Data Protection Act, 2019,²⁰⁶ the Computer Misuse and Cybercrimes Act, 2018,²⁰⁷ and the National Computer and Cybercrimes Co-ordination Committee (NC4).²⁰⁸ Additionally, Kenya formed the “Distributed Ledgers Technology and Artificial Intelligence Taskforce” in 2018 to prepare a report to document local AI policy implications.²⁰⁹ It also released “The Kenya National Digital Master Plan, 2022-2032”, which recognises the adoption of AI as a necessary emerging technology that should permeate all government services.²¹⁰

²⁰⁵ “The Kenya Open Data Initiative,” *Centre For Public Impact (CPI)*, <https://www.centreforpublicimpact.org/case-study/open-data-kenya>.

²⁰⁶ “Data Protection Act, 2019,” *Office of the Data Protection Commissioner Kenya*, November 8, 2021, <https://www.odpc.go.ke/dpa-act/#:~:text=An%20Act%20of%20Parliament%20to,controllers%20and%20processors%3B%20and%20for>.

²⁰⁷ “Computer Misuse and Cybercrimes Act” *Kenya Law Reports*, <http://www.kenyalaw.org/kl/fileadmin/pdfdownloads/Acts/ComputerMisuseandCybercrimesActNo5of2018.pdf>.

²⁰⁸ “NC4,” NC4, <https://nc4.go.ke/national-computer-and-cybercrimes-coordination-committee-nc4/>.

²⁰⁹ “Emerging Digital Technologies For Kenya Exploration & Analysis,” *Ministry of Information, Communications and the Digital Economy*, Government of Kenya, <https://www.ict.go.ke/blockchain.pdf>.

²¹⁰ “The Kenya National Digital Master Plan 2022 – 2032,” *Information and Communication Technology Authority*, Government of Kenya, <https://cms.icta.go.ke/sites/default/files/2022-04/Kenya%20Digital%20Masterplan%202022-2032%20Online%20Version.pdf>.

Kenya's regulatory devices are based on three main principles:

- **Governing AI by Governing Data:** The Data Protection Act ensures that the data controller or processor is also responsible for protecting the data from misuse by Large Language Models (LLMs).
- **Governing Cyberspace:** The Computer Misuse and Cybercrimes Act covers all misconduct on digital platforms to protect users.
- **Separate Oversight Body:** The NC4 governs all security challenges in cyberspace.

Main Actors

Kenya's focus has been on academic and private-sector participation. Within academia, Strathmore University's @iLabAfrica Research Centre in Nairobi conducts cutting-edge research on emerging technologies like big data, blockchain, and AI, in alignment with Kenya's Vision 2030 goals.²¹¹

The private sector, particularly startups, actively invests in AI to develop applications such as Eska and Nuru for crop pest and disease detection. Other apps like UjuziKilimo and AfyaRekod also employ ML to enhance precision farming and access medical data in real-time.²¹²

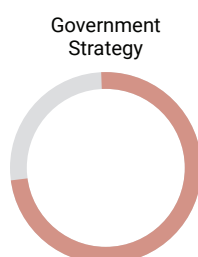
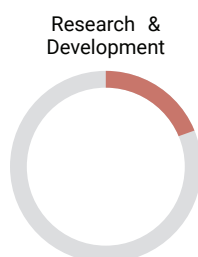
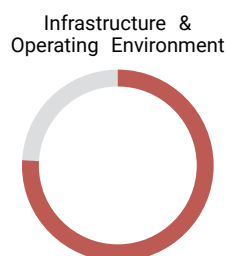
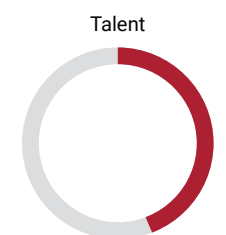
Kenya has included digital planning in many areas, from smart cities to medical service access. However, while specific AI strategies and plans are lacking, the country's data protection policies cover these bases.

²¹¹ "@iLabAfrica Centre," *Strathmore University Research*, https://research.strathmore.edu/ova_dep/ilabafrika-centre/

²¹² "Ujuzi Kilimo," Ujuzi Kilimo <https://www.ujuzikilimo.com/>; "AfyaRekod," *AfyaRekod*, <https://afyarekod.com/>.



THE NETHERLANDS



The Netherlands has consistently focused on enhancing public-private partnership, R&D, and startup culture through its National Strategic Action Plan for AI.²¹³

The Dutch AI strategy is built on three key pillars:

- **Enhancing Societal and Economic Potential:** Implementing policies encouraging AI adoption, use, and advancement in the private and public sectors while promoting AI applications to address broader societal challenges.
- **Establishing a Foundation for Education and Skill Development:** Implementing policies that support the education and skill development necessary for AI, fostering research and innovation in the field, facilitating access to high-quality data, and enhancing digital infrastructure.
- **Creating Holistic, Far-Seeing Policies:** Implementing policy measures that address ethical considerations, such as fostering trust, upholding human rights, ensuring consumer protection, and safeguarding the safety of citizens.

²¹³ "Netherlands Strategic Action Plan For Artificial Intelligence," *OECD*, https://wp.oecd.ai/app/uploads/2021/12/Netherlands_Strategic_Action_Plan_for_Artificial_Intelligence.pdf

Main Actors

The Netherlands is establishing itself as a hub for AI innovation, drawing global talent and capital.²¹⁴ A combination of government support, academic research, and a vibrant startup ecosystem drives the growth of AI in the country. The Netherlands also established the 'Strategic Action Plan for Artificial Intelligence' in 2019,²¹⁵ which outlines a yearly budget of 45 million euros for AI innovation and research—which was raised to 64 million euros in 2019—with an additional 23.5 million euros in 2020 dedicated to the Netherlands AI Coalition (NL AIC) public-private partnership.²¹⁶ The Netherlands has established several such public-private collaborations, including Commit2Data, and VWData,²¹⁷ which foster partnerships among government entities, businesses, educational institutions, and civil society organisations to accelerate AI developments. In 2022, the NL AIC launched the AiNed program with 204.5 million euros in funding over four years from the Dutch National Growth Fund.²¹⁸ The Netherlands also supports AI through the Knowledge and Innovation Covenant (KIC) funding—a three-year funding program under the Netherlands Organisation for Scientific Research (NWO), which promotes public-private partnerships in critical areas like energy transition, technology, biological ageing, sustainability, agriculture, water, food, healthcare, and safety. Another similar

²¹⁴ Tobias Henz et al., "Building a World-Class Dutch Start-Up Ecosystem," *McKinsey & Company*, November 10, 2022, <https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/building-a-world-class-dutch-start-up-ecosystem>

²¹⁵ "Strategic Action Plan For AI, 2019," *OECD.AI*, <https://oecd.ai/en/wonk/documents/netherlands-strategic-action-plan-for-ai-2019>

²¹⁶ "Netherlands AI Strategy Report," *AI Watch*, https://ai-watch.ec.europa.eu/countries/netherlands/netherlands-ai-strategy-report_en

²¹⁷ "VWData Kickstarter Programme Launched," *Netherlands Organisation for Scientific Research (NWO)*, February 23, 2018, <https://www.nwo.nl/en/news/vwdata-kickstarter-programme-launched>

²¹⁸ "Dutch Government to Fund in AI Innovation," Digital Transformation News, *The Financial Express*, January 19, 2024, <https://www.financialexpress.com/business/digital-transformation-dutch-government-to-fund-in-ai-innovation-3369367/>

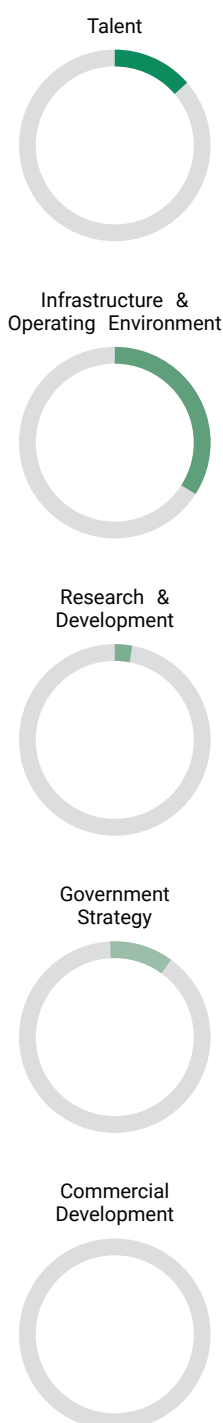
program is ROBUST, which was initiated by the Innovation Center for Artificial Intelligence (ICAI) in 2023 with a budget of over 25 million euros from the Dutch Research Centre and aims to strengthen the Dutch AI ecosystem by advancing fundamental AI research to address societal challenges in healthcare, logistics, media, food, and energy.²¹⁹

This support in government funding and research has expanded the startup ecosystem in the Netherlands, with AI-focused startups such as Scyfer, which was acquired by Qualcomm in 2017, gaining prominence.²²⁰

²¹⁹ "ROBUST AI Program Receives Additional €25 Million In Funding From Dutch Research Council," *Eindhoven University of Technology*, January 1, 2023, <https://www.tue.nl/en/storage/biomedische-technologie/de-faculteit/news-and-events/news-overview/05-01-2023-robust-ai-program-receives-additional-eur25-million-in-funding-from-dutch-research-council>

²²⁰ "Scyfer," Scyfer, <https://scyfer.nl/>; Mark Anthony Gubagaras, "Qualcomm Unit Buys Dutch AI Firm Scyfer," *S&P Global*, August 17, 2017, <https://www.spglobal.com/marketintelligence/en/news-insights/trending/is1avjdiphxcnmpftvf0ea2>

NIGERIA



Nigeria currently does not have a national AI strategy. However, the government, under the National Information Technology Development Agency (NITDA), announced a call for researchers and stakeholders to contribute to developing such a policy in 2022.²²¹ In June 2023, the NITDA announced the commencement of drafting of Nigeria’s code of practice for AI tools, including ChatGPT, to address fake news, transparency issues, data privacy, bias, accountability, and more. In November 2019, Nigeria published the National Digital Economy Policy and Strategy (2020-2030), which recognised AI as an emerging technology with the potential to contribute to the nation’s digital economy development.²²²

Nigeria’s current regulatory framework primarily revolves around the National Digital Economy Policy and Strategy, which has three foundational principles:

²²¹ “Nigerian Government Calls On Researchers To Collaborate On National AI Strategy,” *Digital Watch Observatory*, August 29, 2023, <https://dig.watch/updates/nigerian-government-calls-on-researchers-to-collaborate-on-national-ai-strategy>.

