INDONESIA

Artificial Intelligence Readiness Assessment Report

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Acknowledgements

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Foreword

The Age of Artificial Intelligence is here. The world is now changing at a pace not seen in decades, even centuries. AI-based tools and applications make our lives easier, smoother, and richer. They help us move efficiently, get informed, get credit, get a job, and get our taxes done.

But in its current form, AI reproduces and amplifies many of the social challenges we face. It is not acceptable that around a third of the world's population still lacks adequate internet access. Upstream, the AI industry is highly concentrated, with just two countries – the United States and China – and a dozen companies accounting for a major share of the sector. This can lead only to greater inequality of outcomes – including gender disparities – downstream. Non-diverse AI teams, unrepresentative datasets, and opaque and biased algorithms can cause harm, particularly to those who are already vulnerable, whether companies or individuals, children and young people, women, or entire democracies.

That is why UNESCO developed the Recommendation on the Ethics of Artificial Intelligence, to make sure the use of AI is based on the protection and promotion of human rights, human dignity, and environmental sustainability, and that these values are then translated into principles such as accountability, transparency, and privacy. The Recommendation also sets out concrete policy actions that governments can draw on to steer technological developments in a responsible direction, premised on the belief that light-touch regulation, which has until now remained the norm, is insufficient. We need capable governments that are well equipped, in terms of competencies, institutions and laws, to frame responsible AI development and protect the rule of law online, and public and private developers who are accountable for putting human rights and fundamental freedoms – not profits or geopolitical considerations – first.

The Readiness Assessment Methodology (RAM) is a diagnostic tool intended to assist Member States in upholding their commitment to the Recommendation by helping them understand how prepared they are to implement AI ethically and responsibly for all their citizens. By highlighting any institutional, regulatory or data gaps and obstacles, it enables UNESCO to tailor support for governments to fill those gaps to ensure an ethical AI ecosystem aligned with the Recommendation.

Indonesia is a big, diverse country that is sure to benefit from the adoption of artificial intelligence, and we applaud the initiatives the Indonesian government has taken so far - including a comprehensive national strategy on AI that notes ethics and policy formulation as key opportunities.

In our report, we found Indonesia is making progress in the responsible adoption of AI technologies. The passing of a data protection law, the freedom of information act and the broad coverage of the cyberlaw demonstrates the drive to meet global standards. However, AI-specific regulations need to be detailed and expanded, particularly around AI liability and reporting. Including more public oversight in AI related policymaking is crucial. It was a pleasure working with the Government of Indonesia to conduct this exercise. We are inspired and energized by how all stakeholders in the country capably demonstrates how to collaborate in harmony for a common goal: technology that delivers fair, sustainable, and inclusive outcomes.

Gabriela Ramos
Assistant Director-General for Social and Human Sciences, UNESCO

Abbreviations and Acronyms

Abbreviations	English	Indonesian	Explanation
ACL	Association for Computational Linguistics	Asosiasi untuk Linguistik Komputasional	An international scientific society for the field of computational linguistics.
ADB	Asian Development Bank	Bank Pembangunan Asia	A regional development bank established to promote economic and social development in Asian and Pacific countries.
AI	Artificial Intelligence	Kecerdasan Artifisial	A branch of computer science dealing with the simulation of intelligent behavior in computers.
AIES	Artificial Intelligence Ethics Society	Masyarakat Etika Kecerdasan Artifisial	An organization dedicated to the study and promotion of ethical practices in artificial intelligence.
API	Application Programming Interface	Antarmuka Pemrograman Aplikasi	A set of routines, protocols, and tools for building software and applications.
ARU	Teacher Assistant	Asisten Guru	A role in education, typically providing support to a lead teacher in the classroom.
ASEAN	Association of Southeast Asian Nations	Asosiasi Negara-Negara Asia Tenggara	A regional intergovernmental organization comprising ten countries in Southeast Asia, which promotes intergovernmental cooperation and facilitates economic, political, security, military, educational, and sociocultural integration among its members and other countries in Asia.
BAKTI Kominfo	Agency for Accessibility of Telecommunications and Information	Badan Aksesibilitas Telekomunikasi dan Informasi	An agency under the Indonesian Ministry of Communication and Information that focuses on internet access and digital infrastructure.

Bappenas	National Development Planning Agency	Badan Perencanaan Pembangunan Nasional	The Indonesian government agency responsible for the planning of national development.
BCA	Central Asia Bank	Bank Central Asia	One of the largest private banks in Indonesia.
BIG	Geospatial Information Agency	Badan Informasi Geospasial	The Indonesian government agency responsible for providing geospatial information.
Binus	Bina Nusantara University	Universitas Bina Nusantara	A private university located in multiple cities across Indonesia.
BPK	Audit Board of Indonesia	Badan Pemeriksa Keuangan	It is tasked with auditing state finances, ensuring accountability and transparency in government spending
BPKP	Financial and Development Supervisory Board	Badan Pengawasan Keuangan dan Pembangunan	An agency in Indonesia that conducts financial and development supervision.
BPPT	Agency for the Assessment and Application of Technology	Badan Pengkajian dan Penerapan Teknologi	An Indonesian government agency responsible for carrying out government duties in the field of assessment and application of technology.
BPS	Statistics Indonesia	Badan Pusat Statistik	The agency responsible for conducting statistical surveys and providing statistical data in Indonesia.
BRI	People's Bank of Indonesia	Bank Rakyat Indonesia	One of the largest state-owned banks in Indonesia.
BRIN	National Innovation and Research Agency	Badan Riset Inovasi Nasional	A government institution that is formed after the merger of all government research bodies. Responsible to the President and entasked on coordinating and conducting research and innovation in the country
BSKAP	Standards, Curriculum, and Education Assessment Agency	Badan Standar, Kurikulum, dan Asesmen Pendidikan	BSKAP is the government agency under MoECRT that has the duty to organize the preparation of standards, curriculum, and educational assessments.

CSO	Civil Society Organizations	Organisasi Masyarakat Sipil	Non-governmental organizations that are involved in the promotion of social interests and collective values of the community.
CVPR	Conference on Computer Vision and Pattern Recognition	Konferensi tentang Visi Komputer dan Pengenalan Pola	An annual conference on computer vision and pattern recognition, widely considered one of the most important events in its field.
DIKTI	Directorate General of Higher Education	Direktorat Jenderal Pendidikan Tinggi	The directorate general in Indonesia responsible for managing higher education.
DPD	Regional Representatives Council	Dewan Perwakilan Daerah	One of two elected chambers of the People's Consultative Assembly (MPR), This council represents the interests of regions in the national legislature and works alongside the DPR and MPR.
DPR	House of Representatives	Dewan Perwakilan Rakyat	One of two elected chambers of the People's Consultative Assembly (MPR), the national legislature of Indonesia. This body is responsible for making laws, representing the people, and overseeing the executive branch.
DTS	Digital Talent Scholarship	Beasiswa Talenta Digital	A scholarship program in Indonesia aimed at developing digital talents.
EACL	European Chapter of the Association for Computational Linguistics	Cabang Eropa dari Asosiasi untuk Linguistik Komputasional	The European chapter of the Association for Computational Linguistics.
EMNLP	Conference on Empirical Methods in Natural Language Processing	Konferensi tentang Metode Empiris dalam Pengolahan Bahasa Alami	An annual conference organized by ACL, dedicated to the advancement of computational linguistics.
ESG	Environmental, social, and governance	Lingkungan, Sosial, dan Tata Kelola	A set of standards for a company's operations that socially conscious investors use to screen potential investments.

FACCT	Fairness, Accountability, Confidentiality, Transparency	Keadilan, Akuntabilitas, Kerahasiaan, Transparansi	Principles that guide the ethical use and development of artificial intelligence.
GCI	Global Cybersecurity Index	Indeks Keamanan Siber Global	A measure of the commitment of countries to cybersecurity.
GDP	Gross Domestic Product	Produk Domestik Bruto	GDP, The total value of goods produced and services provided in a country during one year.
HAM	Human Rights	Hak Asasi Manusia	The basic rights and freedoms to which all individuals are entitled.
ICCV	International Conference on Computer Vision	Konferensi Internasional tentang Visi Komputer	A biennial research conference of leading researchers in the field of computer vision.
ICHEI	International Centre for Higher Education Innovation	Pusat Inovasi Pendidikan Tinggi Internasional	An organization under the auspices of UNESCO that aims to expand quality and equitable education opportunities through collaborations in higher education around the world.
ICLR	International Conference on Learning Representations	Konferensi Internasional tentang Representasi Pembelajaran	An annual conference addressing representation learning, commonly known as deep learning and artificial intelligence.
ICML	International Conference on Machine Learning	Konferensi Internasional tentang Pembelajaran Mesin	An international conference that provides a leading international forum for the presentation of new machine learning ideas.
ICT	Information and communications technology	Teknologi Informasi dan Komunikasi	An umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them.

IEC	International Electrotechnical Commission	Komisi Elektroteknik Internasional	A non-profit, non-governmental international standards organization that prepares and publishes international standards for all electrical, electronic and related technologies.
ILO	International Labour Organization	Organisasi Buruh Internasional	A United Nations agency whose mandate is to advance social justice and promote decent work by setting international labor standards.
IoT	Internet of Things	-	A system of interrelated computing devices, mechanical and digital machines provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.
ISO	International Organization for Standardization	Organisasi Internasional untuk Standardisasi	An independent, non-governmental international organization with a membership of 165 national standards bodies that develops and publishes standards.
ITB	Bandung Institute of Technology	Institut Teknologi Bandung	A public university in Bandung, Indonesia, known for its strong emphasis on science and technology.
ITS	Institute of Technology Sepuluh Nopember	Institut Teknologi Sepuluh Nopember	A public university in Surabaya, Indonesia, focused on education and research in technology.
ITU	International Telecommunication Union	Uni Telekomunikasi Internasional	A specialized agency of the United Nations responsible for issues related to information and communication technologies.
KBLI	Standard Classification of Indonesian Business Fields	Klasifikasi Baku Lapangan Usaha Indonesia	A system used in Indonesia to classify business activities.

KIP	Central Information Commission	Komisi Informasi Pusat	A commission in Indonesia responsible for ensuring the implementation of public information disclosure.
Kemenkominfo/ Kominfo/Komdigi	Ministry of Communication and Information Technology	Kementerian Komunikasi dan Informatika	The government ministry in Indonesia responsible for communication and informatics. Since October 2024, the Ministry of Communications and Digital Affairs (Kementerian Komunikasi dan Digital).
KORIKA	Collaboration for Research and Industrial Innovation in Artificial Intelligence	Kolaborasi Riset dan Inovasi Industri Kecerdasan Artifisial	A multi-helix association that involves government, academia, industry, media, and the community, all sharing the same goal of accelerating AI adoption and innovation.
KY	Judicial Commission	Komisi Yudisial	This body oversees the conduct of judges in Indonesia, ensuring accountability and integrity within the judiciary
KYC	Know Your Customer	Kenali Pelanggan Anda	The process of a business verifying the identity of its clients and assessing their suitability, along with the potential risks of illegal intentions towards the business relationship.
LLM	Large Language Model	Model Bahasa Besar	A type of artificial intelligence model designed to understand and generate human language text.
LPDP	Indonesia Endowment Fund for Education	Lembaga Pengelola Dana Pendidikan	The Indonesia Endowment Fund for Education Agency is a public service agency of the Ministry of Finance of Indonesia mandated with managing the state's education endowment fund.
MA	Supreme Court	Mahkamah Agung	It is the highest court in Indonesia, responsible for final appeals in civil and criminal cases, as well as administrative matters

MBZUAI	Mohamed bin Zayed University of Artificial Intelligence	Universitas Mohamed bin Zayed untuk Kecerdasan Buatan	A university in UAE dedicated to the study and advancement of artificial intelligence.
MK	Constitutional Court	Mahkamah Konstitusi	This institution has the authority to adjudicate constitutional issues, including disputes over laws and regulations, and to oversee judicial reviews of legislation to ensure compliance with the Constitution.
ML	Machine Learning	Pembelajaran Mesin	A type of artificial intelligence that enables a system to learn from data rather than through explicit programming.
MoECRT	Ministry of Education, Culture, Research, and Technology	Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi	The Indonesian government ministry responsible for managing education, culture, research, and technology.
MOOC	Massive Open Online Course	Kursus Online Terbuka Masif	A course of study made available over the Internet without charge to a very large number of people.
MPR	People's Consultative Assembly	Majelis Permusyawaratan Rakyat	It is the legislative body of Indonesia, comprising members from the House of Representatives (DPR) and the Regional Representative Council (DPD). The MPR is responsible for amending the Constitution.
NeurIPS	Conference on Neural Information Processing Systems	Konferensi tentang Sistem Pengolahan Informasi Neural	An annual conference featuring the presentation of peer-reviewed papers in the field of artificial intelligence.
NLP	Natural Language Processing	Pengolahan Bahasa Alami	A field of artificial intelligence that focuses on the interaction between computers and humans through natural language.

OECD	Organization for Economic Co-operation and Development	Organisasi untuk Kerjasama Ekonomi dan Pembangunan	An international organization that works to build better policies for better lives. Their goal is to shape policies that foster prosperity, equality, opportunity, and well-being for all.
OJK	Indonesian Financial Services Authority	Otoritas Jasa Keuangan	An Indonesian government agency responsible for regulating and supervising the financial services sector.
PIKA	Center for Artificial Intelligence Innovation	Pusat Inovasi Kecerdasan Artifisial	A platform for all elements of the quad helix, namely government, industry, academics, and community to collaborate on artificial intelligence research and innovation under BPPT.
PMM	Independent Teaching Platform	Platform Merdeka Mengajar	The Merdeka Mengajar Platform (Independent Teaching Platform) is a digital platform for Indonesia's teachers, making it easier for teachers to teach according to students' abilities, provide training to improve competencies, and work to inspire colleagues.
PP	Government Regulation	Peraturan Pemerintah	A type of legislation in Indonesia that is enacted by the President.
PSE	Electronic System Organizers	Penyelenggara Sistem Elektronik	A terminology for any business actor that provides electronic communication facilities, e.g. the internet, for information transactions
PUI-PT	Center of Excellence for Science and Technology in Higher Education	Pusat Unggulan Iptek Perguruan Tinggi	A center of excellence in science and technology at the university level in Indonesia.
R&D	Research and Development	Riset dan pengembangan	A process by which a company works to obtain new knowledge that it might use to create new technology, products, services, or systems that it will either use or sell.

RPJP	Long-Term Development Plan	Rencana Pembangunan Jangka Panjang	A government plan outlining the long-term goals and strategies for national development.
RPJPN	National Long-Term Development Plan	Rencana Pembangunan Jangka Panjang Nasional, which translates to the National Long-Term Development Plan	This plan outlines Indonesia's strategic vision and development goals over a 20-year period. The RPJPN serves as a foundational document for national development, guiding policies and initiatives across various sectors to ensure sustainable growth and progress in the country.
SARA	Ethnicity, Religion, Race, and Inter-group Relations	Suku, Agama, Ras, dan Antargolongan	A term used in Indonesia to refer to issues related to ethnicity, religion, race, and inter-group relations.
SDG	Sustainable Development Goals	Tujuan Pembangunan Berkelanjutan	A collection of 17 global goals set by the United Nations General Assembly for a better and more sustainable future.
SDI	One Data Indonesia	Satu Data Indonesia	An Indonesian government initiative to integrate data management across all government agencies.
SNI	Indonesian National Standard	Standar Nasional Indonesia	The national standardization agency of Indonesia.
SPBE	Electronic-Based Government System	Sistem Pemerintahan Berbasis Elektronik	Administration of government that utilizes information and communication technology to provide services to SPBE Users.
STEM	Science, Technology, Engineering and Mathematics	Sains, Teknologi, Rekayasa, dan Matematika	A curriculum based on the idea of educating students in four specific disciplines — science, technology, engineering and mathematics — in an interdisciplinary and applied approach.
TPAMI	IEEE Transactions on Pattern Analysis and Machine Intelligence	Transaksi IEEE tentang Analisis Pola dan Kecerdasan Mesin	A monthly peer-reviewed scientific journal published by the IEEE Computer Society.

UI	University of Indonesia	Universitas Indonesia	A state university in Depok, West Java and Salemba, Jakarta, Indonesia. Universitas Indonesia is the oldest tertiary-level educational institution in Indonesia.
UU	Law	Undang-Undang	The system of rules which Indonesia recognizes as regulating the actions of its citizens.
UU HAM	Human Rights Law	Undang Undang Hak Asasi Manusia	The law that governs the protection of human rights in Indonesia.
UU ITE	Law on Electronic Information and Transactions	Undang-Undang Informasi dan Transaksi Elektronik	A law in Indonesia that regulates electronic information and transactions.
UU KIP	Law on Public Information Disclosure	Undang-Undang Keterbukaan Informasi Publik	A law in Indonesia that regulates the disclosure.
UU PDP	Law on Personal Data Protection	Undang-Undang Perlindungan Data Pribadi	A law aimed at protecting individuals' personal data and regulating data handling practices by setting out rights and obligations regarding the processing of personal data.

Executive Summary

Indonesia stands to gain a lot from Artificial Intelligence (AI): it can help the country supercharge its growth and help achieve its vision for developed country status in 2045. From this report based on UNESCO's Readiness Assessment Methodology, we see that Indonesia is actively progressing towards an ethical adoption of AI. The country has enacted key steps such as setting up a national AI strategy that clearly states ethics as a key focus area, passing laws and regulations to support digital transformation, and setting up frameworks for stakeholders to collaborate. However, investments, implementation details, coordination, and standardization across all supporting sectors need to be improved for further readiness of AI adoption.

Diagnostic of Key Aspects

Below are some key points to note in the country's progress to responsibly adopt artificial intelligence technologies:

- In the **legal context**, policymakers have created strategies, blueprints, and laws that completed the checklist for regulations needed for global standards in the area of digital technology and artificial intelligence, but necessary details and specifics within the regulations, including how to address liability from AI harms and reporting scope and mechanisms for AI product providers, still needs to be defined more clearly. Public participation should also be bolstered - strong participation monitoring and supervision by the general public should ensure smooth implementation and adherence to standards.
- Indonesia is progressing to ensure gender and urban-rural gaps in digital technologies are closed, but challenges like relatively expensive internet access might stand in the way of optimum **societal inclusion**. IIndonesians generally trust AI and technology and have experienced a lot of growth in terms of digital public service. Data centers are trending green and efforts in leveraging AI to combat climate change effects are being set up, but environment-specific regulation regarding technology still lags. Digital health regulations are being pushed through these last few years after the pandemic, and the progress is promising. A more strategic approach for cultural representation and conservation through AI needs to be set up.
- **Research** in general is still underfunded (0.2% of GDP) compared to regional neighbors and the global average of around 2%, but research interests in AI are growing, and some Indonesian scientists have been featured in the world's top AI conferences. Universities are also adopting AI into programs and curriculums. Specific research into ethical and responsible AI by and for Indonesians is scarce, and this is one area that the country can improve in investing in ethical AI adoption.
- Large investments in the startup ecosystem have significantly increased AI exposure to the public. However, the adoption of AI in the private sector beyond startups remains in its early stages and requires guidance to have a broader impact on **economic growth**.
- There is a critical need for a strong commitment to funding both the hard and soft **infrastructure** tthat supports AI. This includes enhancing cybersecurity capacity, reliable networks, and data centers and ensuring affordable access to computing infrastructure for AI practitioners and stakeholders.