²²² “National Digital Economy Policy and Strategy,” *Federal Ministry of Communications and Digital Economy*, November 2019, <https://www.ncc.gov.ng/docman-main/industry-statistics/policies-reports/883-national-digital-economy-policy-and-strategy/file>.

- **Enhancing Digital Literacy and Skills:** Empowering individuals with digital literacy and skills. It emphasises the importance of fostering a population that is familiar with digital technologies and is equipped with the skills needed to navigate and utilise these technologies effectively. This involves initiatives and programs to promote digital education, training, and upskilling across various demographics to ensure that the Nigerian workforce is well-prepared for the demands of the digital era.
- **Establishing and Safeguarding Digital and Soft Infrastructure:** Creating a robust and secure digital environment that can support the growing demands of a digital economy. It includes developing and maintaining reliable telecommunications networks, cybersecurity measures, and other foundational elements essential for the smooth functioning of digital systems. The emphasis on 'soft infrastructure' underscores the importance of non-physical elements like regulations, policies, and standards that contribute to a conducive digital ecosystem.
- **Incorporating Future and Emerging Technologies in Regulations:** A forward-thinking approach of the regulatory framework, which highlights the importance of adapting regulations to accommodate future and emerging technologies, including AI. This proactive stance acknowledges the dynamic nature of technological advancements and aims to create a regulatory environment that can effectively address the challenges and opportunities presented by cutting-edge technologies. In the context of AI, this principle aligns with ongoing efforts to draft a National Policy on Artificial Intelligence and a code of practice, thus reflecting Nigeria's commitment to responsibly integrate AI into its digital landscape.

Main Actors

The government of Nigeria has promoted partnerships and stakeholder engagement to leverage AI's benefits. In 2020, the NITDA established the National Agency for Research in Robotics and Artificial Intelligence (NCAIR), a special-purpose vehicle to

collaborate with international research bodies, enhance student instruction on AI topics, and promote Nigeria's ability to leverage these technologies for economic growth.²²³

In the academic space, the University of Lagos launched the first AI Hub in Nigeria to serve as an avenue for developing the country's AI cycle by focusing on deep learning and encouraging young talent discovery within the innovation and data analytics space. The AI Hub focuses on developing tools to collect data, which is essential for the growth of the technology.²²⁴

Nigeria is leveraging the high mobile phone penetration in the country (84 percent) to facilitate commercial development.²²⁵ For example, Ubenwa, a Nigerian startup working to detect birth asphyxia, uses inbuilt smartphone microphones and speech-recognition algorithms to identify the condition based on the amplitude and frequency of an infant's cry.²²⁶

International investment has also played a role in fostering AI development in Nigeria. Kudi, a startup based in Nigeria, has developed a chatbot called Kudi AI, which is integrated with Facebook's Messenger app and facilitates mobile banking and payment services to users who may not have access to or may be unfamiliar with browser-based online banking but are comfortable with text-based messaging.²²⁷ The app received seed funding from the Silicon Valley incubator Y-Combinator and is among several

²²³ "National Center For Artificial Intelligence And Robotics," *NITDA*, <https://nitda.gov.ng/ncair/>

²²⁴ "This Is Nigeria's First Ever Artificial Intelligence Hub," *Techpoint Africa*, June 10, 2018, <https://techpoint.africa/2018/06/11/nigerias-first-ever-artificial-intelligence-hub/>

²²⁵ Kanika Saigal, "Regulators Give Mobile Money in Nigeria a Boost," *Euromoney*, November 24, 2023, <https://www.euromoney.com/article/b1cmtgtzyr9/regulators-give-mobile-money-in-nigeria-a-boost>

²²⁶ "Understanding Babies With AI: Ubenwa," *Techpoint Africa*, September 26, 2022, <https://techpoint.africa/2022/09/26/ubenwa-birth-asphyxia/>

²²⁷ Susan Cavan, "Coming to Life: Artificial Intelligence in Africa," *Atlantic Council*, October 5, 2021, <https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/coming-to-life-artificial-intelligence-in-africa/>

AI-powered apps designed to make financial services accessible to underserved populations. IBM launched its Watson Workspace, a messaging app designed to streamline corporate workflow, in Nigeria in 2018.²²⁸ The app has been adopted by Descasio, Nigeria's leading cloud services provider, to enhance its email services and improve employee collaboration.²²⁹

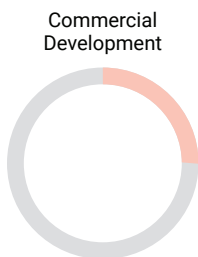
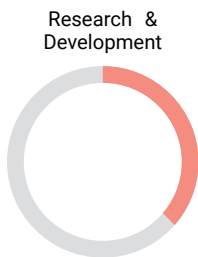
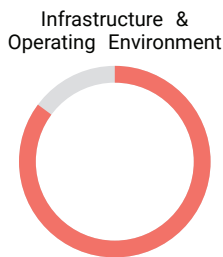
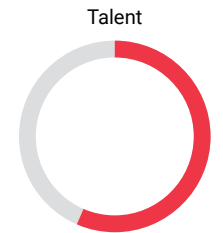
Nigeria's regulatory landscape, currently shaped by the National Digital Economy Policy and Strategy, is rooted in principles that are crucial for digital advancement. As the nation progresses towards formulating a National Policy on Artificial Intelligence and a code of practice, there are vital aspects that Nigeria needs to explore. A comprehensive examination of global AI regulatory frameworks can foster international collaborations and partnerships to build a shared pool of knowledge and best practices in AI governance. Further, a concerted effort to address potential ethical concerns, promote transparency, and ensure inclusivity in AI development is essential. Striking a balance between innovation and responsible AI implementation will be vital for Nigeria to harness the full potential of AI while mitigating associated risks. These aspects can help Nigeria position itself as a leader in the responsible adoption and regulation of AI, contributing to a sustainable and inclusive digital future.

²²⁸ Susan Cavan, "Coming to Life: Artificial Intelligence in Africa."

²²⁹ Susan Cavan, "Coming to Life: Artificial Intelligence in Africa."



SINGAPORE



In 2017, the city-state of Singapore launched AI Singapore (AISG), a national program that invested approximately US\$109 million in its AI ecosystem, comprising startups and research, over five years.²³⁰ The Singapore government also unveiled its National AI Strategy in 2019, which outlined plans to leverage AI for economic transformation.²³¹ Singapore launched its National AI Strategy 2.0 (NAIS 2.0) on 4 December 2023.²³² The NAIS 2.0 introduces three pivotal shifts aimed at positioning Singapore as a frontrunner in the AI domain:

- **Repositioning AI as a Necessity:** Shifting from viewing AI as an optional opportunity to recognising it as an essential tool for societal and economic progress, emphasising its role in addressing challenges and fostering innovation.

²³⁰ "AI Singapore," *AI Singapore (AISG)* (2017), <https://aisingapore.org/#:~:text=the%20world%20map-,Launched%20in%20May%202017%2C%20AI%20Singapore%20brings%20together%20all%20Singapore,to%20power%20Singapore's%20AI%20efforts.>

²³¹ Camillia Dass and A'bidah Zaid Shirbeeni, "SG Unveils Renewed National AI Strategy to Improve Economy," *Marketing Interactive*, December 5, 2023, <https://www.marketing-interactive.com/sg-national-ai-strategy-2-economy.>

²³² "National AI Strategy," *Smart Nation Singapore*, December 4, 2023. [https://www.smartnation.gov.sg/nais/.](https://www.smartnation.gov.sg/nais/)

- **Shifting to a Global Outlook:** Fostering collaborations and partnerships on an international scale to contribute to and benefit from the collective advancements in AI.
- **Establishing Comprehensive AI Infrastructure:** Moving from isolated AI projects to building a robust and interconnected AI ecosystem, emphasising the development of standardised frameworks, research, and resources to ensure sustainability and scalability across sectors.

Main Actors

As of 2023, Singapore's government-supported R&D spending surpassed that of the US by up to 16 percent, relative to their GDPs;²³³ in 2023, Singapore invested US\$1.9 billion in AI.²³⁴ Singapore has formed programmes and initiatives to enhance AI research, development, and skilling. Key initiatives such as the 100 Experiments (100E) and the Tech@SG programme have been instrumental in fostering R&D activities and attracting top talent to the AI domain.²³⁵

Beyond governmental initiatives, Singapore's AI landscape is characterised by domestic and international investors and AI startups. AI unicorns, including Trax and Advance Intelligence Group (AIG), have attracted substantial global investments to surpass billion-dollar valuations.²³⁶

²³³ "S'pore To Surpass the US In AI Investments," *Singapore Business Review*, January 24, 2024, <https://sbr.com.sg/information-technology/news/spore-surpass-us-in-ai-investments>.

²³⁴ "S'pore To Surpass the US In AI Investments."

²³⁵ "100experiments," *AI Singapore*, November 29, 2023, <https://aisingapore.org/innovation/100e/>.

²³⁶ "TRAX Secures \$640 Million Funding Round Led By Softbank Vision Fund 2 and Blackrock To Transform Retail Through Digital Technologies," Trax Retail, April 7, 2021, <https://traxretail.com/news/trax-secures-640-million-funding-round-led-by-softbank-vision-fund-2-and-blackrock-to-transform-retail-through-digital-technologies/>; Tim Burroughs, "Singapore Fintech Player AIG Raises \$80m," *AVCJ*, May 4, 2023, <https://www.avcj.com/avcj/news/3029170/singapore-fintech-player-aig-raises-usd80m>

Trax has secured considerable financial backing, positioning itself among Asia's top 10 most funded AI unicorns. It has received support from international investors, including in the US, UK, and China to exceed a billion-dollar valuation.²³⁷

Similarly, AIG has expanded its operations beyond Southeast Asia with the support of international investors, notably Chinese investors.²³⁸

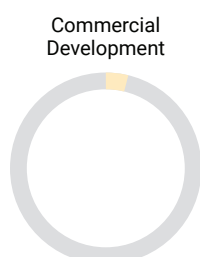
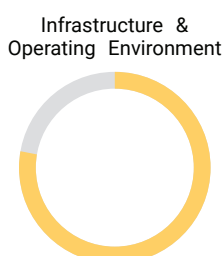
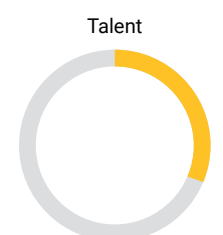
Singapore aims to reposition AI from an optional opportunity to an indispensable tool for societal and economic advancement through emphasising its pivotal role in addressing challenges and driving innovation. Additionally, Singapore embraces a global outlook, recognising the impact of AI and actively engaging in collaborations on an international scale to contribute to and benefit from collective advancements. Lastly, the strategy focuses on building a comprehensive AI infrastructure to transition from isolated projects to an interconnected ecosystem. As Singapore propels itself into this new phase of AI strategy, these shifts underscore its commitment to leading in technological innovation and actively contributing to the global AI landscape, fostering a collaborative and interconnected future for AI development.

²³⁷ "TRAX Secures \$640 Million Funding Round Led By Softbank Vision Fund 2 and Blackrock To Transform Retail Through Digital Technologies."

²³⁸ Tim Burroughs, "Singapore Fintech Player AIG Raises \$80m."



SPAIN



Spain launched its National Strategy in 2020,²³⁹ which draws from critical priorities and policy recommendations that are outlined in the Research, Development, and Innovation (RDI) strategy in artificial intelligence, the Spanish Digital Agenda 2025,²⁴⁰ and the Recovery, Transformation, and Resilience Plan.²⁴¹ Together, they constitute a comprehensive approach to AI development in Spain that focusing on the following three broad areas:

- **Establishing a Robust AI Ecosystem:** Creating a competitive research, development, and innovation (R&D&I) framework, promoting scientific excellence to position Spain as a leading country in AI, and focusing on leadership in the development of tools, technologies, and applications, particularly in the context of the Spanish language.

²³⁹ “National AI Strategy,” *Government of Spain* (2020), <https://www.lamoncloa.gob.es/presidente/actividades/Documents/2020/021220-ENIA.pdf>.

²⁴⁰ “The Spanish Digital Agenda,” *Government of Spain* (2020), https://www.lamoncloa.gob.es/presidente/actividades/Documents/2020/230720-Espa%C3%B1aDigital_2025.pdf.

²⁴¹ “Recovery, Transformation, and Resilience Plan,” *Government of Spain* (2020), https://www.lamoncloa.gob.es/presidente/actividades/Documents/2020/07102020_PlanRecuperacion.pdf.

- **Promoting AI Adoption across Sectors:** Deploying AI technologies in both public and private sectors, addressing cross-cutting sector activities, tackling grand challenges, and ensuring an ethical framework to build trust in AI.
- **Fostering Inclusive and Responsible AI:** Fostering human capital development in AI through skill development and education. This is enhanced by attracting global talent to Spain and stimulating Spanish talent. This also aims to achieve inclusiveness in the AI-driven economy by reducing gender gaps and digital divides, supporting ecological transition, and ensuring territorial cohesion.

Main Actors

Following the release of the Strategy document, the Spanish Government announced a public investment of 600 million euros over the 2021-2023 period for the development and implementation of the strategy.²⁴² Of this, around 275 million euros was dedicated for the development of AI technologies; 133 million euros towards technological integration; 100 million euros towards integrating AI into public and government systems; and the remaining 100 million euros towards increased research, education, and professional training across Spain in order to create a more gender-inclusive tech-based economy.²⁴³ In 2021, Spain launched the Next Tech fund, a capital risk fund to raise 4 billion euros for public-private investment in technologies such as cloud services, big data, AI, and blockchain.²⁴⁴ The Spanish government also plans to invest up to 2 billion euros over four years, with the rest of the funds coming from private investment.²⁴⁵

²⁴² “Spain AI Strategy Report,” *AI Watch* (2021), https://ai-watch.ec.europa.eu/countries/spain/spain-ai-strategy-report_en

²⁴³ “Spain AI Strategy Report.”

²⁴⁴ “Government Doubles Next Tech Fund Investment To Boost the Growth Of Digital Companies and High-Impact Projects,” *Official Credit Institute (ICO)*, March 30, 2023, https://www.ico.es/web/ico_en/government-doubles-next-tech-fund-investment-to-boost-the-growth-of-digital-companies-and-high-impact-projects

²⁴⁵ “Government Doubles Next Tech Fund Investment To Boost the Growth Of Digital Companies and High-Impact Projects”

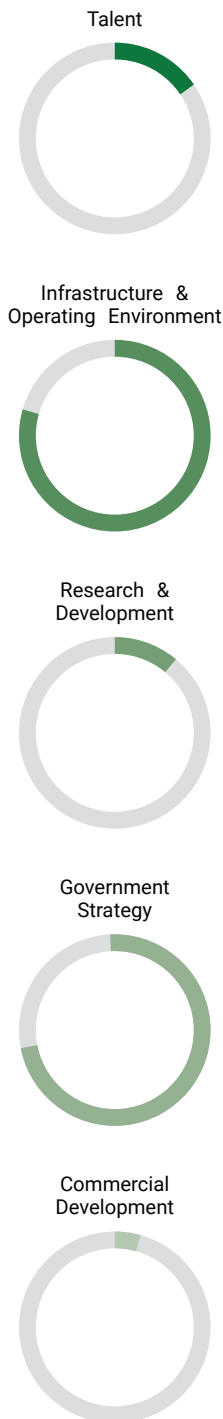
In terms of private investment, Spain became one of the only five members of the EU to invest more than 1 billion euros annually in AI since 2020.²⁴⁶ While Spanish startups like Luzia and Correcto are attracting global investments and attention, entrepreneurship in Spain is overshadowed by France and Germany.

Spain's 2020 National AI Strategy marks a significant step toward global prominence in AI. The strategy is anchored in comprehensive initiatives and fosters a robust AI ecosystem, promotes sector-wide AI adoption, and champions inclusive and responsible AI practices. With a 600-million euro public investment and the Next Tech fund, Spain is investing in AI's future.

²⁴⁶ "Estimating AI Investments In the European Union," AI Watch (2022), https://ai-watch.ec.europa.eu/document/download/dc51ed64-e3f7-4cd2-8c91-919b034ad797_en.



UNITED ARAB EMIRATES



The United Arab Emirates (UAE) government initiated the UAE Strategy for Artificial Intelligence in 2017 with the goal of achieving global AI leadership by 2031.²⁴⁷ Subsequently, a state minister for AI was appointed as part of a new cabinet dedicated to positioning the UAE as a global leader in AI and advanced technologies. The Ministry of State for Artificial Intelligence oversees AI project implementation through initiatives such as Smart Dubai, which integrates AI into urban living for improved public services.²⁴⁸

The regulatory framework of the UAE is based on the following three broad areas:

- **Integration Across Sectors:** Incorporating AI into critical sectors such as transportation, healthcare, space exploration, thoughtful consumption, water, technology, education,

²⁴⁷ "National Strategy For Artificial Intelligence," *Artificial Intelligence Office, United Arab Emirates* (2017), <https://ai.gov.ae/wp-content/uploads/2021/07/UAE-National-Strategy-for-Artificial-Intelligence-2031.pdf>.

²⁴⁸ "UAE Launches AI Strategy and Appoints Minister For AI," *Digital Watch Observatory*, February 26, 2022, <https://dig.watch/updates/uae-launches-ai-strategy-and-appoints-minister-ai>.

and agriculture. The goal is to harness AI solutions to enhance efficiency and innovation across critical domains, contributing to overall national development.