Developing a National Multi-stakeholder Roadmap

Collaboration is key to ensuring ethical AI adoption in Indonesia. Hence, setting a common ground on worries, needs, and expectations is paramount to ensure momentum and alignment in future collaboration.

Stakeholder concerns

Consultations with stakeholders suggest they still hold these 8 major groups of concerns about the adoption of AI:

1. Incorrectness and misuse of AI
2. Security and safety
3. Economic and socio-cultural impact
4. Environmental impact
5. Human cognition
6. Violation of rights and privacy
7. Bias and discrimination
8. Inequality and uneven access to AI

Economic and socio-cultural impact, especially labor displacement, being the most reported issue. While assessing stakeholder's concerns, we find that concerns between stakeholders in the out-of-capital regions the National RAM Implementation Team visited and the area near the capital city Jakarta differ: in regional areas, the focus is primarily on the economic impact, particularly on employment, while in Jakarta, there is more awareness of potential irresponsible uses of AI. We also find that despite Indonesia's rich diversity and minority groups, concerns about AI's potential for discrimination remain low, highlighting the need to enhance public understanding about AI's possibility to discriminate and have a disparate impact on minority communities.

To address these concerns, stakeholders from all regions shared a largely unified perspective and proposed five key strategic clusters:

1. Governance and Regulatory Frameworks
2. Education and Skill Development
3. Democratization and Equity
4. Conflict Prevention and Risk Management
5. Public Awareness and Responsible Usage

Stakeholder Needs and Expectations

Lastly, most stakeholders mentioned a common desire for AI to help them in three areas: enhance workforce productivity, increase operational efficiency, and enhance human engagement. In order to reach this common goal, each stakeholder is expected to contribute to specific areas, such as but not limited to the following:

Government	Academia	Media	Industry and Private Sector	CSOs
❍ Infrastructure and investment ❍ Regulation and implementation ❍ Education and public awareness ❍ Security and Data Protection ❍ Governance and coordination	❍ Human Resources and Ethical Development ❍ Curriculum Integration and Education ❍ Research and Innovation ❍ Collaboration and Government Support ❍ Infrastructure and Tools	❍ Education and public awareness ❍ Ethical reporting and content validation ❍ Promotion and positive framing of AI ❍ Information accessibility and public trust	❍ Leading the charge on adoption ❍ Investment in infrastructure and talent ❍ Collaboration with the ecosystem	❍ Promote ethical AI adoption ❍ Enhance AI education and raise public awareness ❍ Provide feedback on AI-related regulations

Key Recommendations for the Findings

In terms of **regulations**, the Ministry of Communication and Digital Affairs (Komdigi) should update their AI standards to align with global benchmarks like UNESCO's Ethical AI guidelines. Emphasizing proportionality, human oversight, and accountability is essential. Investments should focus on implementing transparency, explainability, and standards adherence, incentivizing ethical AI use. A balanced regulatory approach is recommended to avoid stifling innovation while addressing AI risks. This includes expanding the regulatory sandbox model and avoiding regulatory silos by fostering strong intergovernmental collaboration. Public participation, especially from civil society organizations (CSOs), should be enhanced in AI policymaking.

A balanced regulatory approach is recommended to avoid stifling innovation while addressing AI risks. This includes expanding the regulatory sandbox model and avoiding regulatory silos by fostering strong intergovernmental collaboration. Public participation, especially from civil society organizations (CSOs), should be enhanced in AI policy-making.

As part of building **institutional frameworks** for AI adoption, a National Agency for Artificial Intelligence should be created to coordinate AI policies, set standards, and ensure cross-sector coherence. Indonesia's research effort in AI needs to be coordinated and strategized better to tackle Indonesia's unique challenges. In this regard, collaboration between government, private sector, and academia is critical, as is promoting public-private partnerships in AI research - to optimize the relatively small budget for research nationwide.

Capacity building must prioritize equitable access and social inclusion to AI education, infrastructure, and resources across Indonesia to prevent regional, gender and economic disparities. Digital literacy, especially regarding bias and discrimination in AI, should be promoted through education. AI must also support cultural preservation, ensuring the ethical use of cultural materials while promoting innovation in creative industries. Lastly, the government should help workers in areas vulnerable to AI disruption to upskill themselves, putting them on strong footing with the changing labor landscape.

Diagnosis of the national AI landscape

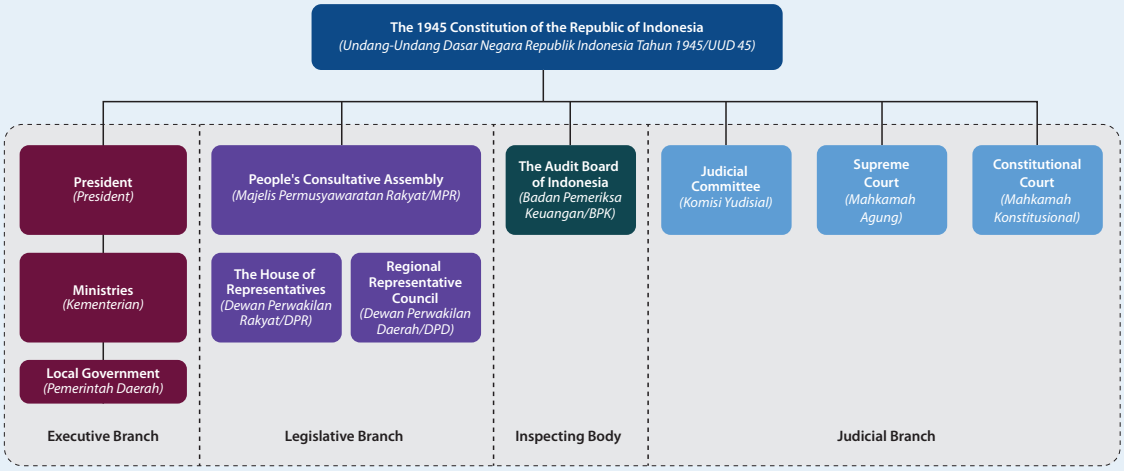
Overview

Indonesia, a strategically located archipelagic nation with a vast population, boasts a rich tapestry of cultures, local wisdom, and a steadily rising economy. This unique combination presents Indonesia with a myriad of opportunities to harness the transformative power of Artificial Intelligence (AI). AI holds immense potential not only to enhance business productivity and innovation across diverse sectors but also to help Indonesia tackle global challenges and foster a more inclusive society.

The country is looking to maximize its growth, having a long-term plan of a '2045 Golden Indonesia' marking the country's 100th year anniversary, which plots Indonesia towards a developed and sustainable future as a nation. In achieving the goal, the country faces numerous challenges, including low labor productivity (1,2), a heavy reliance on extractive industries, making its economic growth somewhat reliant on commodity prices (3), and its vulnerability to climate change - its archipelagic landscape and weather patterns put it in the top-third of countries being at risk from climate change (4). AI stands as a possible tool in helping the country navigate these challenges, and the nation is on the move to utilize it in an optimum way.

Primer on the Indonesian Government

Based on its national constitution, Indonesia is a *negara kesatuan* (unitary state) in the form of a republic (in which political power rests with the public through their representatives). This system is grounded in the 1945 Constitution, which establishes a framework for governance that includes a clear separation of powers among the executive, legislative, and judicial branches. Since 1998, Indonesia has transitioned into a more democratic system characterized by direct elections and enhanced checks and balances within government institutions. The People's Consultative Assembly (MPR) is the highest state institution, comprising two chambers: the House of Representatives (DPR) and the Regional Representative Council (DPD).



The legislative branch, primarily represented by the DPR, holds substantial power in law-making and budget approval. The DPR consists of 575 members elected through proportional representation from multi-member electoral districts.

In contrast, the DPD, which includes four representatives from each province, serves a more advisory role without legislative authority. The MPR has unique powers, including constitutional amendments and presidential inaugurations, reflecting its role as a bicameral legislature 125. The political landscape is marked by a multi-party system.

Judicial authority in Indonesia is vested in an independent judiciary, with the Supreme Court as the highest court. The judiciary also includes specialized courts such as administrative and religious courts. A relatively new entity, the Constitutional Court, was established to ensure that laws passed by the MPR comply with the Constitution.

The executive branch takes the form of a presidential state where the President serves as both the head of state and head of government. The President is supported by his cabinet, which comprises ministries in domains defined by the President.

The hierarchy of laws in Indonesia is structured according to Law No. 12 of 2011, which outlines the legal framework governing the formulation of laws and regulations. At the top of this hierarchy is the 1945 Constitution (Undang-Undang Dasar Negara Republik Indonesia Tahun 1945). Following the Constitution are the Resolutions of the People's Consultative Assembly (*Ketetapan Majelis Permusyawaratan Rakyat*), which guide state policy. The next level includes Acts (*Undang-Undang*) and Government Regulations in Lieu of Acts (*Peraturan Pemerintah Pengganti Undang-Undang*), which are essential for legislative processes. Acts are proposed and approved jointly by the President and the DPR. Subsequent tiers consist of Government Regulations (*Peraturan Pemerintah*), Presidential Regulations (*Peraturan Presiden*), and local regulations from provinces and regencies, reflecting a comprehensive legal framework that accommodates both national and regional governance needs.

The President and the ministries can issue decrees, regulations and orders that are binding if mandated by the stated laws above even though they live outside of the legal framework. These forms of regulations are usually used to clear up implementation details of the laws. The ministry can also issue circular letters that can suggest certain norms, but these letters are non-binding.

General Questions

The government is deploying this Readiness Assessment Methodology (RAM) exercise as part of its initiative to adhere to the international principles espoused in the UNESCO Recommendation on the Ethics of AI. This document is critical for policymakers to assess and evaluate the roadmap of AI adoption for the 2045 Golden Indonesia long-term plan.

National AI Strategy

In August 2020, Indonesia launched its "National Strategy for Artificial Intelligence" through the Agency for the Assessment and Application of Technology (BPPT), now under the National Research and Innovation Agency (BRIN) (BPPT, 2020). With the vision of AI towards Indonesia 2045, the strategy serves as a national roadmap for developing AI to accelerate the goals of the Golden Indonesia 2045, the 100th year vision. It identifies five national priorities where AI can produce the most significant impact: 1) health services, 2) bureaucratic reform, 3) education and research, 4) food security, and 5) mobility and smart cities. The strategy also outlines four focus areas: 1) industrial research and innovation, 2) infrastructure & data, 3) AI talent development, 4) AI ethics and policies) that stakeholders need to work together in order to maximize the country's potential.

The National AI Strategy is developed through quad-helix collaboration (11 Government Institutions, 11 Universities, 6 Communities, and 9 Industry representatives) with representation from across social boundaries like gender, race, and religion. The collaboration between stakeholders is maintained in the next step of implementing the strategy through the establishment of PIKA and later KORIKA (*Kolaborasi Riset dan Inovasi Kecerdasan Artifisial*), to orchestrate AI innovation in Indonesia.

Adoption and AI practices

The launch of the National AI Strategy, by all means, was not the start of AI adoption in Indonesia - research on AI and AI-adjacent methodologies has been flourishing in Indonesia's universities since the 1980s, and companies, especially those in extractive industries have leveraged AI use for their operations. In more recent years, startups tackling NLP, dataset labeling, computer vision, robotics, and smart farming have risen into public consciousness through their development of AI products.

Major companies also developed and applied AI in their operations: Indonesian e-commerce unicorns like Tokopedia, Traveloka, and BukaLapak heavily relied on AI to ensure safe and secure transactions; Big players in the Indonesian financial industry like BRI and BCA leveraged AI to build efficient e-KYC (know your customer) regimes and fundamentally alter their approach to credit scoring and risk management to foster financial inclusion; Telecommunication companies used AI to handle their network operation and consumer handling through chatbots; Mainstream media companies in Indonesia has also leveraged generative AI for their content distribution. This survey of AI use cases in Indonesia showcases the adoption of AI in many other different settings including disaster mitigation, agriculture and food security, quality control in manufacturing, disease treatment and monitoring, and territorial security.

While AI use cases are rampant, there's currently no standing regulation that mandates specific notification when AI is used in public and/or private services. However, there are clauses in the nation's cyber law and the nation's data protection law that mandate every online service using personally identifiable data to ask for consent from the public user. Experiences from prior projects regarding AI research (e.g. in a medical context) with the government, using the general public as a subject, have included ethical clearance form and informed consent before the research start.

Digital transformation agenda

The adoption of AI is also supported by a robust digital transformation trend. Indonesia has demonstrated a strong commitment to achieving significant digital transformation and fostering growth within its technology sector. This dedication is evident through the adoption of digital transformation as one of the key supporting pillars of the country's long-term plan (Kementerian PPN, n.d.), and these numbers released by the Indonesian Coordinating Ministry of Economic Affairs (Haryo Limanseto, 2022): First, Indonesia advances from 56th place in 2019 to 45th in 2023 on the global digital competitiveness ranking. Also, regionally, Indonesia is the second-largest destination for digital investments after Singapore, attracting $22 billion in the last several years. Lastly The nation's digital economy, supported by its large domestic market, contributes over 40% of the total ASEAN digital economy, with an estimated value of $194 billion, primarily driven by the e-commerce sector.

There's also empirical evidence for this: in delivering this report, surveys with stakeholders were held across the Indonesian tech landscape, and the results revealed a widespread commitment to digital transformation. Most institutions from each type of stakeholder, in various regions (not only those near the capital), have established dedicated budgets for digital initiatives, with annual allocations ranging from IDR 100 million (about 6300 USD) to IDR 1 billion (about 63,000 USD), and 90.9% of institutions we surveyed indicated they have a dedicated digital and IT unit tackling their digital transformation efforts.

Aside from the growth of the private sector, the Indonesian government is also strongly committed to digital transformation in the public sector, as evidenced by the implementation of the Electronic-Based Government System (SPBE)[1]. Established under Presidential Regulation No. 95 of 2018, SPBE leverages information and communication technology to provide public services to all Indonesians. This regulation was further strengthened by Presidential Regulation No. 132 of 2022[2] about the Electronic-Based Government System (SPBE)' architecture (Pemerintah Indonesia, 2022). By overseeing and managing the electronic government system at both the national and local levels, the Indonesian government aims to enhance the integration and efficiency of its digital governance efforts, further advancing the nation's digital transformation agenda. Previously, the public services were mostly delivered through numerous siloed digital applications developed by non-coordinating government agencies that varied in quality, hindering Indonesians' experience in getting public service.

Government Support

IIn championing the government agenda around AI, the government has appointed the Ministry of Communications and Informatics/ Kementerian *Komunikasi dan Informatika*/ (*Kemenkominfo* for short), now known as the Ministry of Communications and Digital Affairs or Kementerian Komunikasi dan Digital (after the inauguration of the Prabowo Subianto Administration on October 20th 2024) to lead the charge. *Kemenkominfo* has represented Indonesia in multiple worldwide dialogues around responsible and safe AI, including the AI Safety Summit in 2023 and 2024, and has partnered with UNESCO to hold multiple workshops and consultations regarding ethical use of AI, including the delivery of this Readiness Assessment Methodology, and the participation of the Indonesian delegation in the 2024 Global Forum on the Ethics of AI in Slovenia.

1 Electronic-Based Government System (SPBE) (https://www.menpan.go.id/site/kelembagaan/sistem-pemerintahan-berbasis-elektronik-spbe-2)

2 Presidential Regulation No. 132 of 2022: (https://peraturan.go.id/id/perpres-no-132-tahun-2022)

Kemenkominfo also has published directives and norm-setting policies around the adoption of AI, including a recent issuance of Ministerial Circular Letter No. 9/2023 by Kominfo, which outlined the government's stance on the Ethics of Artificial Intelligence. Aside from *Kemenkominfo*, ministries and agencies with stakes in the digital and technology space, are welcome to publish directives in their respective verticals, in consultation with *Kemenkominfo* to ensure alignment within the government. For example, the Financial Service Authority/ *Otoritas Jasa Keuangan* (OJK) has published a guideline around responsible AI in the fintech industry, and the Ministry of Health/*Kementerian Kesehatan* has published a guideline for responsible usage of AI in the health sector.

Challenges

Despite the initiatives and supporting factors in place, Indonesia's journey to an ideal scenario of AI adoption would still be facing numerous challenges. Some of those will be detailed in the following sections, but high-level observations identified through interactions with AI and technology stakeholders in Indonesia include:

1. **Balancing regulation enforcement and innovation growth**
   Balancing the strictness of laws regulating AI and fostering AI innovation is crucial for navigating the evolving technological landscape. Clear and enforceable regulations are essential to safeguard against risks such as privacy breaches, discrimination, and safety concerns posed by AI systems.

   However, overly stringent regulations can stifle innovation and hinder the development of beneficial AI applications. This is especially true in Indonesia where the current movers and shakers of AI technologies are relatively smaller startups and research labs with limited funding. A balanced approach is needed, where laws provide necessary oversight and accountability while allowing flexibility for exploration and advancement in AI technology.

2. **Upskilling and capacity building**
   Investing in upskilling and capacity building is essential to prepare for potential job displacement due to advancements in Artificial Intelligence (AI) in Indonesia. As AI evolves, automation may change job requirements, necessitating new skills. However, transitioning workers to those new skills and giving them access to gain proficiency in digital tools and programming can be an arduous task due to limitations to our educational and vocational training infrastructure.

3. **Setting up standards and equitable infrastructure**
   One significant hurdle is the uneven distribution of tech talent, with disparities in expertise between institutions and organizations. This gap complicates efforts to implement uniform standards and guidelines of AI adoption, usage and development across the country - as adoption standards will vary depending on the human resources and technological capabilities in implementing it.

   Additionally, setting up standards means investing in equitable AI-related infrastructures (including computing power, ample data sets, measurement tools, and deployment readiness), which necessitates serious funding and commitment from both the government and the private sector.

Legal and Regulatory Aspects

In this section, the Report discusses the legal and regulatory aspects of AI adoption in Indonesia. The regulatory framework around the general information technology sector in which AI is/will be deployed is crucial to ensuring the ethical deployment of AI systems. The legal and regulatory framework should include effective mechanisms for safeguarding and upholding citizens' rights, as well as monitoring, mitigating, and compensating for any unforeseen adverse outcomes resulting from the deployment of AI systems. Examples of the legal framework include regulations concerning Artificial Intelligence, data protection and privacy, data sharing and accessibility, and freedom of information, among others.

AI-Specific Regulations

IIn 2020, Indonesia marked a significant milestone by recognizing Artificial Intelligence (AI) as a formal business sector, with the introduction of Regulation KBLI 2020 by the Indonesian Statistics Bureau (BPS) and the enactment of Law No. 11/2020 concerning Job Creation (*Kementerian Investasi dan Hilirisasi*/BKPM, 2020.; *Pemerintah Indonesia*, n.d.). The following year, 2021, saw the establishment of AI stakeholders through the issuance of Ministerial Regulation No. 3/2021 by the Ministry of Communication and Informatics (Kemenkominfo) (*Kementerian Kominfo*, 2021), designating it as the governing body for emerging technologies such as AI, Blockchain, and IoT, and the implementation of Government Regulation No. 5/2021, designating AI risks as a 'medium to low' level of risks in the national priority (Pemerintah Indonesia, 2021).

In 2022, the focus shifted to evaluating the risk scale for AI through a comprehensive assessment of norms, standards, procedures and criteria, which were transformed into the issuance of Ministerial Circular Letter No. 9/2023 (Kemenkominfo, 2023), which outlined the Indonesian government's stance on ethical Artificial Intelligence. The letter addresses the ethical considerations in the implementation of artificial intelligence (AI) across various sectors in Indonesia. The letter mentioned 9 key values to uphold for AI usage in Indonesia, including:

1. Inclusivity, fairness and equality
2. Humanity and acknowledgement of human rights, religions, and personal thoughts and opinions
3. Safety of use, including from data breaches and privacy violations
4. Accessibility to all and non-discriminatory attitude towards all citizens
5. Transparency of process to prevent misuse and abuse
6. Credibility and accountability for the systems to make good judgment for public good
7. Adequate data protection practices as mandated by the law
8. Sustainability and the effects of AI deployment towards the environment
9. Adheres to laws regarding intellectual property rights

It also emphasizes the significant growth of AI technology and its impact on industries such as healthcare, education, and creative sectors. The letter outlines the need for ethical guidelines to ensure that AI development is inclusive, transparent, and respects human rights. It also mandates that businesses and electronic system organizers, both public and private, establish internal policies on data and AI ethics, and adhere to regulations to prevent

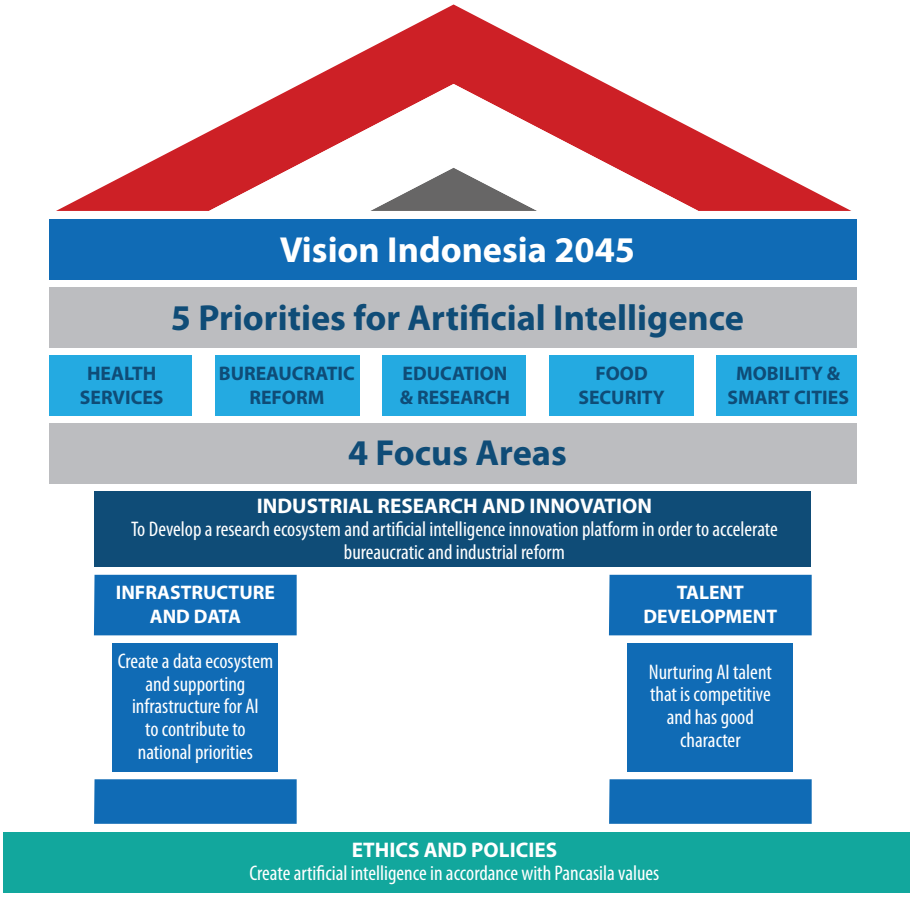
misuse and ensure the protection of personal data. The letter concludes by stressing the importance of risk management and crisis management in AI development and calls for attention to these guidelines for sustainable and responsible AI usage in Indonesia.

This year, Indonesia aims to activate systems that support reporting obligations for AI companies and thoroughly assess AI readiness backed by UNESCO (of which this report is a part). Additionally, the year will see the formulation of a sandbox on AI innovation and the compilation of a policy brief involving multiple stakeholders. The roadmap extends to 2025, emphasizing ongoing policy refinement, implementation, and international cooperation.

National Strategy on AI

As mentioned in the previous section, Indonesia has developed a national AI strategy, upon consultation with diverse stakeholders from different backgrounds, that outlines priorities and critical points to follow up for Indonesia's AI adoption. The national strategy also detailed expectations from stakeholders on the ethical values that Indonesian adoption of AI needs to uphold, key perspectives of law that the AI community assumed will be adopted, and the kinds of regulations that need to be set by the government.

Indonesia's National Strategy for Articial Intelligence Framework



Priorities and focus areas set in Indonesia's National Strategy for Artificial Intelligence

The key ethical values for AI adoption stated in the national strategy includes:

1. **The development of AI to be oriented towards humanity and human values**
   Humanity and human values are interpreted, among others, as putting humans as the main supervisory agent in AI deployment, and ensuring the adoption of AI is inclusive, non-discriminatory, and promoting diversity.
2. **Alignment with the values of *Pancasila*[3] (Republik Indonesia, 1945)**
   All initiatives and activities related to AI must align with the fundamental principles of Pancasila, Indonesia's foundational values (as noted in the preamble of the country's constitution). By adhering to the ethical principles embedded in Pancasila, we can ensure that the AI landscape contributes positively to national goals.
3. **Reliable, secure, open and accountable**
   achieving accountability. This means AI developments should be transparent to both the government and the public to ensure safety and trustworthiness. AI systems should also be reliably accessible or have a minimum service level agreement.
4. **Prioritizes synergy between stakeholders**
   The establishment of a thriving ecosystem is paramount for nurturing the research, study, development, and application of AI. Each stakeholder should operate with a collaborative attitude in mind, helping each other optimize the potential of AI for the benefit of the country.
5. **Adheres to existing laws and regulations**
   Ethical stances in AI have to align with existing laws and regulations, including Article 28C) and Article 31) of the 1945 Constitution (Republik Indonesia, 1945), and other related legal artifacts, such as Law No. 11/2019 that regulate governance, ethics, and legal accountability of Technological Systems (Pemerintah Indonesia, 2019).

The national artificial intelligence (AI) strategy emphasizes that AI itself cannot be regarded as a legal subject with rights and responsibilities, as it is a technological product created by humans. Legal accountability can only be applied to the individuals and institutions utilizing this technology. Additionally, the strategy highlights the need to harmonize regulations and policies across various government bodies. With at least 12 ministries and agencies involved in AI development, along with additional ministries overseeing industry-specific sectors, there is a critical need for frequent and intense collaboration to ensure that AI-related regulations and policies are consistently aligned across all government entities.

In alignment with the need for harmonization across government bodies, the national strategy outlines the necessity for at least four types of regulations regarding AI. These include regulations specifically governing AI-powered technological products and services, such as automated decision-making and facial recognition; sector-specific regulations that govern the application of AI technology within industries like finance, healthcare, and human resources management; legal accountability measures to address the unintended

3 Pancasila is the philosophical foundation of Indonesia and comprised of five principles that are considered to be inseparable and interrelated: Belief in the divine as it is; just and civilized humanity; the unity of the Indonesians; democracy guided by the inner wisdom in the unanimity arising out of deliberations among representatives; and social justice for all the people of Indonesia. Each of the five principles can be abstracted into ideas about: 1. Religiosity; 2. Humanity; 3. Unity; 4. Democracy; and 5. Social Justice.

consequences of AI usage, including criminal and civil liabilities; and voluntary codes of ethics, which are to be developed by associations of AI industry practitioners or specific groups.

Lastly, the National AI Strategy also recommends that an Ethical Committee on AI be formed. Their responsibilities include reviewing and establishing ethical feasibility, evaluating and supervising the implementation of codes of ethics in research, development, assessment, and application according to specific fields of study, and conducting inspections with the authority to impose sanctions in cases of violations of these codes. Together, these principles aim to create a comprehensive framework for responsible and ethical AI deployment across Indonesia.

It must be noted, however, that at the time of the national strategy's formulation in 2020, generative AI technology had not reached the level of development and adoption it has today. The rapid development and adoption of the technology, being at the forefront of AI research in 2024, might necessitate an update to the previously mentioned values and legal opinions. Also, an evaluation of the progress on key action items noted in the strategy, including the creation of the mentioned ethical committee on AI, has not been done yet.

Data Protection and Privacy Law

Contemporary uses of AI technology are rather data-heavy, and its proliferation will cause a massive consumption of data. To safeguard the transaction and communication of data, Indonesia has published their own data protection and privacy law (Undang Undang Nomor 27 tahun 2022 tentang Pelindungan Data Pribadi) (Pemerintah Indonesia, 2022). This law covers notice and consent mechanisms, the right to be forgotten, transparency and documentation requirements, and highlights special cases for children and people with disability.

Although the Personal Data Protection Law (UU PDP) does not explicitly mention the word "privacy" nor specifically regulates privacy and family life in particular, it does provide protections for personal data and safeguards for personal data subjects. However, Indonesia has other regulations that address privacy, including:

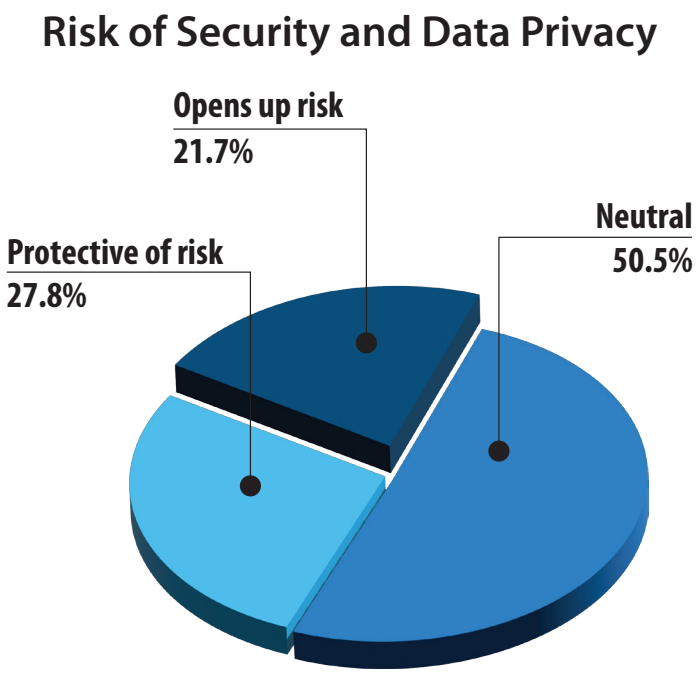
1. The 1945 Constitution (UUD 1945), Article 28G (1) (Republik Indonesia, 1945), which states that everyone has the right to the protection of their personal self, family, honor, dignity, property under their control, and the right to security and protection from fear of threats to do or not to do something that is a human right.
2. Law No. 39 of 1999 on Human Rights (UU HAM) (Pemerintah Indonesia, 1999), specifically Article 29(1), which states that everyone has the right to personal, family, honor, dignity, and property protection. Article 30 states that everyone has the right to security, peace, and protection from threats or fear in performing or refraining from certain actions.
3. The Electronic Information and Transactions Law (UU ITE) (Pemerintah Indonesia, 2016), Article 26, requires that the use of personal data in electronic media must have the consent of the relevant data owner.

Additionally, Kemenkominfo Regulation No. 20 of 2016 on Personal Data Protection in Electronic Systems also governs the protection of personal data in electronic systems (SE) (Kementerian Kominfo, 2016). It includes provisions for the protection of personal data

acquisition, collection, processing, analysis, storage, display, announcement, transmission, dissemination, and destruction. Article 2 of this regulation emphasizes that proper personal data protection includes respecting personal data as privacy. This means that individuals have the freedom to keep their personal data confidential or disclose it, except when required otherwise by laws and regulations. Article 8 states that SE operators must respect the personal data owner's privacy rights.

The country's ability to protect data is reflected through its ranking in the Global Cybersecurity Index, which places it 24th globally with an index of 94.88, regionally putting it behind Singapore and Malaysia and around the same level with Vietnam (ITU, 2024). We have to remember, however, that the GCI data, taken in 2020, hasn't taken into account the recent high-profile data leakages from government agencies, including the national data center ransomware incident that paralyzed many public services - that might affect the country's rating in upcoming assessments.

The nation's data protection law is still in the 'transition' phase (before October 2024) where stakeholders prepare to comply with the provisions stated. The public is still awaiting its full rollout later this year. This effectively meant that evaluation of the law's effectiveness has not been carried out yet.



Attitude of stakeholders in assessing AI as a possible security and data privacy risk

As part of the preparation of this report (methodology detailed in the next chapter and the appendix) - we researched Indonesian technology stakeholder's attitudes towards risk of privacy violations and security breaches in the adoption of AI. And we found that a majority still thinks that AI adoption is neutral in affecting the country's data privacy and security (50.5%), but a significant portion of respondents (21.7%) noted that AI poses a risk towards data privacy and security, as the adoption in itself does not provide a protective measure towards data being used.

Data Sharing and Accessibility

A country's ability to leverage AI also hinges upon its ability to collect and share accurate data. Accessible data and information allow government agencies and members of civil society to leverage and synthesize those data to build digital services. Open data standards like the Open Data Charter have been set on the global level to ensure country adoption and build standards around this area. Indonesia is currently not a signatory of the International Open Data Charter, but the government has set up an open and unified data initiative through Perpres (Presidential Regulation) No. 39 Tahun 2019 about Satu Data Indonesia (One Data Indonesia - SDI) (Pemerintah Indonesia, 2019). In addition to the Regulation, Indonesia, as an OECD accession country, One Data Indonesia, became part of the OECD Open Data Initiative and has followed several OECD surveys, including the Open Data Survey, which evaluates Indonesia's readiness to fully comply with international standards.

SDI, which is enforced by a special team under the country's Ministry of National Development Planning, is a national initiative aimed at establishing a unified, accurate, integrated, accessible, and interoperable data governance framework across the country down to the local level. The initiative is designed to enhance the quality, consistency, and availability of government data by promoting data standardization, interoperability, and transparency across all levels of government and the usage of data by citizens.

Under the SDI framework, data produced and managed by various government agencies are integrated into a single platform. This initiative is critical in improving evidence-based decision-making processes, facilitating more effective public service delivery, and fostering a culture of accountability within the government. This is also reinforced by the assignment given to SDI to support data exchange governance in one of the new national programs that aim to provide end-to-end online public services through Presidential Regulation No. 82 year 2023 about Digital Transformation's Acceleration (Pemerintah Indonesia, 2023).

Furthermore, SDI is aligned with broader global efforts to promote open data, enhance governance, and achieve the Sustainable Development Goals (SDGs). The initiative contributes to the Indonesian government's capacity to monitor, report, and control progress toward these goals by ensuring that data is accurate and readily available.

This initiative, along with adoption on multiple levels of government (including local governments, for example, Jawa Barat (Pemerintah Provinsi Jabar, n.d.), DKI Jakarta (Dinas Komunikasi, Informatika dan Statistik Provinsi DKI Jakarta, n.d.), and Kalimantan Timur (Dinas Komunikasi dan Informatika Provinsi Kalimantan Timur, n.d.), is publishing their own datasets under the Satu Data portal). Currently, SDI's portal has more than 250,000 datasets connected to 69 national agencies, 31 provinces, and 255 cities (Kementerian PPN/Bappenas, n.d.). Indonesia has a relatively high position in the Open Data Inventory: it ranks 26th worldwide with a 71 overall score (67 for Coverage and 75 for Openness) - only second to Singapore in the Southeast Asia region.

Procurement Laws and Policy

There is no specific regulation pertaining to the procurement of AI systems in the private and public sector. However, AI is already designated as a formal business sector according to KBLI (Klasifikasi Baku Layanan Usaha) in 2020, and is regulated through the country's regulation for electronic system organizers (PSE) (Kementerian Kominfo, 2020).

This regulation, Peraturan Menteri Kominfo Nomor 3 tahun 2021, sets up expectations for AI-system providers: businesses are asked to comply to set of standards through self-declaration that includes setting up internal policy around data and AI ethics, certification for technical team and staffs, annual reporting to Kemenkominfo, a regular showcase and demonstration of innovations to the general public and adherence to other laws governing the use of AI in Indonesia.

The current law enacted for the Kemenkominfo also is in the process of developing regulation for electronic system organizers (PSE) in the government/public sphere.

Freedom of information Acts and Access to Knowledge Acts

Transparency and accessibility to information regarding AI models is critical for AI adoption. Deployment of AI in critical processes both in the private and public sector should be accompanied by a clear mechanism for scrutinizing the inherent models as means of assurance against unfairness and bias.

In this regard, the country passed a law ensuring access to data around public service in 2008. Through this law (Undang Undang Nomor 14 tahun 2008 tentang Keterbukaan Informasi Publik / UU KIP) (Pemerintah Indonesia, 2008), public agencies are mandated to provide public information upon inquiry, with select exceptions for certain kinds of information to be kept confidential.

This would mean that the public can demand information around public deployments of AI systems - but precedents in which the public has requested this kind of information are hard to find, and this might indicate no such requests has been made. Laws regulating information request mechanisms for private sector deployments of AI have not been passed, and are not part of the previously discussed procurement standards for AI system providers. There are no known specific obligations for AI deployments to inform whose data they are using and/or sharing apart from the general obligations for notice and consent if personal data is used as per the data protection law. A norms-based value of transparency is expected to be upheld by AI developers in the aforementioned Ministerial Circular Letter No. 9/2023.

The freedom of information act is monitored and evaluated through an index that measures the implementation of the Undang-Undang Nomor 14 tahun 2008 in the society. Public agencies and ministries are scored and ranked each year by the Central Information Commission (KIP).