- **Enhancing Workforce Collaboration:** Supporting employees in both public and private sectors. The strategy envisions a collaborative relationship between humans and machines, aiming to develop AI technologies that augment the workforce's capabilities. The objective is to achieve a synergistic partnership where human intelligence complements artificial intelligence.
- **Ensuring Responsible Use of AI:** Recognizing the importance of ethical AI use, the strategy underscores the need for a robust legal framework. This involves addressing human-machine interaction issues, setting guidelines for responsible AI deployment, and creating regulations that balance innovation with ethical considerations. The focus is on fostering an environment that encourages the ethical and secure integration of AI technologies into various facets of society.

Main Actors

In the academic space, the Mohamed bin Zayed University for Artificial Intelligence (MBZUI) conducts AI research in collaboration with entities like the Abu Dhabi Health Services Authority and IBM, while the Mohammed bin Rashid Centre for Artificial Intelligence conducts research on AI R&D and capacity building.²⁴⁹ In 2018, ADQ founded Abu Dhabi's prominent AI firm G42, in partnership with OpenAI to facilitate AI model deployment across sectors.²⁵⁰ In 2023, in collaboration with MBZUI and Cerebras Systems, G42 launched Jais, a bilingual Arabic-English large language model. In 2022, it initiated the US\$10 billion G42 Expansion Fund for emerging-market tech investments.²⁵¹

²⁴⁹ "Mohamed Bin Zayed University Of Artificial Intelligence," *MBZUI.com*, <https://mbzuai.ac.ae/>

²⁵⁰ Vandana Nair, "Why OpenAI Partnered With G42," *Analytics India Magazine*, October 20, 2023, <https://analyticsindiamag.com/why-openai-partnered-with-g42/>.

²⁵¹ Vandana Nair, "Why OpenAI Partnered With G42."

The UAE government fosters an AI-startup culture with over 90 investment funds and 12 business incubators in the digital sector, totalling US\$408 million in startup valuation. The AED 1 billion Dubai Future District Fund attracts startups that leverage technologies like AI and blockchain.²⁵²

The UAE champions AI integration across vital sectors and fosters innovation for national development. Emphasising human-machine partnership, the strategy aims to ensure ethical AI use through a robust legal framework. This landscape is characterised by key players like MBZUI, G42, and innovative startups, as well as the UAE's focus on technology, ethics, collaboration, and inclusive progress.

²⁵² Shabin Basheer, "H.H Maktoum Bin Mohammed Launches AED1 Billion In Dubai Future District Fund," *Dubai Future Foundation*, March 21, 2022, <https://www.dubaifuture.ae/dubai-future-foundation/maktoum-bin-mohammed-launches-aed1-billion-dubai-future-district-fund-to-support-seed-to-growth-stage-startups/>.

A Critique of AI Policies

EXISTING AI STRATEGIES demonstrate commendable efforts globally. However, there are notable gaps that demand attention.

A key issue is the lack of universal ethical standards and regulatory frameworks, which results in inconsistencies in AI governance worldwide. It is imperative to harmonise these standards to address ethical concerns, ensure accountability, and foster international collaboration. For instance, the EU's AI Act and India's initiative, "Towards Responsible AI for All", aim to establish ethical principles for AI. However, these efforts may prove futile without global consensus and concerted action. Prioritising ethical frameworks in specific regions is crucial, but a cohesive global approach is essential for more meaningful impact and bridging existing gaps in AI governance.

The disparity in AI benefits and accessibility is rooted in a stark divide between the Global North and Global South, underscored by inherent structural limitations. At its core, the challenge lies in establishing the infrastructure required for widespread AI adoption. Technical components such as high-capacity computing, extensive storage, robust network capabilities, and mature cybersecurity are pivotal but remain an unattainable luxury for numerous resource-constrained countries in the Global South. The prohibitive costs associated with implementing and sustaining such advanced technology, exemplified by the multimillion-dollar expense of training AI algorithms, further exacerbates the divide. Compounding the issue, a few dominant companies in the US and China monopolise the development of reusable AI models and tools, intensifying the accessibility gap. Restrictions on access and utilisation impede innovation in resource-constrained regions.

Localised AI solutions demand substantial relevant data, yet the low infrastructure maturity and limited practitioner capacity hinder data availability and compatibility in these regions.

While many national AI frameworks highlight the importance of international collaboration, in-depth analysis and a proactive approach are necessary to address the specific support that the Global South needs. Further, nations need to adopt a far-sighted approach while providing support and facilitating development. This essential requirement goes beyond AI to encompass all emerging technologies and their potential disruptions.

Privacy and security concerns need to be addressed, with an emphasis on the implementation of robust measures to protect personal data and prevent potential misuse of AI technologies. Collaborative initiatives to establish international data protection and cybersecurity standards are essential to strengthening the global AI landscape and underscores the importance of international collaboration in developing new protocols and frameworks to safeguard individuals, institutions, and nations. Given the rapid pace of AI development and the frequent emergence of new use cases, nations must exercise caution against potential threats. While international collaboration is crucial, it is vital to acknowledge that individual nations face unique challenges.

Despite substantial progress in global AI strategies, bridging the gaps necessitates united efforts in standardisation, ensuring fair access, prioritising privacy and security, and promoting education. A collaborative approach that engages governments, industry leaders, and international organisations is crucial to harness the full potential of AI and effectively navigate the ethical challenges accompanying the advancement of AI.

Future-Facing Strategies

AI IS AN EVOLVING domain, with new iterations and applications being developed rapidly. This dynamic nature means that national AI strategies and policies that do not plan for these new developments risk becoming quickly outdated.

A robust national AI strategy should include future-facing measures that reflect new developments in the AI domain. These documents should also be flexible enough to include and alter any facet of AI that emerges after the strategy has been released to the public domain. This flexibility can be facilitated through a comprehensive process marked by the effective monitoring and evaluation of new challenges and innovative solutions.

This section outlines three considerations that are becoming increasingly relevant in policy discussions around AI.

Responsible AI

AI technology advancements often indicate technological progress, emphasising speed, efficiency, and positive impacts on human well-being. However, the adverse impacts of AI applications, including information systems (IS) research and harmful effects at the organisational and human levels, have been attracting growing interest. The tension between technological capabilities and human structures raises questions about the benefits of technology when it is being increasingly associated with adverse outcomes,

including emotional distress, increased bias and inequality towards minorities, lack of transparency, loss of intellectual property and reduced human agency.²⁵³

Concerns about losing control over advanced AI entities have led to calls for establishing principles for responsibly governing AI. Private-sector leaders and organisations like Google and IBM have proposed guiding principles to mitigate both intended and unintended adverse effects. These private-sector guidelines aim to ensure responsible use, albeit on the terms of the organisation deploying the guidelines in order to ensure consistent market presence.

In this context, responsible AI (RAI) is broadly understood as having an “ethics by design” foundation,²⁵⁴ i.e., incorporating responsibility principles at all stages, including designing, developing, and deploying AI. Given the vast potential of the application of AI, RAI acts as an umbrella term that encompasses considerations around explainable and ethical AI systems. According to the AI, Algorithmic, and Automation Incidents and Controversies (AIAAIC) database, which tracks incidents related to the ethical misuse of AI, the number of AI incidents and controversies has increased 26 times since 2012.²⁵⁵ With the increasing accessibility of AI tools, specifically GenAI tools such as Dall-E,²⁵⁶ the scope of misuse may increase, warranting the need for RAI.

RAI regulation needs to consider the adverse outcomes of a rapidly growing technology that is easier to access (compared to other technologies that can be weaponised, such as nuclear and space technologies) by non-state and non-government organisations

²⁵³ Patrick Mikalef et al., “Thinking Responsibly About Responsible AI and ‘The Dark Side Of AI,’” *European Journal of Information Systems*, Volume 31, February 11, 2022, <https://www.tandfonline.com/doi/full/10.1080/0960085X.2022.2026621>.

²⁵⁴ Philip Brey and Brandt Dainow, “Ethics By Design For Artificial Intelligence - AI and Ethics,” *SpringerLink*, September 21, 2023, <https://link.springer.com/article/10.1007/s43681-023-00330-4#:~:text=1%20Introduction,the%20design%20of%20AI%20systems>.

²⁵⁵ Helen Ngo, “Artificial Intelligence Index Report 2023, Chapter 3: Technical AI Ethics,” *Stanford University* (2023), https://aiindex.stanford.edu/wp-content/uploads/2023/04/HAI_AI-Index-Report_2023.pdf.

²⁵⁶ A form of generative AI that creates images and art, often drawing from existing art without attributing value to original sources.

and individuals. The focus on RAI principles has emerged from concerns about increased bias²⁵⁷ that negatively impacts minorities (as seen in biases in facial recognition systems that use AI).²⁵⁸ These cases are especially concerning when used in border control, policing, and other forms of justice implementation. Thus, it is essential to ensure that AI is programmed and deployed responsibly by accountable private-sector participants as well as in public-sector governance.