Undang-Undang Nomor 14 Tahun 2008 itself is planned for revision, and Kemenkominfo is currently conducting a review for the revision of the law. Potential substantive revisions include: how public bodies manage public information, their understanding of the consequences, and the process of public services to the community. The use of technology or AI has not been regulated in the current draft. Government Regulation (PP) No. 61/2010 (Pemerintah Indonesia, 2010), a derivative of UU KIP, also does not yet include provisions regarding the use of AI.

Due Process and Accountability

The Indonesian constitution stated that the country is a country of law, and rights to fair legal proceedings for all its citizens are protected. In the specific context of AI, however, there are no known liability regimes and / or redressal mechanisms exist for harms caused by AI. We have not yet seen any specific monitoring being done by any government bodies relating to AI-harms.

This meant that harms caused by AI systems would be evaluated through the lens of the criminal code, the law on Electronic Information and Transactions (UU No.1. Tahun 2024 ITE) (Pemerintah Indonesia, 2024), the data protection law, the consumer protection law (Undang-undang No. 8 Tahun 1999 tentang Perlindungan Konsumen) (Pemerintah Indonesia, 1999), or through advocacy by the national Ombudsman (in the cases of public sector deployment). In the case of public sector deployment, an audit regime for all information systems governance is undertaken by *Badan Pengawasan Keuangan dan Pembangunan* (BPKP) - Financial and Development Supervisory Board - and each agency's inspectorate general.

Mechanisms for law enforcement to check on electronic systems, however is present: in Government Regulation Number 71 of 2019 on Electronic System and Transaction Operation (PSTE) (Pemerintah Indonesia, 2019), Article 21 states that private sector electronic system operators (PSE) are required to ensure the effectiveness of supervision by Ministries or Agencies and law enforcement, as well as provide access to the electronic system and electronic data for supervision and law enforcement purposes.

Article 22 states that an audit trail must be provided by PSEs for purposes of supervision, law enforcement, dispute resolution, verification, testing, and other inspections.

Online Safety and Integrity of Speech

The proliferation of AI has raised concern about the safety of online spaces - as generative AI has enabled content generation at an unprecedented scale, how we prepare and mitigate against unwanted content, hate speech, violence and misinformation becomes paramount for a healthy information landscape.

In Indonesia, protection against hate speech, violence and misinformation in the digital space is covered under the nation's primary cyberlaw (UU ITE - with its most recent version under *Undang-Undang Nomor 1 tahun 2024 tentang Informasi dan Transaksi Elektronik*), and the perpetrator of such actions are liable to criminal offense.

AI can be maliciously used for disinformation, which for this report refers to false information that was generated or spread with the deliberate intent to mislead or deceive. AI-generated text can be indistinguishable from genuine human-generated material, and may already be disseminated at scale on social media. In addition, AI systems can be used to not only generate text but also fully synthetic or misleadingly altered images, audio, and video content. Humans often find such content indistinguishable from genuine examples, and generating such content is both relatively simple and extremely cheap. An example of this is images of human faces that were altered, or completely generated, using general-purpose AI or narrower types of AI systems. Such 'deepfake' images and videos are thought to have been deployed in several national elections over recent months to defame political opponents, with potentially significant impact, but there is currently not much scientific evidence about the impact of such campaigns.

The public can essentially report negative content to *Kemenkominfo*. There are 12 categories of negative content that can be reported, including pornography/child pornography, gambling, extortion, fraud, violence/child abuse, defamation/slander, intellectual property violations, products with specific regulations, SARA (ethnic, religious beliefs, racial, and intergroup) provocation, fake news, terrorism/radicalism, and electronic information/ documents.

The ITE Law has undergone two amendments (first being the UU nomor 19 tahun 2016, and nomor 1 tahun 2024 as the latest iteration) since its enactment. On previous iterations, its articles on defamation are often abused to criminalize critical opinions - in some ways deviating from its original intent of protecting online spaces. Revisions are made to accommodate public scrutiny of such implementation. This highlights the necessity for public participation in future regulation of online spaces and AI: to ensure potential abuses can be identified and mitigated earlier.

Public Sector Capacity

In ensuring an effective regulatory regime for AI and information technology, we must ensure that public servants are well-equipped and qualified to catch up with the rapid development of the technology. The government has prepared upskilling mechanisms for relevant public servants through the LPDP scholarship (the government flagship education endowment program, which has an affirmative program for public servant graduate education funding), and *Kemenkominfo* themselves has set up a specially focused Digital Talent Scholarship scheme for their employees, which includes upskilling program in AI skills such as machine learning and data analytics.

Socio-cultural Aspects

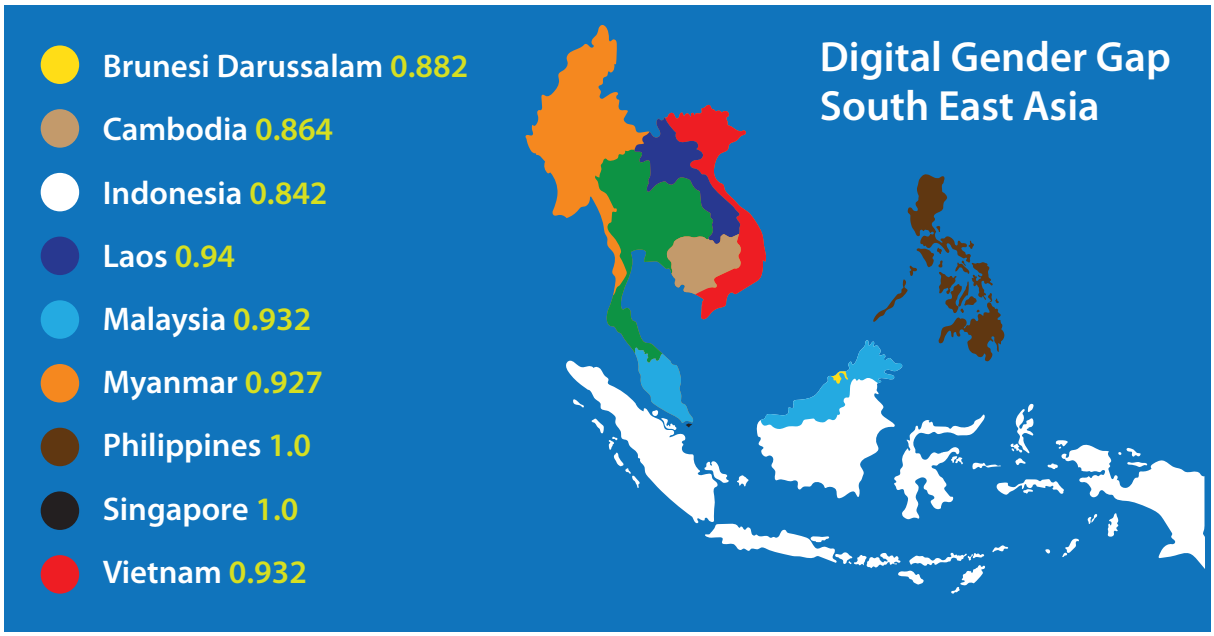
In this section, social and cultural dimensions will be discussed. Social and cultural dimensions are crucial to assessing ethical components in AI systems deployment, such as mechanisms to avoid biases in the whole AI system lifecycle and the creation of a fair and inclusive AI ecosystem. In this regard, this section addresses topics such as the inclusion of women in the science, technology, engineering, mathematics (STEM) and AI development environment, as well as the incorporation of social and cultural diversity to ensure the ethical application of AI. Additionally, it includes the level of acceptance and attitudes of the general public towards AI.

Diversity, Inclusion and Equality

A gap of access and participation between socio-economic groups may result in biased deployments of AI and other technological systems. Our study of the Indonesian technology landscape suggests some level of inclusivity that needs to be addressed to fully mitigate possible future biases in AI adoption, especially in terms of gender and rural/urban dimension.

Gender balance

The gender gap in internet use presents an area for improvement. Our data reveals that the ratio of female to male internet users estimated using the Digital Gender Gap Index is 0.842, indicating that for every 100 male internet users, there are approximately 84 female users. This disparity highlights the potential for targeted initiatives to enhance digital inclusion among women, empowering them to fully participate in the digital economy. The score has been stagnant the last few years, and the ratio is behind all regional neighbors in ASEAN.



Gender disparities in tertiary education, particularly in STEM fields, present an opportunity for targeted support. The data shows that 12.39% of women have graduated from STEM programs, in contrast to 26.91% of men. The share of female STEM graduates, based on ILO's publication in 2022, is at 38%, but the number is growing, and multiple efforts by the government, private sector and communities are looking to close the gap. Some examples include the Ministry of Communication's recent training in Generative AI for women, ILO's women in STEM program, and programs by women-in-STEM CSOs and community support groups.

Efforts to nurture female participation in STEM must be prioritized, as the potential is there: notably, per PISA assessments, girls outperform boys in science, with a performance difference quantified at -5, indicating that, on average, girls score five points higher than boys in science assessments. Also, success stories are abundant: the country has numerous female leaders in the tech sector (government, industry, academics). By implementing policies and programs that encourage and support female participation in STEM education and careers, Indonesia can unlock the full potential of its talent pool.

Rural/urban gap

In 2022, the percentage of people using the internet in Indonesia is 66.5%, slightly above ITU's global percentage of 64.4%. 80.6% of households in rural areas have access to the internet, while 90.9% of households in urban areas have access to the internet. In terms of percentage of people using the internet, the gap is wider: 56% of people use the internet in rural areas while 74% of people use the internet in urban areas.

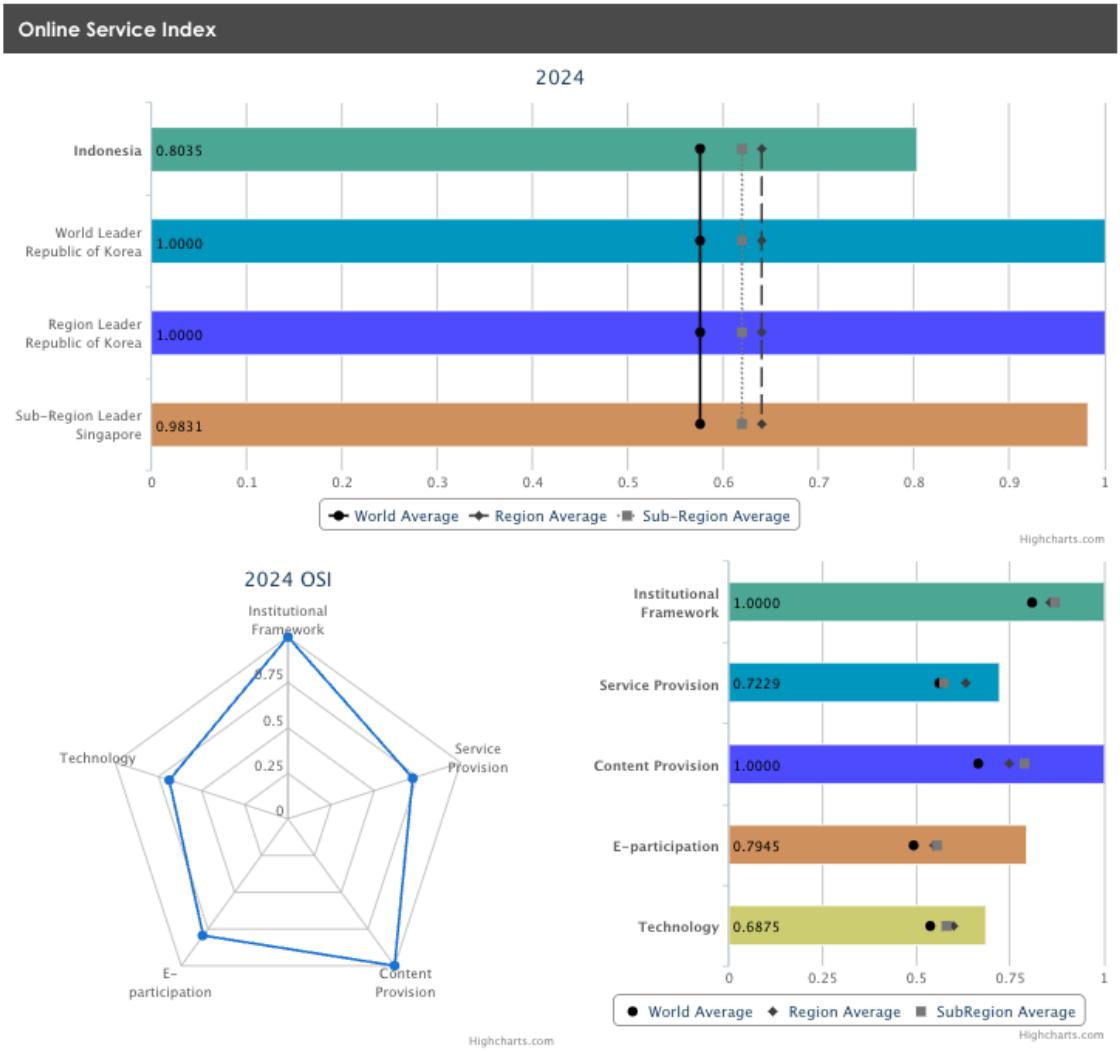
Indonesia ranks 46th globally and 11th among the 22 countries of Asia in the Economist's Inclusive Internet Index. According to the index, Indonesia experienced growth in the readiness aspect, due to government programs like *BAKTI Kominfo* to promote 5G and level of web accessibility in remote locations, but affordability and price is still an issue - the country ranked 2nd to last in this metric regionally. In ITU's metric of choice for affordability - the percentage of internet-related spending versus the gross national income, Indonesia's 6.18% is above the global percentage of around 2%.

Public Engagement and Trust

A nation's AI adoption will be hampered if their citizens in general have a distrust of technologies. In the case of Indonesia, Indonesians in general are neutral to positive in their perception of AI. In preparation for this report, (methods detailed in the next chapter and appendix), we surveyed 309 stakeholders in the Indonesian technological ecosystem through a questionnaire, and the results reveal a general positivity towards Artificial Intelligence and its adoption.

Aspects of trust	Responses	Share	Key Insights
Whether AI is seen as beneficial	Highly beneficial	69.6%	• Majority recognize significant advantages of AI in transforming society. • Some acknowledges benefits but still has reservations about AI's full potential. • Only minimal skepticism towards AI's overall role.
	Somewhat beneficial	28.8%	
	Not beneficial	1.6%	
Impact on jobs and the economy	Reduces manual labor (positive impact)	79.9%	• Generally positive view on AI's role in automating tasks and improving productivity. • A section still concerns about job displacement in various industries. • A few sees that natural coexistence will happen.
	Replaces existing jobs (negative impact)	12.0%	
	Does not cause job reduction / neutral impact	8.1%	
Perceived risk for discrimination	Neutral	78.6%	In terms of risks like discrimination or harm, a large majority of people still deem AI to be neutral. Only a few that sees AI that it is a serious risk to be mitigated
	Does not discriminate	13.9%	
	Does discriminate	7.4%	
Perceived risk for danger and harm	Neutral	89.0%	
	Dangerous	6.1%	
	Does not pose danger	4.9%	

The government's effort in ensuring growing public trust in digital technologies and their services, based on global standards, is trending positively. Based on the UN's 2024 e-Government Development Index, Indonesia (with a score of 0.7945) was ranked 35th in the world in terms of e-Participation, which describes how the government leverages online platforms to include their citizens in policymaking processes, showing there's a good deal of effort being thrown in the domain. The nation's Online Services Index (with a score of 0.8031), which measures the quality of delivery of public service through online means, experienced a huge growth over the last 4 years (Indonesia previously scored 0.68 in 2020 and currently scored above world and regional average).



Online Service Index	2024	2022	2020	2018	2016	2014	2012	2010	2008	2005	2004	2003
Indonesia (Value)	0.80346	0.76440	0.68240	0.56940	0.36232	0.36220	0.49673	0.24444	0.33444	0.29615	0.32432	0.43231

Indonesia's e-GDI Online Service Index components
source: https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/78-Indonesia/dataYear/2024

Environmental and Sustainability Policies

The Ministerial Circular Letter No. 9/2023 mentions sustainability as a value that needs to be upheld in ethical AI development. Aside from that mention, Indonesia currently has no specific environmental or sustainability regulations regarding AI but plans for developing green data centers are trending in the public and private sector: the government's own *Pusat Data Nasional* (PDN - National Data Center) in Cikarang is built to be a green data center, meanwhile industry players have committed to build green data centers of their own.

In addition, the government, researchers have championed efforts to leverage AI in sustainable development and ESG targets. An effort to combat and monitor climate-induced diseases like Malaria and dengue fever through AI, for example, has been carried out by the Government along with KORIKA, Institute for Health Modeling and Climate Solutions, and Mohamed bin Zayed University of Artificial Intelligence (MBZUAI) (KORIKA, 2023).

Heath and Social Wellbeing

Indonesia's digital healthcare ecosystem has grown significantly, particularly since the COVID-19 pandemic began. The Ministry of Health of the Republic of Indonesia has released the Minister of Health Decree Number HK.01.07/MENKES/1559/2022 and the "Blueprint of Digital Health Transformation Strategy 2024", which outline the strategy, roadmap, and framework for digital health transformation to guide stakeholders and key players within Indonesia's health industry. The blueprint prioritizes three main areas: the integration and development of a health data system, the integration and development of a healthcare application system, and the development of the health technology ecosystem. Specific initiatives under these umbrellas include implementing a single identity health record, integrating electronic system services between health institutions and government, developing an AI-based big data ecosystem, expanding telemedicine facilities, and integrating business processes and improving Medical Record keeping in health informatics.

To support digital transformation initiatives, several regulations have been introduced to facilitate digitalization, data and information system integration, and data compliance. These include Government Regulation Number 28 of 2024, which governs the implementation of Law Number 17 of 2023, Minister of Health Regulation Number 24 of 2022 regarding medical records, Minister of Health Regulation Number 18 of 2022 about Healthcare One Data. Note that the scope of healthcare governed in Law Number 17 of 2023 already includes mental health.

Additionally, the Minister of Health has established SATUSEHAT as a platform integrating nationwide healthcare data, as outlined in Minister of Health Decree Number HK.01.07/MENKES/133/2023. To further encourage innovation in digital healthcare, a regulatory sandbox has been implemented, as stated in the Minister of Health Decree Number HK.01.07/MENKES/1280/2023.

In general, the existing regulatory framework for Indonesia's healthcare does not explicitly address the utilization of AI. However, the primary foundations can be traced back to Law Number 17 of 2023, which governs compliance and innovation in health technology, and Minister of Health Regulations Number 51 of 2017, which focuses on health technology assessment aimed at patient safety, the effectiveness of treatments, alignment with patient needs, and cost efficiency.

Culture

Bahasa Indonesia, Indonesia's national language, is one of the world's most spoken languages, with around 200 million speakers. Despite its popularity, datasets around the language are still massively underrepresented in research circles (Aji et al., 2022). Efforts to rectify this are active: Indonesian researchers have set up open source initiatives like NusaCrowd to gather quality datasets in the Indonesian language (NusaCrowd, n.d.), and LLMs in Bahasa Indonesia are being created by both public and private research and business organizations in Indonesia and abroad (see SEA-LION (AI Singapore, 2023), Komodo-7b (Yellow AI, n.d.)).