As AI becomes a general-purpose technology, several countries have included RAI considerations for documents outside organisation-led guidelines. Ten countries surveyed in this report (Australia,²⁵⁹ Canada,²⁶⁰ China,²⁶¹ Germany,²⁶² India,²⁶³ South Africa,²⁶⁴ South Korea,²⁶⁵ Saudi Arabia,²⁶⁶ US,²⁶⁷ and the UK²⁶⁸) have included

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- ²⁵⁷ S Akter, et al., "Algorithmic Bias In Data-Driven Innovation In the Age of AI," *International Journal of Information Management*, July 10, 2021, <https://www.sciencedirect.com/science/article/abs/pii/S0268401221000803>.
- ²⁵⁸ Abdullah Hussein Sham et al., "Ethical AI In Facial Expression Analysis: Racial Bias - Signal, Image and Video Processing," *SpringerLink*, May 9, 2022. <https://link.springer.com/article/10.1007/s11760-022-02246-8>.
- ²⁵⁹ "Australia's AI Action Plan", *OECD*, June 2021, https://wp.oecd.ai/app/uploads/2021/12/Australia_AI_Action_Plan_2021.pdf
- ²⁶⁰ "Pan-Canadian AI Strategy," *Government of Canada*, July 20, 2022, <https://ised-isde.canada.ca/site/ai-strategy/en>.
- ²⁶¹ Graham Webster and Lorand Laskai, "Translation: Chinese Expert Group Offers 'Governance Principles' For 'Responsible AI,'" *DigiChina, Stanford University*, October 1, 2021, <https://digichina.stanford.edu/work/translation-chinese-expert-group-offers-governance-principles-for-responsible-ai/>.
- ²⁶² "Artificial Intelligence Strategy of the German Federal Government," *Federal Government of Germany*, December 2020, https://www.ki-strategie-deutschland.de/files/downloads/Fortschreibung_KI-Strategie_engl.pdf.
- ²⁶³ "Responsible AI," *NITI Aayog*, February 2021, <https://www.niti.gov.in/sites/default/files/2021-02/Responsible-AI-22022021.pdf>; "Responsible AI - Part 2," *NITI Aayog*, August 2023, <https://www.niti.gov.in/sites/default/files/2021-08/Part2-Responsible-AI-12082021.pdf>
- ²⁶⁴ "Report of the Presidential Commission on the 4th Industrial Revolution," *Government of South Africa*, January 2020, https://www.gov.za/sites/default/files/gcis_document/202010/43834gen591.pdf.
- ²⁶⁵ "National Strategy for Artificial Intelligence," *Government of South Korea (2023)*, <https://www.msit.go.kr/eng/bbs/view.do?sCode=eng&mId=4&mPid=2&pageIndex=&bbsSeqNo=42&nttSeqNo=878&searchOpt=ALL&searchTxt=>
- ²⁶⁶ "National Strategy for Data and AI," *Saudi Data and AI Authority*, December 2020, https://ai.sa/Brochure_NSDAI_Summit%20version_EN.pdf
- ²⁶⁷ "Biden-Harris Administration Announces New Actions To Promote Responsible AI Innovation That Protects Americans' Rights and Safety," *The White House, Federal Government of United States of America*, May 4, 2023. <https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/04/fact-sheet-biden-harris-administration-announces-new-actions-to-promote-responsible-ai-innovation-that-protects-americans-rights-and-safety/>.
- ²⁶⁸ Department for Science, Innovation and Technology, "National AI Strategy," *Government of United Kingdom*, December 18, 2022, <https://www.gov.uk/government/publications/national-ai-strategy>.

RAI considerations in their national documents and engagements as national strategies or independent endeavours to govern AI.

In its national strategy, the US aims to add public-private partnerships in AI and ensure that the private sector is included in all AI advancements. From the government's perspective, this is a prudent move due to the incongruence between participation and impact. While the AI market in the US sees more investment from the private sector (up to 18 times the public sector investment as of 2022),²⁶⁹ the public sector faces more risk as the most significant data producer.²⁷⁰ Creating partnerships between these sectors will ensure responsible use and equitable participation.

India's AI governance extends back to 2021, when NITI Aayog released a two-part report on approaches towards²⁷¹ and operationalising²⁷² RAI principles. These documents cover the deployment and use of AI technologies in civilian and private-sector spaces, highlighting seven principles: safety and reliability, equality, inclusivity and non-discrimination, privacy and security, transparency, accountability, and protection and reinforcement of positive human values. It also recommends measures for the government, industry bodies, and civil society to implement these principles in the AI products they develop or work with.

Under its United Kingdom Research Institute (UKRI), the UK has created an RAI Working Group to address RAI competition and funding in and out of the UK.²⁷³

²⁶⁹ "Artificial Intelligence Index Report 2023," *Stanford University* (2023), https://aiindex.stanford.edu/wp-content/uploads/2023/04/HAI_AI-Index-Report_2023.pdf.

²⁷⁰ Hannah Algar, "Reskilling In the Private Vs. Public Sector," *The AI Journal*, January 2, 2024, <https://aijourn.com/reskilling-in-the-private-vs-public-sector/#:~:text=The%20stakes%20are%20higher%20in,a%20mistake%20or%20was%20hacked>.

²⁷¹ "Responsible AI," *NITI Aayog*, February 2021, <https://www.niti.gov.in/sites/default/files/2021-02/Responsible-AI-22022021.pdf>.

²⁷² "Responsible AI - Part 2," *NITI Aayog*, August 2023, <https://www.niti.gov.in/sites/default/files/2021-08/Part2-Responsible-AI-12082021.pdf>.

²⁷³ "AI, Law and Governance Working Group," *Responsible AI UK*, <https://www.rai.ac.uk/law-wg>.

²⁷⁴ Aaron Hurst, "How Generative AI Regulation Is Shaping Up Around The World," *Information Age*, July 11, 2023, <https://www.information-age.com/how-generative-ai-regulation-shaping-up-around-world-123503911/>.

In some countries, such as Australia, a focus on RAI is also institutionally established through the funding and creation of new initiatives. The 2023 Australian Federal Budget announced a Responsible AI Network and funding of AU\$41.2 million (US\$26.9 million) towards the responsible roll-out of multiple AI technologies across the country.²⁷⁴

South Africa also published a report on the uses of AI in health, education, and labour in the country as well as in Africa at large at the AfricAI conference in 2023, highlighting the importance of RAI.²⁷⁵ The SAAIA also monitors private-sector participation in academia, public sector, and international research.²⁷⁶

Such associations at the national and international levels are crucial for monitoring innovation. Apart from specific countries, several multilateral groupings have made a case for RAI, such as the OECD,²⁷⁷ EU,²⁷⁸ Global Partnership on AI (GPAI),²⁷⁹ and UNESCO, through initiatives like the Women4EthicalAI.²⁸⁰

Of the ten countries mentioned above, Australia, Canada, China, Germany, India, South Korea, Saudi Arabia, US, and UK signed the Bletchley Declaration on AI in November 2023.²⁸¹ The declaration highlights the importance of addressing shared AI

²⁷⁴ Aaron Hurst, "How Generative AI Regulation Is Shaping Up Around The World," *Information Age*, July 11, 2023, <https://www.information-age.com/how-generative-ai-regulation-shaping-up-around-world-123503911/>.

²⁷⁵ "Advancing Responsible AI in Africa," *African AI Observatory*, June 2023, <https://www.africanobservatory.ai/social/advancing-responsible-ai-in-africa>.

²⁷⁶ "South African Artificial Intelligence Association," SAAIA, December 12, 2023, [https://saaiaassociation.co.za/#:~:text=The%20South%20African%20Artificial%20Intelligence%20Association%20\(SAAIA\)%20is%20an%20industry,Academic%2C%20Startup%20and%20NGO%20sectors](https://saaiaassociation.co.za/#:~:text=The%20South%20African%20Artificial%20Intelligence%20Association%20(SAAIA)%20is%20an%20industry,Academic%2C%20Startup%20and%20NGO%20sectors).

²⁷⁷ "The State Of Implementation Of the OECD AI Principles," *OECD*, October 2023, <https://www.oecd.org/publications/the-state-of-implementation-of-the-oecd-ai-principles-four-years-on-835641c9-en.htm>.

²⁷⁸ "Responsible Artificial Intelligence: Ethics and Regulation: EU Publications," *General Secretariat of the Council of the EU*, <https://consilium-europa.libguides.com/c.php?g=690732&p=4948483#:~:text=The%20EU's%20human%2Dcentric%20approach,encouraging%20businesses%20to%20develop%20them>.

²⁷⁹ "Responsible AI," *GPAI*, <https://gpai.ai/projects/responsible-ai/>.

²⁸⁰ "Artificial Intelligence: UNESCO Launches Women4ethical AI Expert Platform To Advance Gender Equality," *UNESCO.org*, April 28, 2023, <https://www.unesco.org/en/articles/artificial-intelligence-unesco-launches-women4ethical-ai-expert-platform-advance-gender-equality>.

²⁸¹ "The Bletchley Declaration By Countries Attending the AI Safety Summit, 1-2 November 2023," *Prime Ministers Office, Government of United Kingdom*, November 6, 2023, <https://www.gov.uk/government/publications/ai-safety-summit-2023-the-bletchley-declaration/the-bletchley-declaration-by-countries-attending-the-ai-safety-summit-1-2-november-2023>.

safety risks through collaborative efforts and emphasises the need to establish and maintain a common scientific understanding of these risks. It recommends developing risk-based policies tailored to each country's circumstances and legal frameworks, with an acknowledgement of potential variations in approaches. This includes promoting transparency among private entities developing cutting-edge AI technologies, creating evaluation metrics and safety testing tools, and enhancing public-sector capabilities and scientific research in AI safety.²⁸²

RAI is a growing field that depends on the future applications of AI and its increasing scope of misuse. Governance systems must incorporate the public and private sectors and create accountability systems through independent associations that monitor both sectors as well as non-state actors.