Aside from the national language, Indonesia is also home to more than 700 indigenous languages. As global trends show, indigenous languages are on the brink of extinction (Bromham & Hua, 2021): Professor Endang Aminuddin Aziz, Indonesia's head of the language development agency at the Ministry of Education and Culture stated that Indonesia are

heading towards monolingualism due to globalization and modernisation (Renaldi et al., 2024), but at the same time is optimistic that AI and LLMs will help preserve indigenous languages (The aforementioned Komodo-7b, for example, is trained in 11 regional languages aside from Bahasa Indonesia (Owen, 2024), like Javanese, Sundanese or Acehnese). The agency's effort in leveraging AI to identify and monitor the vitality of these Indigenous languages is recognized internationally: Professor Aziz is featured in the recent Time 100 Most Influential People in AI through his efforts (de Guzman, 2024).

Computer technology is also being deployed to preserve other cultural heritages, like the Batik, the Indonesian technique of wax-resist dyeing applied to the whole cloth. Software-generated batik is being sold commercially (Batik Fractal, n.d.), and digital preservation techniques are being developed in the academic space (Permatasari, n.d.).

How Bali used information technology to preserve their cultural heritage

In preparation of this report, we visited Bali, an island in Indonesia which is famous for its culture and tourism to see how local players leverage technology to preserve culture.

We found Bali has embraced digital and information technology to capture and preserve its rich cultural heritage in innovative ways. The internet and modern archival techniques have been instrumental in repatriating, restoring, and disseminating old recordings of Balinese songs, music, and films originally captured by foreign researchers. Computational methods have also been employed to scan and catalog traditional Balinese masks for a comprehensive digital database. In addition, initiatives like Quantum Temple utilize blockchain and tokenization to preserve Balinese culture while simultaneously providing financial benefits from this cultural heritage (Quantum Temple, n.d.). Furthermore, computer vision technology has been used to decompose and detect basic movements of the traditional Tari Bali dance, ensuring its preservation for future generations.

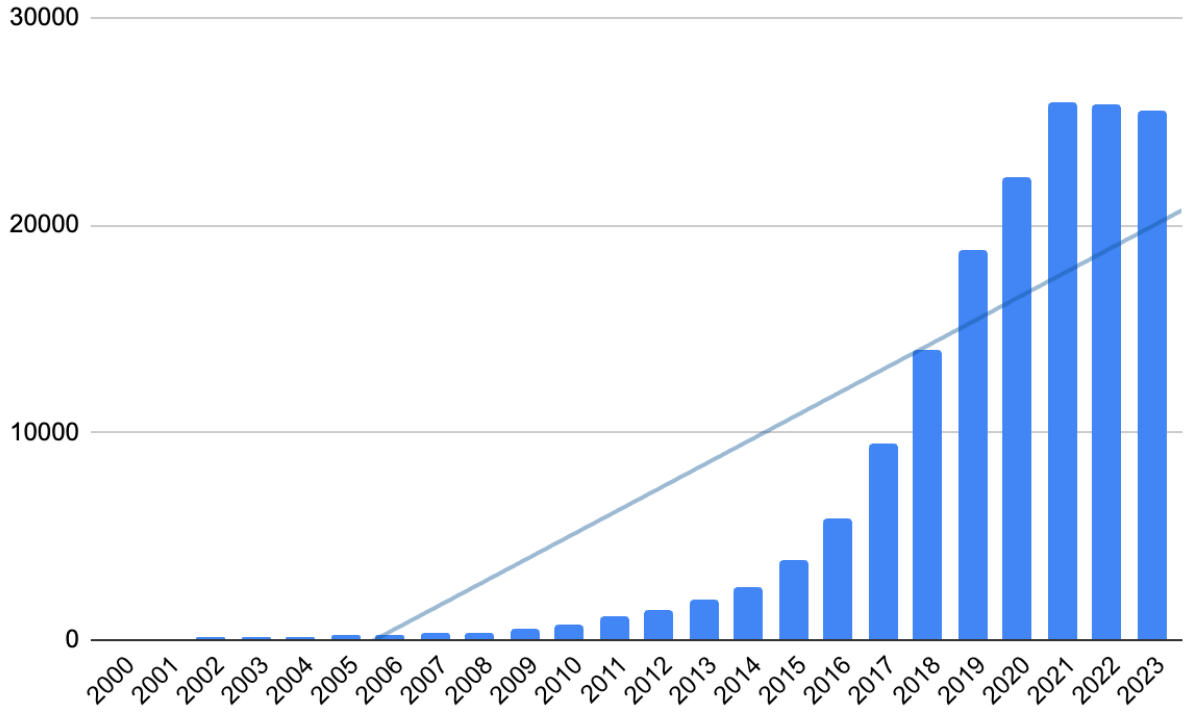
Local practitioners we visited in Bali expressed a positive outlook regarding the potential of AI as a cultural medium for the development and preservation of arts. They emphasized the need to recognize and respect the human creators whose works are utilized in joint creation with AI. The government must consolidate these preservation initiatives to safeguard culture—not only in the realm of the arts but also in language and local wisdom.

Scientific and Educational Aspects

In this section, the scientific and educational dimensions supporting AI adoption in Indonesia will be discussed. Given that the scientific and educational components significantly contribute to the advancement of AI, evaluating them becomes a pertinent method to assess a country's readiness for AI development. The scientific aspect is gauged by the country's performance in research and innovation (R&I), comprising research and development (R&D) expenditure, research output, ethical AI research and AI talent innovation output. Conversely, the educational aspect is assessed through the country's performance in educational aspects such as educational strategy, educational infrastructure, curriculum content, educational attainment and public access to AI education.

Research and Innovation

A vibrant research scene is key to ensure optimum AI adoption and development, as discovery and innovation from AI research can translate to economic opportunities and will sustain the momentum for the country's growth. Indonesia as a whole spends around 2 billion dollars in gross expenditure on research and development, or 0.2 percent of its GDP. The government specifically allocates around 420 million dollars yearly from their budget on R&D. This is still under the global average of around 2% and behind regional neighbors Singapore, Malaysia, Thailand and Vietnam. While the number has increased significantly in comparison to the 0.08 average in the early 2000s - this number stagnates in the last decade and stands in contrast to the rise in R&D spending in Asia Pacific in the last 4 years. The government contributes up to 80% of research spending, while industry contribution is less than 20% (Humas Sekretariat Kabinet Republik Indonesia, 2020).



AI research papers published by Indonesian researchers in the last 23 years

Despite the low research expenditure, activity in the AI research space is growing. Based on OECD data Indonesian researchers published more than 25 thousand research papers around AI in 2023, and the numbers are steadily increasing since the early 2000s. Key universities like *Universitas Indonesia*, *Institut Teknologi Bandung*, *Institut Pertanian Bogor*, *Institut Teknologi Sepuluh Nopember*, *Universitas Gadjah Mada*, and research institutions like *Badan Riset dan Inovasi Nasional* (BRIN), has contributed in research fields such as NLP, speech processing, big data analytics, robotics, and autonomous vehicles. These AI research topics are then applied in various fields/industries/sectors such as healthcare, transportation, agriculture and livestock, banking, tourism, disaster management, the creative industry, and other public sectors.

A few Indonesians have been active authors of research papers published in top AI-related conferences and journals, such as CVPR, ICCV, ICML, ICLR, NeurIPS, ACL, EACL, EMNLP, TPAMI, etc indicating a growing expertise in advanced AI (Indonesia Vision AI, 2023) (IndoNLP, 2022). However, the majority were affiliated with institutions outside of Indonesia at the time of publication.

A search into Google Scholar with the term 'Etika AI' shows 47,700 articles of research around Ethics and AI in Indonesia, but most of it consists of literature reviews and opinion-based readings of Indonesian AI adoption. Indonesia also has no known researcher that publishes in top AI ethics publication spaces like FaccT and AIES, some indication that research around the topic needs to be further improved in the future.

The Directorate General of Higher Education has launched a program called *Pusat Unggulan Iptek Perguruan Tinggi* (PUI-PT), or Center of Excellence for Science and Technology, aimed at fostering research and innovation within selected institutions (Ridwan et al., 2021). This program provides funding to support various aspects of the research ecosystem, including academic excellence, commercialization of research outputs, and institutional capacity building. Several Centers of Excellence, particularly from leading universities such as Institut Teknologi Bandung and Institut Teknologi Sepuluh Nopember, have been at the forefront of advancing research and innovation in the field of AI.

To further enhance the synergy between universities and industries in driving research and innovation, the Ministry of Education, Culture, Research, and Technology (MoECRT) launched the Kedaireka program, along with its digital platform, which serves as a hub for facilitating collaborative research and innovation (Kedaireka DIKTI, n.d.). This platform aims to bridge the gap between academic institutions and industry partners by providing a space for knowledge exchange and joint innovation projects. To support these collaborations, a matching fund with a total value of approximately USD 65 million has been made available, offering financial support for selected research initiatives. This funding encourages universities and industries to work together on impactful projects that address real-world challenges and contribute to Indonesia's technological and economic development, with a focus on 5 key priority topics: green economy, blue economy, digital economy, healthcare, and tourism (Nizam et al., 2024). Many research projects conducted under the Kedaireka program involve the application of AI.

Education

AI Education Strategy

Merdeka Belajar Kampus Merdeka, a governmental strategy for higher education, puts a heavy emphasis on experiential learning and out-of-campus industry engagements. As part of this strategy, the government has worked alongside top technology companies like Google, GoTo and Traveloka to create a program called Bangkit, which aims to provide industry-level IT know-how to thousands of students every year (Google, n.d.) that has since has educated more than 15.000 students since 2020 (DIKTI, 2024).

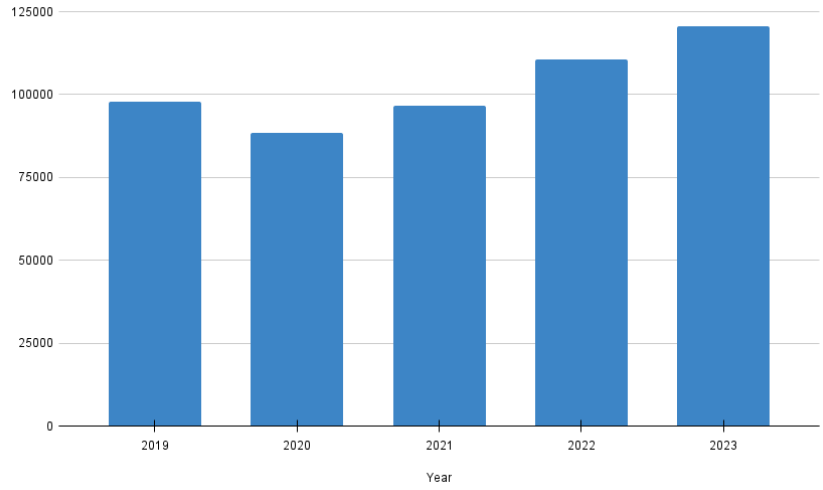
Another important component of this strategy involves fostering strong collaboration between the academic ecosystem and private industry. A notable example is the establishment of the DIKTI AI Center, a partnership between the nation's Directorate General

of Higher Education, Research and Technology and NVIDIA (DIKTI, n.d.). This collaboration aims to support AI research, development, and education by providing universities with adequate computing infrastructure and training programs over the next five years (DIKTI, 2022).

In Indonesia's higher education, AI/ML and data science have been integrated into various fields of study within science and technology disciplines, such as Informatics, Computer Science, Electrical Engineering, Computer Engineering, Information System, and Mathematics. Approximately 900 universities, both public and private, offer these programs, producing around 500,000 total graduates between 2019 - 2024. Furthermore, most of those universities have also incorporated foundational topics related to philosophy, ethics, social impact of technology, including AI. To keep pace with the rapid advancement of AI, six universities, in collaboration with the Directorate General, have established AI-specific study programs as per 2024: *Institut Teknologi Sepuluh Nopember, Universitas Airlangga, Universitas Bina Nusantara, Universitas Syiah Kuala, Universitas Gadjah Mada and Universitas Sumatera Utara* (Meutia, 2024). These institutions offer both undergraduate and graduate level programs dedicated to AI.

Number of Graduates from Programs Teaching AI/DS/ML in Indonesia

The data includes 953 universities offering programs categorized under Informatics, Computer Science, Electrical Engineering, Computer Engineering, Information Systems, Mathematics, Statistics, Computer Education, Mathematics Education, and other related fields.



Source: Data from the Directorate General of Higher Education, Research, and Technology

In light of advancements in Generative AI, the Directorate General of Higher Education, Research and Technology has launched a guideline for the nationwide use of Generative AI in higher education. This guideline aims to assist academics across Indonesia in implementing policies that ensure the ethical and responsible use of Generative AI, (Kusumawardani et al., 2024). Additionally, various training programs, workshops, short courses related to Generative AI have been provided through partnerships among multiple stakeholders, including initiatives from UNESCO-ICHEI, Gemini Academy, and others, to empower lectures and teachers (DIKTI-b, 2024).

In K12 education, Indonesia has implemented a new curriculum, *Kurikulum Merdeka*, which aims at making learning simpler and more profound, and enhancing students' critical thinking and problem-solving skills (Wang et al., 2023). In order to help teachers in implementing this new curriculum, the Ministry of Education, Culture, Research, and Technology (MoECRT) introduced Platform *Merdeka Mengajar* (PMM), a one-stop platform to enable and upskill teachers. This app is equipped with a feature called *Asisten Guru* (ARU). (Pusat Informasi Kemdikbud, 2024) which leveraged generative AI trained over expert-reviewed teaching content that helps teachers create relevant and responsible teaching materials. Over 37,000 teachers have utilized ARU at least once within two months of its launch.

As a part of this new curriculum, topics on Digital Literacy and Computational Thinking has been incorporated in junior and senior high schools as mandatory subjects (BSKAP, 2024). Additionally, senior high schools, including vocational schools, offer optional subjects for students with specific interests, covering topics such as data analysis, algorithm, information system, software engineering, and computer networks that are developed in alignment with certain certification schemes, the occupational map created by *Kemenkominfo*, and national and international competency standards.

Education Infrastructure

A digital-first educational infrastructure is key in exposing the younger generation to the benefits of information technology, including AI. Proportion of primary schools and secondary schools with access to the internet for pedagogical purposes has hit 84.08% and 92.8% respectively, and the proportion of secondary schools with access to computers has reached 94.6%. For reference, regional neighbor Singapore, has succeeded in ensuring 100% proportion on these metrics. The Ministry of Education and Culture and Research and Technology, however, has undergone many steps to catch up on this matter. Since 2021, it has provided assistance in the form of more than 284,000 Chromebook laptops for many of these schools throughout Indonesia (CNN Indonesia, 2021).

Public Access to AI Education

Expanding access to AI education will enable the general public to increase AI literacy, and to learn about and develop AI systems independently. In Indonesia, many educational institutions offer open-access AI courses. The government, through Kemenkominfo, runs the Digital Talent Scholarship program, allowing citizens to enroll in free AI and other IT cohort courses (*DTS Kominfo, n.d.*). Prominent universities such as UI, ITB, and Binus also offer Massive Open Online Courses (MOOCs) in AI, further broadening access for the general public.

Economy

In this section, the economic dimension will be discussed. The economic dimension considers relevant aspects within the ecosystem in which AI systems are developed and deployed, such as those related to the labor market, intermediate consumption and investment and production for AI. The dynamism and qualification level of the labor market, along with the level of spending on intermediate consumption and investment and production, are crucial aspects for evaluating the performance and readiness of the specific ecosystems in which AI is deployed.

Economic Overview and Investments

Indonesia boasts the largest digital economy in Southeast Asia (Google, Temasek, Bain & Company, 2022) - and hold immense potential. A study by Access Partnership estimates that generative AI has the potential to unlock USD243.5 billion in productive capacity for Indonesia (Ng, et al., 2024), with the Manufacturing and Construction sectors poised to contribute nearly half of these potential gains.

Indonesia has achieved significant progress in attracting investments to the AI sector. According to the Deputy Minister of Communication and Information, the country secured a total of IDR120.2 trillion in AI investments throughout 2023 (Firdausi, 2024), which is the second largest AI funding after Singapore. This momentum continued recently, as Microsoft announced USD1.7 billion (over IDR 27 trillion) in late April 2024. This investment focuses on developing cloud and AI solutions in Indonesia, specifically, to establish local Azure infrastructure equipped with the OpenAI API, provide AI skills training for the public, and offer supporting tools for developers.

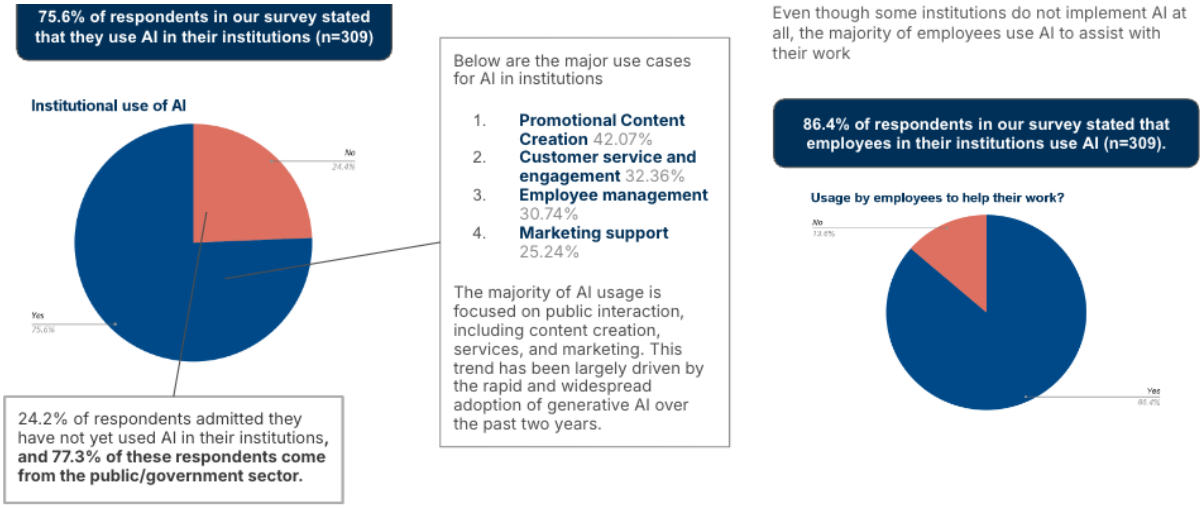
The private sector is also a key player in ensuring AI adoption happens. Indonesia is one of the region's hottest startup market (Yean, 2023), with the second-largest number of tech unicorns in the region - in addition to having the biggest share of the digital economy in the Southeast Asia region (40% share). The aforementioned unicorns employ AI and machine learning to its millions of users in Indonesia: Gojek uses AI for driver-user matching, dynamic pricing and many more use cases (Lim, 2019); Traveloka AI solution to personalize and minimize options for users (Crozier, 2022); Bukalapak leverages its in-house data to build recommendation engines for its users (Arief, 2018); and Grab, while a Singaporean company, has its largest market in Indonesia and has showcased how it used AI in multiple use cases from complaint handling to precision mapping thoroughly (Balea, 2016; Grab, n.d.).

Investments are also being made in terms of reskilling programs. In 2018, the Ministry of Communication and Information Technology (Kemenkominfo) launched the Digital Talent Scholarship (Badan Pengembangan SDM Kominfo, n.d.). This comprehensive training program equips young Indonesian professionals, the general public, and civil servants in the ICT sector with the necessary skills and expertise, including those related to AI. Indonesia also has a robust program to reskill millions of unemployed nationals with digital skills including AI (Purbasari, et al., 2022), and an out-of-campus internship program that has enabled thousands of university students to intern in various AI-related and digital companies (Suparman, 2024).

Level of Adoption

According to a survey of stakeholders (n=309) in preparation for the report (methodologies detailed in the appendix and the next chapter), the adoption of Artificial Intelligence (AI) across various institutions shows a positive trend.

AI adoption is widespread, with 75.6% of institutions reporting active use of AI technologies. However, a significant portion of those who have not used AI are public or government institutions, signaling potential growth areas. Notably, individual employees are embracing AI tools even in institutions (86.4%) without formal integration with institution. This aligns with the known data where Indonesia's ranked 3rd in terms of country with most visits to AI services globally (Muhamad, 2024).



The common usage patterns (content creation, customer engagement, and marketing support) suggest that organizations are leveraging off-the-shelf generative AI tools, particularly after the 2022 boom, as an entry point into AI adoption.
In terms of productivity, the impact is also pronounced. 63.4% of respondents report that AI significantly enhances productivity, with an additional 34.3% noting a moderate increase. Only 13.7% perceive no productivity gains from AI implementation.

On future outlooks, institutions are gearing up for deeper AI integration, with 64.7% planning to procure AI technologies. This future investment is split equally between domestic and international providers, with domestic solutions emphasizing tailored software. The demand for AI talent is also on the rise, with 30.9% of institutions aiming to hire specialists. Moreover, over half of the respondents (55.9%) plan to integrate AI into their core processes, reflecting a strategic shift toward AI-driven operations.

Talent and Labor Market

As mentioned before, 30.9% of respondents in a survey conducted for this report indicate a plan to hire employees with AI-related skills. This reflects a growing recognition of the importance of AI expertise within various organizations. The respondents' definition of employees with AI related-skills varies broadly also: aside from the expected technical positions that advance AI technologies (like AI Engineers, Data Scientists) and their managers, expectation of demand for AI-literate employees from other functions like communications and HR are expressed.

In terms of talent development, Indonesia has demonstrated a remarkable 116% year-over-year (YoY) increase in Professional Certificate enrollments on Coursera, reflecting a strong focus on acquiring industry-aligned skills. This surge is particularly evident in the growing interest in AI and big data, which are projected to comprise over 40% of technology training programs in Indonesia over the next five years. This trend underscores the nation's strategic initiative to solidify its position as a key player in Southeast Asia's burgeoning tech economy.

According to *Kemenkominfo*, Indonesia has around 5 million IT talents, with most of them residing on the Java island. While the number seems big, *Kemenkominfo* projects Indonesia will need, in addition, 9 million digital talents in 2030 suggesting that a push on talent development is needed (Yulianti, 2022).

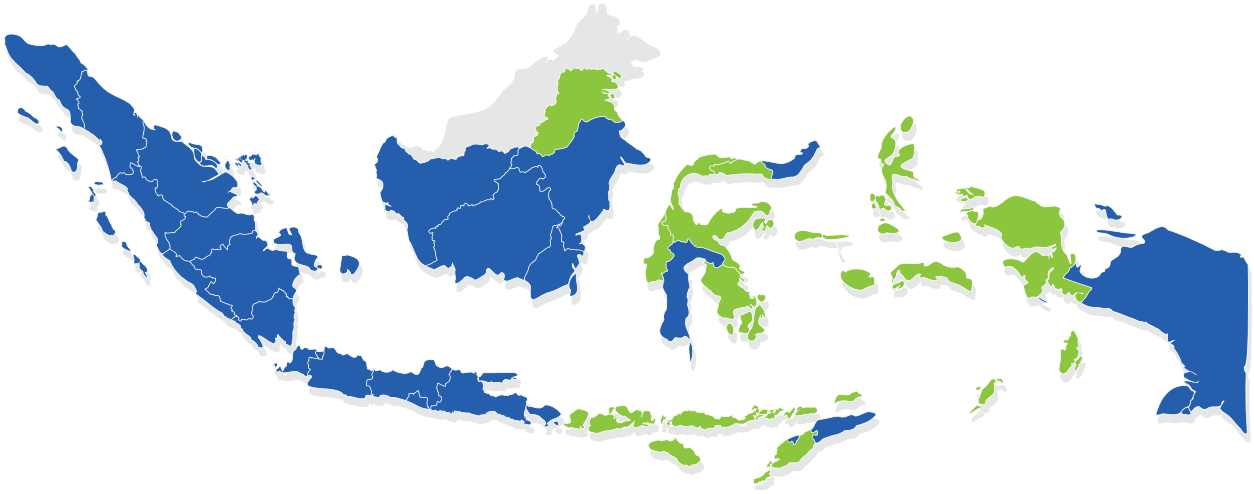
Technology and Infrastructure

In this section, infrastructural and technical dimensions will be discussed. The technical and infrastructure dimensions refer to the installed capacity within countries for the development and deployment of AI solutions, whether through their computing power, the availability of data centers, connectivity, and internet access, among others. These elements are relevant enablers for the development of AI systems within a country, as they determine development capabilities based on the infrastructure available and necessary to support processed information.

Infrastructure & Connectivity

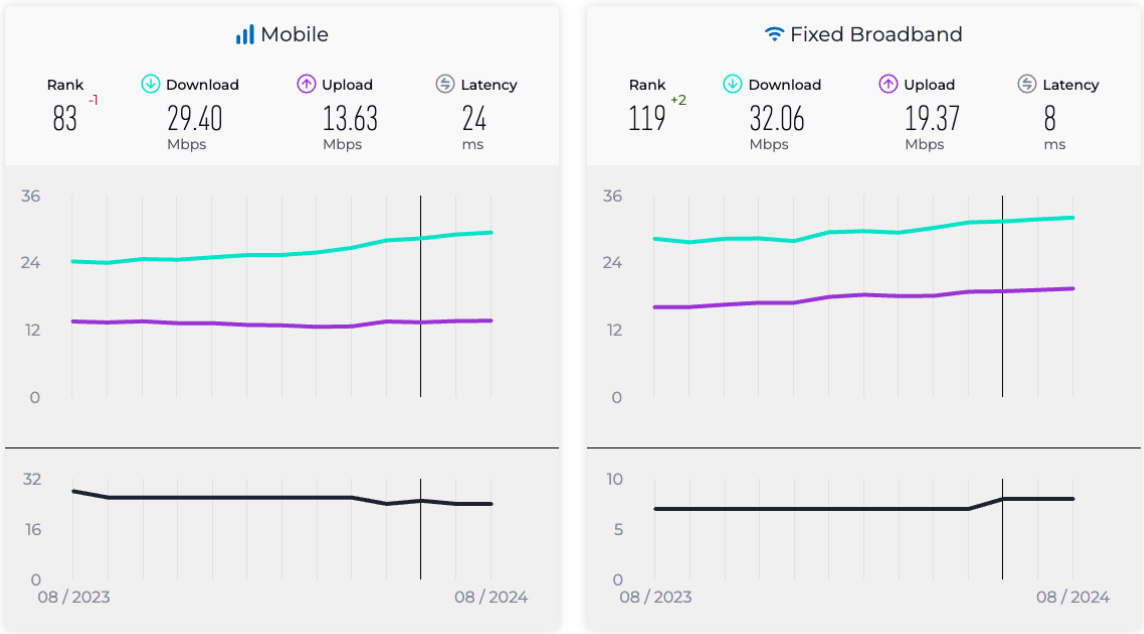
Connectivity is key to ensure people have equitable access to advanced technologies. Moreover, as most AI services are delivered online, a lag in connectivity would directly translate into a lag in AI adoption. The percentage of people using the internet in Indonesia is 66.5%, slightly above ITU's global percentage of 64.4% - showing that internet penetration in Indonesia is up to par with other countries. The government has also developed programs like *BAKTI Kominfo* and *Internet Masuk Desa* to ensure the internet is adopted in Indonesia's most remote locations (Bakti Kominfo, n.d.; Mahrofi, 2023). Some areas, as illustrated in the map below, still suffer from lagging internet coverage. The recent partnership between the government and Starlink (Firdaus, 2024), has also been touted to increase coverage and internet connectivity.

Distribution of internet user penetration in 2024



Indonesia Internet coverage spread per 2024 (Source: APJII)
green areas suggest less than 70% internet coverage in the region

It is important to note that the majority of internet connections in Indonesia are mobile based. The mobile telephone subscription rate stands at 122.94% meaning there are more mobile subscriptions than people in the population. This suggests a high penetration rate and the likelihood of individuals having multiple subscriptions. In contrast, fixed broadband subscriptions account for only 4.88%, reflecting a relatively low adoption rate. This may be attributed to infrastructure limitations, or the higher costs associated with fixed broadband compared to mobile broadband. Additionally, Indonesia's internet speed is considerably slower than the global average. According to Speedtest's Global Index in June 2024, Indonesia's median download speed is 28.35 Mbps, significantly below the global average of 56.34 Mbps.



Indonesia Internet Speed growth in the last year
(Source: https://www.speedtest.net/global-index/indonesia)

Computing Capabilities

Indonesia Data Center Spread (Source: https://www.datacentermap.com/)

Data centers and computing capabilities reflect the nation's ability to process data critical to the development of AI technologies. Indonesia has 123 mapped sites of data centers, or 0.00000044 data centers per capita. This puts Indonesia as the country with the most data centers in the South East Asia region, but in terms of data centers per capita, it's behind regional neighbors Singapore (0.00001) and Malaysia (0.000002). As we see in the graph below, data centers in Indonesia still converge around the capital of Jakarta, with almost 60% of them situated around the capital area.

The nation, through their policy that mandates citizen's personal data to be stored locally in Indonesia, has succeeded in convincing international cloud providers like Amazon, Alibaba

and Google to open data center regions in Indonesia (Riyanto et al., 2021; Alibaba News, 2019; Hart et al., 2020). This move is ensured to boost digital transformation in the government and private sector alike. The local data center business is also growing, and shows promise to be more energy efficient than global peers according to a study conducted by ADB (Asian Development Bank, 2017).

The country has also actively worked to get specialized computing capabilities for AI: Aside from the aforementioned collaboration between the Directorate General for Higher Education, Research and Technology with NVIDIA, there are other efforts like the development of Solo Technopark (Putri, 2024), which collaborates with NVIDIA and Indosat to provide AI computing resources in the city of Solo. The country's research institute, BRIN, has also set up a high-performance computing center (Humas BRIN, 2022), providing access for researchers to GPUs to run and train AI models. Telkom, the state-owned telecommunications conglomerate, is in the process of setting up a collaboration in Batam for a AI-specific data centers (Hidayat, 2024). Researchers around Indonesia needs more of these initiatives: our consultation workshops suggest access to computing resources is still scarce for academics outside Jakarta.

Applied Standards

Several regulations from *Kemenkominfo* refer to standards issued by International Standardization Bodies, such as: *Kemenkominfo* Regulation No. 11 of 2022 concerning the Governance of Electronic Certification, specifically Article 36, which mandates that certified electronic signature devices must comply with the provisions stipulated in SNI ISO/IEC 15408 and SNI ISO/IEC 18045. *Kemenkominfo* actively participates in global meetings, such as those at ITU-T, which collaborates with international standardization bodies like ISO/IEC.

Statistical Performance

A country's statistical performance reflects their capability to process and leverage statistical information, a key component for AI development. Based on the World Bank's assessment Indonesia has an overall Statistical Performance Index Score of 79, putting it in the 4th quintile from all of the countries in the world. On the breakdown, Indonesia reported a score of 89 in data products, indicating a high quality of data products, including reports, datasets, and analytical tools, supposedly bringing comprehensive and well-documented outputs that are valuable to stakeholders. Their relatively worse scores on data sources (55) and data infrastructure (60), however, suggest a better regime of collection, indexing of sources, and investment commitment on robust data infrastructure is needed.

Other Technological concerns

Cybersecurity is one of the challenges still haunting Indonesia for proper AI adoption: the recent ransomware case in the government-owned national data center (PDN) (Teresia, 2024), taking hostage a significant share of the government's most critical public service data, exemplifies this challenge. The government is also plagued by data breach incidents that undermine digital transformation in its digital services (Baharudin, 2024). The US's International Trade Administration has noted that the country's lack of cybersecurity talents is hampering Indonesia's digital ambition (International Trade Administration, 2023).

Developing a National Multi-stakeholder Roadmap

Indonesia's AI ecosystem is driven by several key stakeholders, each playing a critical role in its development and governance.

The government has a huge role, it acts as the primary regulator and a major source of funding for AI research (the government contributes more than 70% of the country's R&D spending) and education, with public universities being the premier learning institution in Indonesia. In addition, the government facilitates upskilling programs and collaborative efforts, serving as a convener and orchestrator for multi-stakeholder initiatives. Through its functions and employment opportunities, the government also boosts local economies and becomes the major adopter of IT and technologies like AI, especially in regions outside the capital and major cities.

The private sector plays an equally important role, with AI startups leading innovation and established companies developing AI technologies tailored to their specific use cases. This sector also supports the growth of private bootcamps and online courses, helping to build AI capacity across the workforce.

Academia remains a vital contributor, consulting private companies with possible AI solutions for their problems, providing AI education, and advancing research to further AI knowledge and its practical applications.

Meanwhile, civil society organizations focus on the social impacts of AI, working alongside the government and international organizations to shape policies that ensure responsible technology development.

Technical communities are another essential part of the ecosystem, sharing cutting-edge AI techniques and use cases while advocating for regulatory frameworks that support AI growth and innovation. Together, these stakeholders form a robust network fostering AI development and integration across Indonesia.

In 2020, representatives from these stakeholders collaborated to develop Indonesia's National Strategy on Artificial Intelligence. Arising from the efforts are collaborative institutions like KORIKA, which comprises representatives from all parts of the landscape - facilitating joint efforts to bolster the implementation of the national strategy.

The effort undertaken to develop and implement the National Strategy on Artificial Intelligence underscores the importance of maintaining and building upon this collaborative momentum in future national AI initiatives.

Hence, the most important next step is to have a collective understanding of needs, worries and expectations. To extract these perspectives, a series of consultative workshops were held in cities like Aceh, Balikpapan, Makassar, and Jakarta - aiming to bring forth a nuanced understanding from all parts of Indonesia.

Consultative Workshops

Four consultative workshops were held in the month of July 2024, in the aforementioned 4 regions representing the capital (Jakarta), alongside the West (Aceh), Central (Balikpapan), and East (Makassar) regions of Indonesia. Attendees are curated, and all of them were members of Indonesia's AI ecosystem, consisting of representatives from the government, media, private sector, special interest groups and civil society organizations. More than 300 people attended on-site and virtually.

During the workshop, participants are briefed on the initial diagnostics of the Readiness Assessment Methodology by the Indonesian expert team, followed by a questionnaire. The survey collects demographic and professional details, examines institutional involvement in digital transformation, examines their outlook on AI, and assesses the adoption of AI talent and tools within their organization. Additionally, it gauges the respondent's awareness of government efforts and international frameworks, such as UNESCO's AI Readiness Assessment Methodology. The survey concludes by inviting opinions on the steps the government should take to regulate AI usage in society. The detailed questions and rationale for the questionnaire are in the appendix.

The questionnaire filling is followed by 2 sessions of immersive discussions in groups led by the expert team. The discussions are set to dig deeper, more qualitative insights from the attendees to augment the questionnaires with nuances quantitative questions cannot provide.

Immersive Session: Mapping Stakeholder Concerns

The first immersive session is a futuring exercise on possible AI issues and harm. This session is designed to explore potential future challenges related to AI misuse and harmful adoption in Indonesia.

First Immersive Session

Scenario Generation - Participants begin by generating possible future media headlines concerning AI misuse in Indonesia. These headlines serve as a creative tool to surface potential issues that may arise from AI adoption.

Sharing and Synthesis - Selected participants share their headlines, allowing the group to see a range of possible issues. The facilitation team will then synthesize these contributions to highlight recurring themes.

Mitigation brainstorming - Using the synthesized themes as a prompt, participants discuss how the concerns can be mitigated and prevented. This session helps map the alignment (or misalignment) of current policy positions and stakeholder actions with public needs and wants.

Recap and Conclusion - The session will conclude with a recap of the discussions and key takeaways, summarizing insights on the immediate issues regarding AI and the prioritization of action items to curb it.

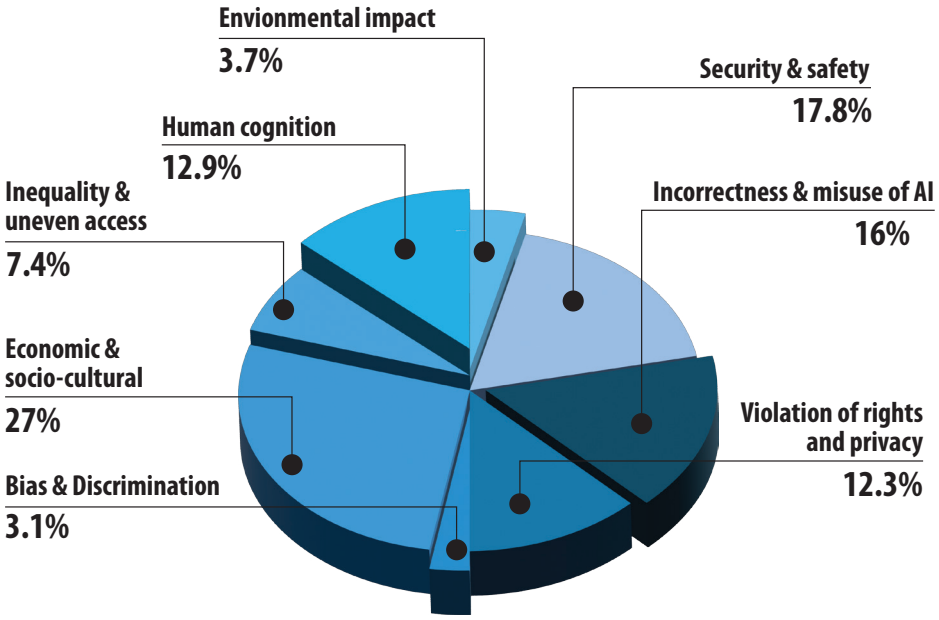
Stakeholder concerns about AI

Through the first session, stakeholders across 4 regions identified 163 unique headlines. From these data points, 8 distinct groups of ethical concerns related to AI were extracted, reflecting the broad spectrum of risks and challenges that AI could pose in the local context of Indonesia.