Generative AI

Generative AI, which can synthesise and generate novel content rather than analyse or process supplied data, has garnered interest since OpenAI released its generative-AI-based chatbot, ChatGPT.²⁸³ While seemingly innocuous, ChatGPT and subsequently GenAI services and tools present novel challenges to the general public and policymakers. GenAI has the potential to upend several creative industries and processes, introduce and reintroduce biases in its outputs, propagate mis/disinformation, and pose hurdles to individuals' privacy and intellectual property.

GenAI has blurred the lines between fabrication and reality. The emergence of realistic deepfakes created using GenAI and the subsequent propagation of fake news has highlighted the potential misuse value of GenAI, raising concerns about misinformation,

²⁸² "The Bletchley Declaration By Countries Attending the AI Safety Summit, 1-2 November 2023," *Government of the United Kingdom*, November 2023, <https://www.gov.uk/government/publications/ai-safety-summit-2023-the-bletchley-declaration/the-bletchley-declaration-by-countries-attending-the-ai-safety-summit-1-2-november-2023>

²⁸³ "Chat GPT," *OPENAI*, <https://chat.openai.com/>

privacy infringements, and reputational damage. These can also distort public opinion and perception and fuel spurious propaganda while negatively impacting individuals and organisations. Politically damaging uses of deepfakes have already been observed in Gabon,²⁸⁴ Myanmar,²⁸⁵ India,²⁸⁶ and the US,²⁸⁷ as well as in the context of the Russia-Ukraine war,²⁸⁸ among others.

GenAI is also able to generate content that mirrors existing copyrighted material, which can result in IP infringements on a mass scale. This can have severe repercussions for the entertainment industry, such as the film and music industries, as well as artistic and literary works. Metadata tagging for training content and watermarking could address IP infringement and deepfake content concerns and therefore, must be an essential component of any AI strategy or regulation.²⁸⁹

GenAI also threatens the cybersecurity landscape. GenAI and LLMs are already being utilised to conduct malware, ransomware, and other social-engineering attacks through creating content that appears to be increasingly legitimate. For example, phishing attacks assisted by GenAI may lack the common traits of such attacks

²⁸⁴ “How Misinformation Helped Spark an Attempted Coup In Gabon” *Washington Post*, February 13, 2020. <https://www.washingtonpost.com/politics/2020/02/13/how-sick-president-suspect-video-helped-sparked-an-attempted-coup-gabon/>.

²⁸⁵ “Did Myanmar’s Military Deepfake A Minister’s Corruption Confession?” *KrASIA*, May 14, 2021. <https://kr-asia.com/did-myanmars-military-deepfake-a-ministers-corruption-confession>.

²⁸⁶ Akram Mohammed, “‘Deep Fake’ Video, Says DV Sadananda Gowda; Files Complaint,” *Deccan Herald*, September 19, 2021. <https://www.deccanherald.com/state/deep-fake-says-dv-sadananda-gowda-on-sleaze-video-files-complaint-1032140.html>.

²⁸⁷ Sarah Mervosh, “Distorted Videos Of Nancy Pelosi Spread On Facebook and Twitter, Helped By Trump,” *The New York Times*, May 24, 2019. <https://www.nytimes.com/2019/05/24/us/politics/pelosi-doctored-video.html>.

²⁸⁸ Zachary Smith, “Snowdon ‘Hacked’ Ukrainian TV Station Transmits Fake Zelensky Surrender Announcement,” *Forbes*, March 16, 2022. <https://www.forbes.com/sites/zacharysmith/2022/03/16/hacked-ukrainian-tv-station-transmits-fake-zelensky-surrender-announcement/?sh=247b5ae5528d>

²⁸⁹ Somdip Dey, “Which Ethical Implications Of Generative AI Should Companies Focus On?” *Forbes*, October 17, 2023, <https://www.forbes.com/sites/forbestechcouncil/2023/10/17/which-ethical-implications-of-generative-ai-should-companies-focus-on/?sh=4d5980a5239f>

such as misspellings, grammatical errors, and lack of cultural context, making their identification more challenging. Moreover, malicious AI may be deemed unnecessary by GenAI tools such as invoice reminders, which are legal and can be exploited by attackers to target victims.²⁹⁰

Attackers who are ignorant of programming languages can exploit ChatGPT's functionalities to assist them with writing code to perform malware attacks. ChatGPT can output a framework to create a zero-day ransomware capable of evading cybersecurity tools. It can also manipulate existing ransomware that has already been detected by a cybersecurity tool by generating a different algorithm to avoid detection. GenAI algorithms can identify vulnerabilities in defences and create customised attacks to exploit them while also automating various stages of an attack. Additionally, they can create malware that can adapt to and evolve on according to the target environment.²⁹¹

While pioneering GenAI applications have been explored in industries such as healthcare and fintech, national policies still need to contend with the ethical, legal, and societal implications of such applications. Industry efforts around forming standards for GenAI are fragmented and need to be more cohesive in order to confront the harms associated with GenAI. There is also a need to codify GenAI in national policy. The Indian government has applied only light-touch regulation to AI and has not specified any impending plans to regulate GenAI, noting that laws and policies related to privacy, data protection, intellectual property, and cyber security partly address the concerns associated with GenAI.²⁹²

²⁹⁰ Sabrina Ortiz, "Watch Out: Generative AI Will Level Up Cyberattacks, According To New Google Report," *ZDNET*, November 9, 2023, <https://www.zdnet.com/article/watch-out-generative-ai-will-level-up-cyber-attacks-according-to-new-google-report/>

²⁹¹ Yuen Pin Yeap, "Generative AI Is the Next Tactical Cyber Weapon For Threat Actors," *Forbes*, October 16, 2023, <https://www.forbes.com/sites/forbestechcouncil/2023/10/16/generative-ai-is-the-next-tactical-cyber-weapon-for-threat-actors/?sh=52e947f62fe9>

²⁹² "Generative Artificial Intelligence," *Ministry of Electronics and IT, Government of India*, February, 3, 2023, <https://pib.gov.in/PressReleasePage.aspx?PRID=1896016>.

As of 2023, China is the only country to have established specific regulations focused on GenAI. In early 2023, the Cyberspace Administration of China (CAC) introduced rules around GenAI and deepfakes, which came into effect in August 2023.²⁹³ The provisions are meant to address generative tech across all forms of media and specifically refer to how “deep synthesis technologies” have been used “unscrupulously” to disinform, slander, and steal people’s identities.²⁹⁴

Meanwhile, the EU AI Act remains most comprehensive regulation measure for GenAI. Proposed in 2021 and despite being delayed numerous times, in December 2023, the three branches of the EU “provisionally agreed” to pass the law. It was subsequently passed in March 2024.²⁹⁵ The Act divides its rules based on the level of risk that an AI system poses to society, stating that “the higher the risk, the stricter the rules.”²⁹⁶ However, while the Act initially had stringent requirements for GenAI, most of these have now been watered down thanks to growing concerns among member states like France, Germany, and Italy that such severity could negatively affect the AI market in the EU and hamper innovation.²⁹⁷

On the other hand, the US still needs to implement comprehensive AI regulation despite being home to some of the most prominent players in the field such as OpenAI, Amazon, Google, and NVIDIA. Its most significant initiative thus far has been an EO by the Biden administration which directed government agencies to develop safety standards and build on voluntary, non-binding agreements

²⁹³ “Provisions On the Administration Of Deep Synthesis Internet Information Services (Draft for solicitation of comments),” *China Law Translate*, January 28, 2022, <https://www.chinalawtranslate.com/en/deep-synthesis-draft/>.

²⁹⁴ “Regulations On the In-depth Synthesis Management Of Internet Information Services,” *Government of China*, November 3, 2022, https://www.gov.cn/zhengce/zhengceku/2022-12/12/content_5731431.htm.

²⁹⁵ “Artificial Intelligence Act: MEPs Adopt Landmark Law,” *European Parliament*, March 13, 2024, <https://www.europarl.europa.eu/news/en/press-room/20240308IPR19015/artificial-intelligence-act-meps-adopt-landmark-law>

²⁹⁶ Jorge Liboreiro, “The Higher the Risk, the Stricter the Rule’: Brussels’ New Draft Rules On Artificial Intelligence,” *Euronews*, April 21, 2021, <https://www.euronews.com/my-europe/2021/04/21/the-higher-the-risk-the-stricter-the-rule-brussels-new-draft-rules-on-artificial-intellige>

²⁹⁷ Emilia David, “The EU AI Act Passed - Now Comes the Waiting,” *The Verge*, December 15, 2023, <https://www.theverge.com/2023/12/14/24001919/eu-ai-act-foundation-models-regulation-data>.

signed by large AI players. The few bills introduced in the Senate have revolved chiefly around deepfakes and watermarking and need to be more comprehensive.²⁹⁸ The decentralised structure of the US government, coupled with political differences and the complex nature of AI itself, are the primary issues forestalling the process. Some states have enacted laws, such as the “deepfake legislation” in California.²⁹⁹ However, current regulatory efforts are too fragmented to be of any real significance, and the precise approach to AI regulation in the US remains elusive.