No	Ethical Concern	General sentiment
1	**Economic and socio-cultural impact**	The negative effects of AI adoption on the economy, job market, culture, and social structure.
2	**Security and safety**	Potential threats and risks that AI systems could pose to individuals, organizations, and society at large including cybersecurity threats, weaponization, and safety of autonomous systems.
3	**Inaccuracy and misuse of AI**	Errors in AI, whether intentional or unintentional, including misinformation, manipulation, flawed decisions, unethical use, over-reliance, and lack of transparency and accountability..
4	**Environmental impact**	Various ways in which the development, deployment, and operation of AI systems can contribute to environmental degradation including energy consumption, carbon footprint, e-waste, resource depletion, water usage, etc.
5	**Human cognition**	Impacts of the widespread use and reliance on AI that can potentially bring negative effects on human thinking, decision-making, creativity, and overall cognitive development.
6	**Violation of rights and privacy**	Ethical and legal concerns arising from the use of AI technologies that can infringe upon individuals' privacy and fundamental rights.
7	**Bias and discrimination**	Potential harms that arise when AI perpetuate or even exacerbate existing biases and inequalities, leading to unfair treatment of individuals or groups (minorities, disabilities, ethnics, religions, etc) and reinforcing societal prejudices.
8	**Inequality and uneven access to AI**	Disparities in the availability, use, and benefits of AI technologies across different groups of people, regions, and countries.

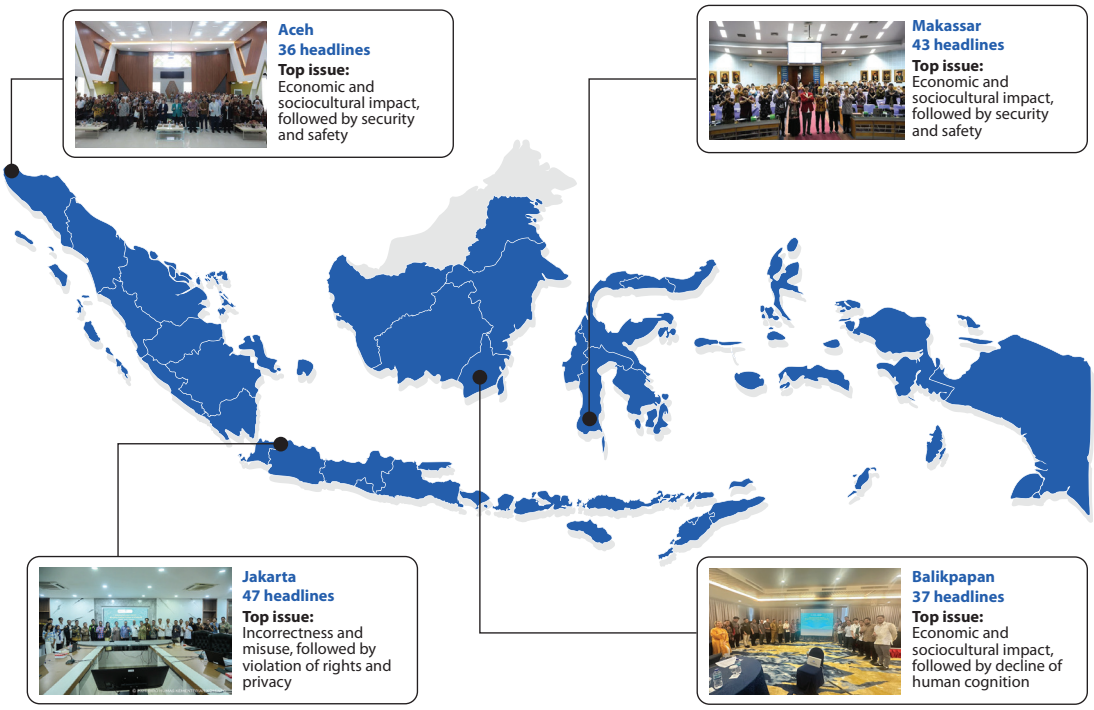
The analysis of the distribution of ethical concerns reveals that the most significant ethical concern regarding AI in Indonesia centers around the **economic and socio-cultural impacts**, indicating widespread concerns about how AI might disrupt industries, jobs, and social norms. This is closely followed by concerns about **security and safety** as well as **incorrectness and misuse of AI**, reflecting the importance of building trustworthy and reliable AI systems that are used ethically.

Ethical Concern on AI - Overall



Although issues related to **environmental impact** as well as **bias and discrimination** are highly significant in the context of Indonesia, given its tropical climate being susceptible to climate change effects and its inherently diverse ethnic groups, large number of minority groups, languages (more than 700 indigenous languages), religions, and cultures, these concerns were mentioned the least: only 3.7% and 3.1% of the total headlines addressed by the participants respectively.

In such a diverse society like Indonesia, the risk of AI systems perpetuating or exacerbating existing biases is particularly concerning. For example, AI systems trained on data that do not adequately represent the full spectrum of Indonesia's population could lead to discriminatory outcomes in areas such as healthcare, education, and law enforcement.



If we try to compare between regions, there is a notable divergence in concerns between other regions and the capital. In the other regions, the primary worry centers around the **economic impact, particularly regarding employment**. Conversely, in Jakarta, the focus shifts towards the potential for irresponsible use and individual rights, reflecting a deeper awareness of the issue, a better confidence of the post-AI economy and a preference for individual/personal level outlook.

Stakeholder Strategies Concerning AI

We tasked the stakeholders to strategize on how we could best handle these issues. Below are the clustered response from the stakeholders - which can be summarized hen as follows:

1. **Governance and Regulatory Frameworks**:
   The most frequently mentioned strategy involves the establishment of strong governance frameworks to oversee AI development and deployment. This includes creating and enforcing regulations that prevent the use of biased data in AI systems and ensuring transparency in AI processes, a reporting regime, and a mechanism for redressal if there are setbacks and harms caused by the deployment of an AI system. The fact that this strategy is mentioned most often shows a high expectation for the government as a stakeholder to take proactive steps to ensure AI is governed well.

2. **Education and Skill Development**:
   Another prominent cluster focuses on enhancing education and skills related to AI. Proposals include updating educational curricula to incorporate AI literacy and ethical considerations, promoting moral education, and implementing national retraining programs to equip the workforce with the necessary skills for the AI era. These strategies aim to build a society capable of understanding and responsibly engaging with AI technologies.

3. **Democratization and Equity**:
   This cluster emphasizes the need for AI democratization, ensuring that AI benefits are accessible to all, not just a select few. It includes promoting inclusive AI policies that address the needs of marginalized groups and ensuring AI systems align with human rights and ethical standards.

4. **Conflict Prevention and Risk Management**:
   Strategies in this cluster involve anticipating and mitigating potential conflicts and risks associated with AI adoption. This includes proactive measures to address socio-economic disparities that AI might exacerbate and developing policies that limit AI's negative impacts, such as privacy violations or job displacement. Comprehensive risk assessments and contingency planning are crucial to managing AI-related challenges.

5. **Public Awareness and Responsible Usage**:
   Finally, the need for public awareness and responsible AI usage is highlighted. Strategies include fostering public understanding of AI's potential risks and benefits, promoting ethical AI usage practices, and encouraging responsible AI innovation. By cultivating a well-informed society, these measures aim to prevent misuse and enhance public trust in AI technologies.

Immersive Session: Mapping Stakeholder Hopes and Expectations

The second session is a backcasting-based exercise that focuses on envisioning the positive growth of businesses and institutions in Indonesia through AI adoption over the next decade. The structure is designed to identify stakeholders' needs and desires, set public priorities, assess necessary investments, and map stakeholder expectations across various sectors.

Envisioning Future Growth
Participants will begin by imagining how their businesses or institutions will positively evolve over the next 10 years due to AI adoption. They will fill out forms detailing their envisioned growth. This exercise helps identify the specific needs and desires stakeholders have concerning AI and its role in their future success.

Backcasting Actions
Participants will then backcast, identifying three key actions needed by stakeholders - we split this into four sectors: government, media, private sector and academia. This step is crucial for setting public priorities and understanding what investments are necessary to fulfill the collective needs and desires for AI in Indonesia.

Card Sorting and Ranking
The identified actions will be sorted and shuffled, with participants ranking all 12 actions by each sector in order of importance. This exercise helps clarify the priority and urgency of the necessary investments, giving insight into what actions should be taken first to ensure the desired AI-driven outcomes.

Showcase and Sharing
A roundtable discussion will follow, where participants share their 'AI dream' and the top five priority actions they identified. This sharing session allows for the mapping of stakeholder expectations, as participants express what they believe each sector should contribute to achieve the collective AI goals.

Recap and Conclusion
The session will conclude with a recap of the discussions and key takeaways, summarizing the identified needs and desires, public priorities, necessary investments, and the stakeholders' expectations of one another.

Aspirations and Expectations for AI

The second session aims to understand the stakeholder's expectations on how AI will transform their current processes and capabilities. Similarly to the session that asks the stakeholders strategies to mitigate the negative impacts of AI, expectations for AI converge in these regions we visited. After synthesizing and clustering the comments told to us in the session's forms, most stakeholders mentioned a desire for AI to help them in 3 things: enhance workforce productivity, increase operational efficiency, and enhance human engagement.

Workforce Productivity

Indonesian professionals anticipate AI to streamline office tasks, making daily operations more manageable. As one respondent noted, "Tasks at the office become easier" with AI integration. There is a particular emphasis on AI-based applications facilitating work processes, especially in content creation and communication. For instance, AI is expected to simplify "article creation, social media content, writing, or responding to letters and emails," thus accelerating routine tasks.

The overall sentiment indicates that AI will lead to more effective and higher-quality work output. As one stakeholder succinctly put it, "Employees work more effectively and with higher quality."

Operational Efficiency

AI is viewed as a catalyst for operational streamlining across institutions. Stakeholders anticipate "operational efficiency, increased productivity, and improved quality of human resources." This extends to public sector operations, where "institutions benefit from efficiency in management and public administration processes."

A notable example is in healthcare, where "medical staff are greatly assisted in inputting patient medical data and prescription data in applications," showcasing AI's potential to enhance accuracy and speed in critical sectors.

Enhanced Human Engagement

In the education and research sectors, AI is seen as a transformative force. Stakeholders believe that "AI plays a positive role in learning, research, and community service processes." There's an expectation that "learning processes will become easier and more measurable," indicating AI's potential to personalize and optimize educational experiences.

The implementation of AI technologies, particularly chatbots, is expected to revolutionize customer service. As one respondent highlighted, "Fast data processing and chatbots can respond to services 24/7 without interruption," suggesting a significant improvement in service availability and response times.

After noting their hope and aspirations about AI, stakeholders are asked to detail action items from each stakeholder to help them achieve their aspirations. This section of the session aims to map out stakeholder's expectations of other stakeholders and, in turn, create a collective understanding of the roles each stakeholder needs to play for optimum AI adoption. The result is summarized as follows:

Government

Stakeholders generally put the most action items for the government, signifying high expectations for them to deliver in this national effort for ethical AI adoption. Action items for the government from the stakeholders can be clustered into the following four points:

- **Infrastructure and Investment**
  Stakeholders called for government investment in key AI infrastructure, such as reliable data centers, high-speed networks, and computing resources. They also emphasized the need for targeted support for human capital and SMEs to boost AI adoption across sectors. These priorities will foster innovation and drive AI-powered economic growth.
- **Regulation and Implementation**
  Stakeholders urge the government to create comprehensive AI regulations covering ethical, legal, and operational aspects, backed by strong enforcement and sanctions for compliance. They also call for infrastructure to support regulation, including monitoring platforms and incentives to encourage adherence.
- **Education and Public Awareness**
  Stakeholders expect the government to lead public education on AI through curriculum integration and awareness campaigns. They also urge policymakers to gain a strong understanding of AI to make informed decisions.

- **Security and Data Protection**
  Fresh from publicized cybersecurity incidents during the time of the consultative workshops, stakeholders urge the government to prioritize data protection by enhancing cybersecurity and enforcing strong regulations. This includes providing secure storage, encryption, and frameworks to mitigate AI risks, ensuring both public and private data are safeguarded.
- **Governance and Coordination**
  The stakeholders suggest that the government should lead in creating a unified AI strategy, coordinating efforts across agencies and stakeholders, managing data resources, and fostering synergies to avoid duplication and ensure consistent AI initiatives.

Academia

The role of academia is crucial in driving the responsible and effective adoption of AI, and specific expectations from stakeholders have been identified across various dimensions. These expectations have been grouped into the following key clusters:

Human Resources and Ethical Development
Stakeholders turn to academia to develop skilled, ethical AI professionals by training students in AI technologies and instilling responsibility in its use. Talents graduating from educational institutions are expected to be able to apply AI efficiently and ethically, helping to mitigate risks and promote AI for public good.

Curriculum Integration and Education
Stakeholders expect an agile education system that offers updated AI-related content, ensuring students gain the skills needed in this evolving field. This agility includes a frequent revisit of curricula, creating AI programs, and offering professional training. Collaboration with government and industry is encouraged to align education with real-world needs, providing internships and scholarships for practical experience.

Research and Innovation
Stakeholders want universities and research institutions to lead in cutting-edge AI research, develop innovative solutions, and publish findings that address societal challenges. This research should advance AI while informing policy and industry practices, fostering innovation to ensure AI benefits society.

Collaboration and Government Support
Collaboration is essential for AI adoption, with academia expected to work with industry, government, and other institutions to highlight AI use cases and bridge the gap between research and practical application. Academia is also expected to contribute to policy development and support government efforts, ensuring AI development is based on rigorous research and aligned with societal goals to maximize its impact.

Infrastructure and Tools
Stakeholders expect academia to play a crucial role in supporting AI education and research by identifying necessary infrastructure and tools. If such resources do not already exist, academia is also expected to inform urgency and execute the research needed to develop them. This ensures that all stakeholders have the support they need for effective AI adoption.

Media

The role of the media is pivotal in shaping public understanding and perception of AI, and specific expectations have been identified to ensure the media effectively supports the responsible adoption of AI technologies:

Education and Public Awareness
Stakeholders expect the media to lead in educating the public about AI, providing accurate information on technologies, regulations, ethics, and societal impacts. Through outreach and educational content, the media can empower citizens to engage with AI knowledgeably, fostering a more informed and tech-literate society.

Ethical Reporting and Content Validation
Stakeholders expect the media to maintain high standards when reporting AI-generated content, ensuring ethical practices through rigorous fact-checking and validation. Accurate, trustworthy reporting will prevent misinformation and reinforce public confidence in both the media and AI technologies.

Promotion and Positive Framing of AI
The media plays a key role in shaping public perception by promoting AI innovations and success stories, emphasizing positive impacts in fields like healthcare, education, and accessibility. By showcasing AI's potential benefits, the media can foster greater acceptance and adoption. Additionally, it's important for the media to monitor and report on ethical AI practices, ensuring responsible use for the benefit of society.

Information Accessibility and Public Trust
The media is expected to improve the accessibility of AI information, making it understandable for all, including marginalized communities. Clear, inclusive communication of AI's benefits and challenges is essential. Additionally, fostering public trust through transparent and accountable AI reporting is key to strengthening confidence in both AI technologies and governing institutions.

Industry and Private Sector

The private sector is crucial for advancing AI adoption, with stakeholder expectations focused on driving innovation, investment, and ethical integration of AI technologies. As a key driver of economic growth, businesses are expected to use AI to boost efficiency, competitiveness, and sustainability.

Leadership in AI Adoption and Innovation
The private sector is expected to lead in AI adoption, integrating it across operations like production, supply chain, and customer service. Businesses are also expected to set an example, showcasing AI's value and encouraging broader industry adoption, which is essential for driving AI integration across the economy.

Investment in Talent and Infrastructure
Stakeholders expect the private sector to invest heavily in both AI talent and technological infrastructure for sustainable AI adoption. This includes recruiting and training data scientists, machine learning engineers, and other specialists to keep the workforce at the forefront of AI advancements. Additionally, businesses are expected to invest in infrastructure like high-performance computing, secure data storage, and advanced AI tools to ensure seamless AI integration and maintain competitiveness in the global market.

Collaboration and Ecosystem Development
Stakeholders expect the private sector to collaborate across industries and with academia, government, and civil society to build a strong AI ecosystem. This includes partnering with research institutions for AI innovation, working with governments on regulations, and engaging with NGOs to address societal issues. Such collaboration is crucial for fostering knowledge sharing and creating AI solutions that support sustainable development and inclusive growth.

CSOs

CSOs are crucial for providing checks and balances to other institutions as representatives of the society. In our discussions, stakeholders expected CSOs to contribute in AI adoptions through these points:

Provide feedback on AI-related regulations
Stakeholders feel that CSOs are critical for in policy consultations to offer perspectives from diverse communities, ensuring regulations reflect a wide range of societal concerns, including human rights, labor impact, and environmental sustainability. They also can submit research and reports that highlight potential regulatory gaps or unintended consequences of AI technologies, helping policymakers refine existing laws or draft new legislation.

Promote ethical AI adoption
Stakeholders hope that CSOs can raise awareness about the potential harms and benefits of AI, ensuring that social values like fairness, accountability, and transparency are prioritized.

They could also advocate for marginalized groups to ensure AI applications do not reinforce biases or deepen inequalities. They can also help monitor regulatory compliance by reviewing the implementation of AI technologies in various sectors and raising concerns when violations occur.

Enhance AI education and raise public awareness
CSOs can contribute to increasing the public's understanding of AI by providing educational resources and training programs to demystify AI for the general public, helping people understand its potential impact on society; organizing workshops, seminars, and public forums that bring together AI experts, educators, and community members to discuss the societal implications of AI; developing community outreach programs aimed at underserved populations to ensure equitable access to AI knowledge and opportunities.

Policy Recommendations

Regulation

Updating AI Standards and Strategies

The Ministry of Communication and Information Technology (now Ministry of Communications and Digital Affairs) should update key regulations pertaining to AI standards and norms, especially Ministerial Circular Letter No. 9/2023, to ensure alignment with global benchmarks. While some of the principles stated in the circular letter are aligned with global benchmarks (including UNESCO Recommendation on the Ethics of Artificial Intelligence), there are some key concepts that are missing from the stated standards (UNESCO, 2022).

UNESCO Recommendation on the Ethics of Artificial Intelligence, for example, mentioned the value of proportionality and do not harm, which is essential to limit potential overreach and ensure any harmful risks are taken care of properly. Another point is about human oversight and determination, which puts emphasis on human accountability in critical deployments.