While extant GenAI regulations and considerations are too nascent to be monitored and evaluated for their effectiveness, a national acknowledgement of the policy interest in the technology is essential to spark regulatory discourse around it. Any comprehensive AI policy must encompass GenAI and anticipate forthcoming shifts in the GenAI landscape. Therefore, regulatory bodies need to collaborate with industry stakeholders, academia, and civil society to forge a balanced framework that fosters innovation while safeguarding against potential harm. Since this is a policy consideration that extends beyond national borders, international cooperation also plays a pivotal role in shaping robust GenAI policies.

²⁹⁸ Bill Whyman, “AI Regulation Is Coming- What Is the Likely Outcome?” *Centre For Strategic & International Studies*, October 10, 2023, <https://www.csis.org/blogs/strategic-technologies-blog/ai-regulation-coming-what-likely-outcome>.

²⁹⁹ Natasha Allen and Louis Lehot, “What To Expect In Evolving U.S. Regulation Of Artificial Intelligence In 2024,” *Foley & Lardner LLP*, December 7, 2023, <https://www.foley.com/insights/publications/2023/12/us-regulation-artificial-intelligence-2024/>.

Revolutionary AI Case 8: First Film Written and Directed By AI³⁰⁰

On 17 December 2023, the first film ever to be written and directed by AI, *The Safe Zone*, was released. The film, created using OpenAI's ChatGPT, is set in a dystopian future where AI has taken over the world. The producers asked ChatGPT to develop ideas for the movie's plot and picked the top five, which they then fed back to the AI. They found that the tool quickly digressed from the central theme, and they had to keep reminding it to course-correct.

Nevertheless, ChatGPT directed the entire film by creating a shot list for the film, along with a complete breakdown of camera positioning, cast positions, lighting, and facial expressions for each character in the shot. It also gave inputs on costumes and production design. Subsequently, GenAI-based imaging tools DALLE-2 and Midjourney were used to create a storyboard for the film. The result highlights possibilities for AI and human collaboration in the future.

Quantum AI

Emerging technologies like AI are able to intersect with other existing and emerging technologies. A prime example is quantum AI, which makes it possible to run machine-learning algorithms using quantum computers. Once quantum computers become a reality, they will possess "quantum advantage", which will enable them to solve a particular class of problems much faster than classical computers. There is also a possibility that these computers will include machine learning, which is a subset of AI wherein computers can sift through large volumes of data and identify patterns, thus enabling them to make inferences in unfamiliar situations.³⁰¹ The release of IBM's 1000-qubit processor, for instance,³⁰² seems to be on track to merge GenAI and quantum computing. However, there is a need to examine future implications, potential threats, and current relevance for policymakers, as the technology seems to be a while away.

³⁰⁰ Kamya Pandey, "First Film Ever Written and Directed By AI: The Safe Zone," *JUMPSTART*, January 4, 2023, <https://www.jumpstartmag.com/first-film-ever-written-and-directed-by-ai-the-safe-zone/>.

³⁰¹ David Castelvecchi, "The AI-Quantum Computing Mash-Up: Will It Revolutionize Science?" *Nature*, January 2, 2024, <https://www.nature.com/articles/d41586-023-04007-0>.

While quantum algorithms exist that exponentially speed up machine learning algorithms, there have been cases where this assertion has been proven wrong. For example, in 2018, a computer scientist found a way to beat a quantum computing machine-learning algorithm that was devised in 2016.³⁰³ Further, classical data may be incompatible with quantum computers due to the fact that the functioning of quantum computers differs from classical computers. Therefore, even if quantum computers process data faster, the complications involved at the input and output stages could neutralise the impact of the increased speed.³⁰⁴

Some proponents of quantum AI argue that speed is not the only metric by which quantum algorithms should be judged. Machine learning using quantum computers could also identify patterns in data that a classical computer cannot through utilising “quantum entanglement”, which establishes correlations between quantum bits and, therefore, between data points. Additionally, the problem of incompatibility can be overcome by utilising inherently quantum data obtained via quantum sensors. However, this is also something that would remain in the distant future.³⁰⁵

Despite these complications, the question remains: what would happen if quantum AI becomes viable soon? Even if machine learning is not presently entirely compatible with quantum computers, some form of it is likely to be compatible. The pace of development of GenAI has raised several ethical concerns. If quantum AI is to become a reality, it would dwarf the progress made by AI so far. Machine learning algorithms are typically restricted by the processing power of computers, and the speed provided by quantum computers can likely boost machine-learning capabilities significantly. While it may be difficult to implement policy measures at present, any AI regulation that is enacted now could have ramifications on quantum AI.

³⁰² “IBM Launches First-Ever 1,000-Qubit Chip: What It Means For Tech Industry, Scientists And More,” *Times of India*, December 5, 2023, <https://timesofindia.indiatimes.com/gadgets-news/ibm-launches-first-ever-1000-qubit-chip-what-it-means-for-tech-industry-scientists-and-more/articleshow/105758243.cms>.

³⁰³ Castelvechi, “The AI-Quantum Computing Mash-Up: Will It Revolutionize Science?”

³⁰⁴ Castelvechi, “The AI-Quantum Computing Mash-Up: Will It Revolutionize Science?”

³⁰⁵ Castelvechi, “The AI-Quantum Computing Mash-Up: Will It Revolutionize Science?”

Recommendations for a Global AI Framework

WHILE AI HOLDS IMMENSE potential for societal benefits and has resulted in investments across countries, regulation needs to focus on its potential risks, including political interference, discrimination through algorithmic bias, mass surveillance, job displacement, and existential threats such as the emergence of super-intelligent entities.³⁰⁶

Various countries are developing regulatory frameworks for AI, governed by different motivations and approaches, including investment in innovation, research, and development. The EU aims to balance innovation with safeguarding fundamental rights, while China emphasises information control and societal stability. The US has been slower in enacting regulations, relying more on voluntary commitments from industry players. India seeks to promote domestic innovation while ensuring citizen safety through its regulatory efforts.³⁰⁷

Due to AI's global impact, international governance is crucial through efforts such as establishing guiding principles, codes of conduct, and expert-led reports by organisations like the G7 and the UK. However, pursuing geopolitical and economic advantages poses challenges to global regulation.³⁰⁸

³⁰⁶ European Parliament, "Artificial Intelligence: Threats and Opportunities," *European Parliament*, September 23, 2020, <https://www.europarl.europa.eu/topics/en/article/20200918STO87404/artificial-intelligence-threats-and-opportunities>.

³⁰⁷ Emma Klein and Stewart Patrick, "Envisioning a Global Regime Complex To Govern Artificial Intelligence," *Carnegie Endowment for International Peace*, March 21, 2024, <https://carnegieendowment.org/2024/03/21/envisioning-global-regime-complex-to-govern-artificial-intelligence-pub-92022>.

³⁰⁸ Emma Klein and Stewart Patrick, "Envisioning a Global Regime Complex To Govern Artificial Intelligence."

Governing AI requires navigating complex regulatory landscapes involving numerous stakeholders and geopolitical considerations. Despite international efforts, overcoming barriers to global regulation remains a significant challenge. Australia, for example, has tried to discuss a national approach to ethical AI governance that focuses on individual innovation and social accountability. While global governance is a challenge, it is a requirement to ensure the future of any emerging technology, including AI.³⁰⁹

Governing technology is a complex process, and cybersecurity governance remains fragmented despite several attempts at global governance.³¹⁰ Addressing a globally accountable emerging technology, especially one that is as rapidly growing and changing as LLMs and AI, would require an organisation like the World Economic Forum (WEF), which can cover more countries than the G20, to form a governance framework. The WEF has already addressed quantum computing,³¹¹ and a similar approach can be adopted to balance private-sector demands and government and security requirements in AI. Such a framework could have the following features:³¹²

- **Foster Trust and Loyalty:** By adhering to these principles, organisations can cultivate public trust in their products and services while driving consumer loyalty towards AI-enabled offerings. These can be certified similarly to International Organization for Standardization (ISO) certifications.

³⁰⁹ High-Level Advisory Body on AI, “Interim Report: Governing AI For Humanity,” *United Nations*, November 2023, https://www.un.org/sites/un2.un.org/files/ai_advisory_body_interim_report.pdf.

³¹⁰ Emma Sandvik Ling, “Global Cybersecurity Governance Is Fragmented – Get Over It,” *E-International Relations*, April 11, 2021, <https://www.e-ir.info/2021/04/10/global-cybersecurity-governance-is-fragmented-get-over-it/>.

³¹¹ “Quantum Computing Governance Principles,” *World Economic Forum*, November 7, 2023, <https://www.weforum.org/publications/quantum-computing-governance-principles/>.

³¹² Department of Industry Science and Resources, “Australia’s AI Ethics Principles,” *Government of Australia* (2022), <https://www.industry.gov.au/publications/australias-artificial-intelligence-ethics-framework/australias-ai-ethics-principles>.

- **Prioritise Human, Societal, and Environmental Well-Being:** AI systems should benefit individuals, society, and the environment, prioritising their overall well-being. Therefore, innovation should be motivated by positive impact. An ethics committee that has regular re-appointments can be instated to ensure human participation.
- **Uphold Human-Centred Values:** The development and deployment of AI systems should respect human rights, diversity, and individual autonomy. AI systems should be inclusive, accessible, and free from unfair discrimination against individuals, communities, or groups. Additionally, they should respect privacy rights, uphold data protection standards, and ensure the data security used by AI systems.
- **Establish Contestability:** Processes should be implemented to allow individuals or communities to challenge the use or outcomes of AI systems when they significantly impact them.
- **Ensure Accountability:** Individuals responsible for various stages of the AI life cycle should be held accountable, enabling human oversight to ensure ethical outcomes.

Conclusion

AI DEVELOPMENTS AND ITS applications have addressed the concerns of its early critics.³¹³ AI has already become a significant actor in geopolitics due to its growing use by malicious non-state actors in the spread of misinformation and propaganda, as well as its role in the potential development of autonomous weapons. In order for the benefits from the technology to be shared equally, the “AI divide”³¹⁴ between the Global North and South needs to be overcome. Equal representation is also required to ensure that less developed countries have a voice regarding current and future AI regulation. Global collaboration is essential in this regard, with multilateral organisations and groupings like the G20 playing a pivotal role, such as through its Voice of the Global South Summit.³¹⁵

Almost every G20 country has outlined a national AI strategy. While most of these are comprehensive, particularly in the case of tech giants like the US, UK, EU, and China, there is room for improvement in some countries, like South Africa. Global South countries such as Brazil, Argentina, and India have proven that an effective national strategy can help achieve progress, even amid economic limitations, by contributing to social services. African countries like Kenya and Nigeria have focused their AI efforts on areas that will pay maximum dividends, such as agriculture.

³¹³ “Artificial Intelligence - Not a Buzzword Anymore. Its Evolving and Growing Fast,” *WIPRO*, July 2021, <https://www.wipro.com/business-process/artificial-intelligence-not-a-buzzword-anymore-its-evolving-and-growing-fast/>.

³¹⁴ Yu et al, “The ‘AI Divide’ Between the Global North and the Global South.”

³¹⁵ “Chair’s Summary: 2nd Voice Of the Global South Summit,” *Ministry of External Affairs, Government of India*, November 21, 2023, https://www.mea.gov.in/bilateral-documents.htm?dtl/37278/Chairs_summary_2nd_Voice_of_the_Global_South_Summit_November_17_2023.

Indonesia and Singapore have managed to manoeuvre foreign investments effectively to meet their goals.

Future-facing strategies will be paramount, given the steadily increasing effectiveness of AI. GenAI is already posing a severe threat to cybersecurity, especially when used by non-state groups. In the face of increasing biases and inequality, as well as lack of transparency and IP theft, RAI governance needs to be prioritised. Although quantum AI is not an imminent threat, it would be prudent to prepare for its arrival. Whether these need to be addressed by individual governments as part of their national AI strategies, through separate regulations like the EU AI Act, or by international conventions remains an open question and needs to be confronted sooner than later.

The G20 has proved to be an essential forum to raise these concerns and seek appropriate solutions. It has also served as a critical platform for the Global South to vocalise its concerns. The inclusion of the African Union as a permanent member of the G20 will further bolster this cause.³¹⁶ The G20 New Delhi Leaders' Declaration stated "Harnessing AI Responsibly For Good and All" as one of its main provisions, citing responsibility, accountability, and transparency as the primary tenets that need to be adhered to while incorporating AI regulation.³¹⁷ At a time when the importance of multilateral organisations and groupings is declining, these are welcome steps that may pave the way for a broader global consensus on AI governance.

³¹⁶ Chido Munyati, "The African Union Has Been Made a Permanent Member Of the G20 - what does it mean for the continent?" *World Economic Forum*, September 14, 2023, <https://www.weforum.org/agenda/2023/09/african-union-g20-world-leaders/>.

³¹⁷ "G20 India 2023," *Center for AI And Digital Policy*, <https://www.caidp.org/resources/g20-india-2023/>.

Appendix

Table 1: AI Capacity Scores for G20 Countries

Country	Talent	Infrastructure	Operating Environment	Research	Development	Government Strategy	Commercial Development*	Scale**	Intensity***
Argentina	17.50	52.50	80.90	2.60	0.40	56.70	1.40	15.80	20.00
Australia	34.20	54.30	53.80	34.40	11.70	83.30	7.00	23.60	47.50
Brazil	29.30	55.80	75.70	8.50	1.90	71.40	3.30	21.20	22.70
Canada	46.00	62.10	93.10	34.00	18.90	93.40	18.90	31.90	56.90
China	30.00	92.10	99.70	54.70	80.60	93.50	43.10	67.80	39.30
European Union****	27.95	60.60	87.69	15.70	7.07	70.35	6.45	20.95	40.03
France	41.50	68.90	84.20	21.40	8.90	87.30	10.80	29.50	39.70
Germany	57.00	68.20	90.70	29.30	19.50	93.90	10.30	34.70	46.40
India	86.20	34.70	91.10	12.00	7.60	56.00	8.90	33.70	20.00
Indonesia	28.10	40.90	80.00	3.90	0.30	55.00	2.50	18.00	19.50
Italy	28.50	56.60	93.70	16.50	3.20	89.80	3.70	24.00	31.60
Japan	38.00	80.80	92.40	18.60	22.20	80.30	6.80	32.20	36.40
Kenya	10.6	13.5	59.3	1.3	0.1	9.0	2.1	7.6	9.4
Mexico	20.20	43.80	78.20	4.20	0.40	53.50	1.10	16.10	18.70
Netherlands	45.20	65.70	90.30	27.10	15.70	71.80	7.90	25.50	55.50
Nigeria	16.6	5.0	64.6	3.5	0.1	13.9	1.3	8.0	10.7
Russia	25.10	64.10	80.70	7.90	6.70	91.30	1.70	22.10	24.90
Saudi Arabia	14.30	63.30	88.10	8.20	1.30	100.00	6.00	20.60	29.50
Singapore	56.9	82.8	85.7	48.8	24.4	81.8	26.2	28.1	100
South Africa	11.40	41.40	81.50	3.80	0.30	0.00	5.40	13.70	17.10
South Korea	35.10	74.40	91.40	24.30	60.90	91.90	8.30	31.30	57.30
Spain	31.50	65.20	90.20	14.50	4.30	93.40	4.70	24.60	34.50
Türkiye	25.00	45.50	93.60	6.90	0.30	72.50	2.00	19.00	23.30

United Arab Emirates	16.9	80.8	77.8	9.4	1.7	72.8	5.3	20.0	32.5
United Kingdom	53.80	61.80	79.50	38.10	19.80	89.20	20.00	34.60	52.80
United States	100.00	100.00	82.80	100.00	100.00	90.30	100.00	100.00	60.50
EU Countries									
Austria	27.60	57.00	94.70	21.30	7.40	63.10	5.80	21.70	44.00
Belgium	27.40	55.30	84.80	21.90	5.10	57.00	6.60	21.60	41.40
Czech Republic	20.80	53.60	80.40	11.40	2.70	81.20	2.80	18.10	31.90
Denmark	30.60	67.50	100.00	19.40	8.80	75.00	8.30	23.30	50.90
Estonia	22.00	57.20	88.30	8.50	2.90	78.80	17.50	17.70	44.90
Finland	34.50	73.00	97.70	27.40	13.10	82.70	9.50	24.20	62.00
France	41.50	68.90	84.20	21.40	8.90	87.30	10.80	29.50	39.70
Germany	57.00	68.20	90.70	29.30	19.50	93.90	10.30	34.70	46.40
Greece	26.70	46.50	60.50	13.30	1.80	15.40	2.90	14.00	28.60
Hungary	19.00	59.10	83.10	8.10	1.50	59.10	3.40	17.90	28.90
Ireland	31.80	60.80	88.00	13.60	19.20	71.70	8.60	20.10	49.60
Italy	28.50	56.60	93.70	16.50	3.20	89.80	3.70	24.00	31.60
Lithuania	19.20	56.10	80.20	5.30	2.20	61.00	3.50	15.40	29.10
Luxembourg	24.00	74.90	90.40	19.40	7.50	66.80	8.80	19.00	53.10
Malta	17.30	56.30	87.70	6.50	12.80	72.60	4.30	15.30	36.70
Poland	31.90	59.00	87.80	10.10	2.20	89.10	2.70	22.00	31.20
Portugal	20.30	56.40	92.60	11.40	2.20	72.60	6.60	19.40	34.70
Slovakia	13.60	54.10	84.10	3.40	0.60	43.50	1.90	14.10	22.50
Slovenia	10.90	59.70	79.90	13.30	2.50	74.80	2.70	16.40	33.30
Spain	31.50	65.20	90.20	14.50	4.30	93.40	4.70	24.60	34.50
Sweden	33.70	62.20	99.90	22.40	11.40	47.00	8.60	22.50	50.10

Source: Tortoise Media, *The Global AI Index, 2023*, <https://www.tortoisemedia.com/intelligence/global-ai/>.

*Commercial development is a composite variable that measures the average funding of AI companies, business self-reportage using AI, number of AI companies, number of AI companies per capita, number of AI startups, number of AI startups per capita, number of AI unicorns, total funding of AI companies, total funding of AI companies proportional to GDP, and total funding of AI startups.

**Scale measures a nation's absolute AI capacity

***Intensity measures AI capacity relative to the size of a country's population and economy

****Scores for the EU are calculated by taking an average of the scores of available member countries. Scores for the following countries are not included due to unavailability: Bulgaria, Croatia, Republic of Cyprus, Latvia, Romania.

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