Topics Covered	UNESCO recommendation on ethical AI	ASEAN guide on ethical AI	International Scientific report on the safety of advanced AI: Interim Report	UN's Report on Governing AI for Humanity: How AI governance can help achieve the Sustainable Development Goal's	OECD AI Principles
Safety and Security	✓	✓	✓	✓	✓
Privacy and Data Protection	✓	✓	✓	✓	✓
Multi-stakeholder and Adaptive Governance and Collaboration	✓			✓	
Responsibility and Accountability	✓	✓			✓
Tranparency and Explainability	✓	✓	✓		✓
Human Oversight and Determination	✓	✓	✓		✓
Sustainability	✓			✓	✓
Awareness and Literacy	✓				
Fairness and Non-Discrimination	✓	✓	✓	✓	✓
Robustness and Reliability		✓	✓		✓

Example of values in global benchmarks that Indonesia can adopt as their national standards and norms. (ASEAN, 2024; Department for Science, Innovation and Technology & AI Safety Institute, 2024; UN AI Advisory Body, 2023; OECD, 2024)

Adherence to global benchmarks and standards would ensure that future regulations in Indonesia that will refer to the circular letter for standards will be comprehensive and up-to-date with global consensus.

This recommendation also suggests revising the national AI strategy (created in 2020) to reflect the surge in generative AI, which has made artificial intelligence more accessible to the public. By incorporating these developments, Indonesia can facilitate greater public participation and engagement in AI advancements.

Investment and Incentive Regimes for Implementing Standards and Active Preparation of Risks

The Draft Bill on the 2025-2045 National Long-Term Development Plan (RPJPN) has identified AI as one of the key enabling technologies that Indonesia must master to achieve the goal of national economic transformation. Substantial investment is crucial in realizing that plan. Aside from funding capabilities to achieve 'Sovereign AI' - the nation's ability to develop AI using its own infrastructure, data, workforce and business networks, to safeguard and advance its interests – the government should create an incentive regulation for the operationalization of ethical AI norms and AI risk mitigation. Some examples for the incentive mechanism the government can make:

- Increasing funding for research on ethical AI values like explainability deploying such values effectively.
- Tax cuts for companies that integrate government-set AI standards (e.g. Ministerial Circular Letter No. 9/2023 or) into their practices.
- Grants for AI foresight research and risk mitigation strategies in companies and institutions.

Balanced Approach to Regulation

Stakeholders have expressed strong expectations for the government to mitigate the risks associated with AI. However, this should not lead to rushed or overly restrictive legislation that risks hindering innovation or infringing on human rights.The government should adopt a balanced approach such as these steps:

- **Proportionate Regulation:** Tailor rules to the risk level of AI applications:
  - **High-risk AI (e.g., healthcare, finance, autonomous vehicles)** would requires stricter oversight to mitigate societal harm.
  - **Low-risk AI (e.g., chatbots, recommendation systems):** Lighter regulations to foster innovation and experimentation.
- **Regulatory Sandbox:** Support startups by enabling controlled innovation environments. The government can build on successful models like the Ministry of Health's digital health sandbox and expand to other sectors.
- **Matrix-Based Strategy:** Give general norms but also mind the nuances of application in each verticals.
- **Strengthen Existing Laws:** Rather than adding new regulation, the government could enhance implementation of UU ITE and UU PDP, along with their derivatives, to address gaps we identified earlier, including:
  - Mechanisms for requesting information on AI systems.
  - Protection from AI-related harms.
- **Inclusive Policy Development:** Expand public participation by involving civil society organizations (CSOs) in shaping and implementing AI policies. These inclusiveness can also minimize the risk of law abuse and misuse as mentioned in the first chapter.

Institutional Framework

The Creation of a National Agency for Artificial Intelligence

To support the regulatory agenda, Indonesia should establish a National Agency for Artificial Intelligence. This body, either as an independent entity or integrated into the Presidential Secretariat, would play a central role in coordinating AI-related policies, setting standards, orchestrating synergy and collaboration, and ensuring alignment with technological advancements and societal needs. This centralized agency could maintain coherence across sectors, give urgency, and would prevent the inefficiencies and fragmentation that could result from siloed efforts among ministries, as mentioned above in the regulation section.

Coordination and Focused Strategy-Building between Research Institutions

Research in Indonesia generally still happens in a bottom-up manner. This is great for fostering diversity of thought, but can be result in an unfocused, scattered national research agenda. We recommend that research institutions like the National Research and Innovation Agency (BRIN) along with universities be empowered to define a joint national research agenda that, among other things, include these points:

- Prioritizes AI research problems that are Indonesia specific and needing cross-sector coordination, like cultural preservation, biodiversity and disaster resilience.
- A consolidation of budget and logistical plannings to maximize returns of the scant research budget.
- Coordinated efforts public-private partnership to improve the private sector's contribution in R&D.

Standardization for AI Adoption Measurement

It is currently hard to track adoption of AI across sectors and government agencies due to differing metrics, labeling and terminologies. To track AI adoption across sectors, ministries, and agencies such as *Bappenas* (One Data Indonesia), BPS, and BIG should establish and coordinate standardized data governance and measurement practices. This would enable a concrete, and measurable roadmap for AI that could be monitored and controlled by *Bappenas* and the Coordinating Ministry for Economic Affairs. This standardization and formal planning are necessary to position AI as a core element of Indonesia's future economic development.

Capacity Building

Equitable access to AI Education, Resources and Infrastructure

Ensuring equitable access to AI education, resources, and infrastructure across Indonesia is essential for fostering inclusive AI development. We established in the previous chapters that Indonesia still has some way to go to close the gaps between gender uses of key technology and variances between urban centers and more outlying regions. To tackle this issue the government should:

- Expand access to AI infrastructure, particularly for AI practitioners, researchers, and startups located outside the capital. Equitable access is vital to prevent regional disparities in AI innovation and utilization.
- Promote diversity in AI programs by offering scholarships, mentorship programs, and targeted initiatives to encourage the participation of women, minorities, and economically disadvantaged communities.
- Partner with industry leaders, universities, global institutions, and development partners to create a learning environment that improves AI literacy across the archipelago. An AI-literate population capable of harnessing the benefits of AI responsibly can really help the government in fulfilling the future demand of 9 million digital and AI talents.

Bias and Discrimination

Addressing bias and discrimination is critical, particularly in the context of Indonesia's diverse population. Related to the previous discovery in our consultative workshops, we find that Indonesians are not generally aware of the bias and discriminative risk AI poses to a diverse population. The government, especially the Ministry for Education, Culture, Research, and Technology, should push for a digital literacy campaign/ curriculum that underlines this risk.

After addressing the literacy issue, the government, academia, civil society organizations, private sectors, and the media should work hand-in-hand to ensure the bias and discrimination risk does not materialize in the forms of actions such as:

- Providing guidelines and norms to ensure inclusive AI initiatives involves a broad range of stakeholders. This ensures that the development and deployment of AI technologies reflect the values and needs of all Indonesians.
- Create a representative dataset for Indonesia's culture and heritage through just and fair means.
- Monitor and evaluate deployments of AI systems and measure them for any possible disparate impacts.

Cultural Representation and Preservation

Generative AI presents both opportunities and challenges in the context of cultural preservation. Indonesia's rich cultural heritage, encompassing over 700 languages and numerous art forms, must be carefully safeguarded in the face of AI advancements. The government could help boost this initiative by:

- Facilitating a dialogue between AI industry players with cultural practitioners to ensure fair compensation and ethical use of cultural materials, especially as training data for AI systems, are critical to maintaining cultural integrity.
- Launch a focused strategy on how we can best represent and preserve our cultural heritage with, or in the face of, AI – echoing the previous call to set a nationwide research priority on this matter.
- Increasing the cultural practitioner's literacy on how AI can affect their work, so they can advocate their rights independently.

Upskilling to Withstand Labor Disruption

Our consultative workshops have highlighted a major concern regarding AI adoption: its potential socio-economic impact, particularly the risk of labor displacement. Additionally, the substitutive applications of generative AI technologies have sparked concerns within the field of creative workers. While recent studies indicate that generative AI can boost the productivity of highly skilled workers, the question of whether it will generally automate or augment human labor in the big picture remains unresolved.

To address the diverse effects of AI advancements, the government should take proactive steps to support workers in these areas:

- Entask statistical agencies to collaborate with academic researchers and CSOs to better understand the conditions under which AI either automates tasks or complements human work. The insights gained should then be applied to ensure that lower-wage workers and those in rural or underserved communities are prioritized in AI workforce development programs.
- Implement labor policies that is adaptable and broad, focusing on flexibility rather than targeting specific jobs or groups.
- Leverage vocational training institutions in upskilling the workforce this process by integrating AI-related skills training.
- Incentivize industry players to upskill their talents and foster collaborative spirit between employers to do so in their verticals.

Appendix

Appendix 1. Questionnaire

The additional questionnaire is intended to: 1) acquire more detailed data than those obtained from the RAM questionnaire about AI adoption in Indonesia, and 2) provide various RAM related data from sampling of the population when nationally required data from the RAM Questionnaire cannot be obtained.

The questionnaire is distributed to multiple stakeholders, including government institutions, academics, companies, startups, communities, and media in Indonesia with interest and stakes in information technology and computing, with a total of 309 respondents who filled out the questionnaire.

Some aspects to be obtained from this additional questionnaire include: 1) digital transformation, 2) types and spending on IT technology, 3) human resources managing IT, 4) types and spending on AI technology, 5) policies related to data and AI technology, 6) respondents' views on the opportunities and risks of AI utilization, and 7) several specific questions related to the RAM questionnaire.

Below are the lists of question being asked through this questionnaire:

1. Domisili Bpk/Ibu/Sdr - *Your place of residence*
2. Nama Institusi yang Bpk/Ibu/Sdr wakili - *Name of the institution you represent*
3. Profesi atau pekerjaan Bpk/Ibu/Sdr adalah - *Your profession or occupation*
    a. Pejabat pemerintah - *Government official*
    b. Manajer/pimpinan perusahaan swasta - *Manager/executive at a private company*
    c. Founder atau karyawan di startup - *Founder or employee at a startup*
    d. Peneliti di Lembaga penelitian - *Researcher at a research institute*
    e. Dosen di perguruan tinggi - *Lecturer at a university*
    f. Data scientist
    g. Lainnya - *Others (to fill in)* : ……..
4. Usia Bpk/Ibu/Sdr saat ini - *Your current age*
    a. 16-25
    b. 26-35
    c. 36-45
    d. 46-55
    e. 56-65
    f. > 65
5. Jenis Kelamin Bpk/Ibu/Sdr - *Gender*
    a. Laki-laki - *Male*
    b. Perempuan - *Female*
6. Apakah perusahaan atau institusi dimana Bpk/Ibu/Sdr bekerja ada inisiatif terkait transformasi digital - *Does the company or institution you work for have digital transformation initiatives?*
    a. Ada - *Yes*
    b. Tidak ada - *No*
    c. Lainnya : ……. *Other answer*
7. Berapa perkiraan belanja teknologi digital (perangkat lunak dan perangkat keras) per-tahun di perusahaan/institusi Bpk/Ibu/Sdr - *What is the estimated annual expenditure on digital technology (software and hardware) in your company/institution? (1 USD = ~15.000 IDR)*
    a. 100-500 juta - *IDR 100-500 million*
    b. 500juta s/d 1 Milyar - *IDR 500 million to 1 billion*
    c. 1-10 Milyar - *IDR 1-10 billion*

8. Media sosial apa yang sering digunakan di perusahaan/institusi Bpk/Ibu/Sdr - *What social media platforms are frequently used in your company/institution?*
    a. Whatsapp
    b. Facebook
    c. Twitter (X)
    d. Telegram
    e. Lainnya …. - *Other answer*
9. Apakah di perusahaan/institusi Bpk/Ibu/Sdr ada bagian/unit yang mengelola sistem/teknologi informasi - *Does your company/institution have a department/unit that manages information systems/technology?*
    a. Ada - *Yes*
    b. Tidak ada - *No*
10. Jenis aplikasi atau perangkat lunak yang digunakan di perusahaan/institusi Bpk/Ibu/Sdr (jawaban bisa lebih dari satu) - *What types of applications or software are used in your company/institution (multiple answers possible)?*
    a. Sistem informasi kepegawaian - *employee management*
    b. Sistem informasi logistik/pengadaan - *procurement or logistics*
    c. Sistem informasi keuangan - *financial*
    d. Sistem informasi lainnya : ……(sebutkan) - *other uses*
11. Terkait dengan penggunaan sistem informasi (sistem informasi, database, e-mail, media sosial dll) apakah ada kebijakan dari perusahaan/institusi Bapak/Ibu/Sdr mengenai keamanan data pribadi - *Regarding the use of information systems (information systems, databases, e-mail, social media, etc.), does your company/institution have policies regarding personal data security?*
    a. Ada - *Yes*
    b. Tidak ada - *No*
12. Terkait dengan penggunaan sistem informasi (sistem informasi, database, e-mail, media sosial dll) apakah ada kebijakan dari perusahaan/institusi Bapak/Ibu/Sdr mengenai keamanan data perusahaan/institusi - *Regarding the use of information systems (information systems, databases, e-mail, social media, etc.), does your company/institution have policies regarding company/institutional data security?*
    a. Ada - *Yes*
    b. Tidak ada - *No*
13. Terkait dengan penggunaan sistem informasi (sistem informasi, database, e-mail, media sosial dll) apakah ada kebijakan dari perusahaan/institusi Bapak/Ibu/Sdr mengenai privasi data pribadi - *Regarding the use of information systems (information systems, databases, e-mail, social media, etc.), does your company/institution have policies regarding personal data privacy?*
    a. Ada - *Yes*
    b. Tidak ada - *No*
14. Apakah perusahaan/institusi Bpk/Ibu/Sdr menggunakan atau melanggan aplikasi/perangkat lunak yang menggunakan (berbasis) kecerdasan artifisial (AI-Artificial Intelligence), seperti misalnya (bisa salah satu) Microsoft Copilot, ChatGPT, Google Cloud AI Platform, Microsoft Azure Machine Learning Studio, AWS dan lainnya - *Does your company/institution use or subscribe to AI-based applications/software, such as (any of the following) Microsoft Copilot, ChatGPT, Google Cloud AI Platform, Microsoft Azure Machine Learning Studio, AWS, or others?*
    a. Ya - *Yes*
    b. Tidak - *No*
15. Apakah sistem informasi di perusahaan/institusi Bpk/Ibu/Sdr menggunakan kecerdasan artifisial untuk mendukung analisis data (data analytics) - *Does the information system in your company/institution use AI to support data analytics?*
    a. Ya - *Yes*
    b. Tidak - *No*
16. Selain aplikasi sebagaimana disebutkan pada Pertanyaan No. 15 dan 16 diatas, apakah perusahaan/institusi Bapak/bu/Sdr memanfaatkan jenis aplikasi berbasis kecerdasan artifisial lainnya - *Apart from the applications mentioned in Questions No. 10 and 11 above, does your company/institution utilize other AI-based applications?*
    a. Ya - *Yes*
    b. Tidak - *No*
17. Bilamana perusahaan/institusi Bpk/Ibu/Sdr menggunakan atau melanggan aplikasi atau perangkat lunak berbasis kecerdasan artifisial, aplikasi atau perangkat lunak ini digunakan untuk (jawaban bisa

lebih dari satu) - *If your company/institution uses or subscribes to AI-based applications or software, for what purposes are they used (multiple answers possible)?*
    a. Mendukung pemasaran - *Marketing Purposes*
    b. Mendukung pembuatan konten untuk promosi perusahaan/institusi dalam bentuk dokumen, audio, gambar/foto, video - *Content creation*
    c. Mendukung inspeksi kualitas produk - *Product quality inspection*
    d. Mendukung layanan pelanggan - *Customer service*
    e. Memprediksi permintaan produk dan/atau penjualan - *Sales / demand prediction*
    f. Mendukung analisis keuangan - *Financial analysis*
    g. Presensi kehadiran karyawan/pegawai - *Employee management*
    h. Lainnya : ……(mohon disebutkan)
18. Apakah karyawan/pegawai di perusahaan/institusi Bpk/Ibu/Sdr ada yang memanfaatkan ChatGPT/ Gemini/Copilot/Claude/Grok dan sejenisnya dalam membantu pekerjaan - *Do employees in your company/institution use ChatGPT/Gemini/Copilot/Claude/Grok or similar tools to assist in their work?*
    a. Ada - *Yes*
    b. Tidak ada - *No*
19. Apakah ada rencana pengadaan/melanggan perangkat lunak atau aplikasi berbasis kecerdasan artifisial di perusahaan/institusi Bpk/Ibu/Sdr dalam 5 tahun kedepan? - *Is there a plan to procure or subscribe to AI-based software or applications in your company/institution within the next 5 years?*
    a. Ada - *Yes*
    b. Tidak ada - *No*
20. Bila pada Pertanyaan No. 15 jawabannya adalah ada rencana pengadaan/melanggan, jenis perangkat lunak atau aplikasi yang akan diadakan/dilanggan adalah - *If in Question No. 15 the answer is planning to procure/subscribe, what types of software or applications will be procured/subscribed to* :
    a. ChatGPT, GPT-4o dan sejenisnya *(and the like)*
    b. Microsoft Copilot
    c. Perangkat lunak atau aplikasi khusus berbasis kecerdasan artifisial lainnya - *other AI tools and software*
21. Berapa perkiraan belanja atau melanggan perangkat lunak atau aplikasi berbasis kecerdasan artifisial di perusahaan/institusi per-tahun - *What is the estimated annual expenditure on AI-based software or applications in your company/institution? (1 USD = ~15.000 IDR)*
    a. Lebih kecil dari Rp. 100 juta - *smaller than IDR 100 million*
    b. Rp. 100 juta -200 juta - *between 100-200 million*
    c. Rp. 200 juta – 500 juta - *between 200-500 million*
    d. Lebih dari 500 juta - *more than 500 million*
22. Berapa perkiraan anggaran yang ingin/sudah dikeluarkan institusi bapak ibu untuk me-riset penggunaan AI untuk institusi ataupun melakukan riset AI sendiri? - *What is the estimated budget that your institution wants/has allocated for AI research or conducting AI research in-house? (1 USD = ~15.000 IDR)*
    a. Tidak ada anggaran khusus - *no specific budget*
    b. Lebih kecil dari Rp. 100 juta - *smaller than IDR 100 million*
    c. Rp. 100 juta -200 juta - *between 100-200 million*
    d. Rp. 200 juta – 500 juta - *between 200-500 million*
    e. Lebih dari 500 juta - *more than 500 million*
23. Apakah pimpinan perusahaan/institusi Bpk/Ibu/Sdr menerapkan kebijakan khusus mengenai pemanfaatan perangkat lunak atau aplikasi berbasis kecerdasan artifisial - *Does the leadership of your company/institution have specific policies regarding the use of AI-based software or applications?*
    a. Ada - *Yes*
    b. Tidak ada - *No*
24. Bila pimpinan perusahaan/institusi Bpk/Ibu/Sdr memiliki kebijakan khusus mengenai pemanfaatan perangkat lunak atau aplikasi berbasis kecerdasan artifisial, sejauh mana efektivitas kebijakan tersebut - *If your company's/institution's leadership has specific policies regarding the use of AI-based software or applications, how effective are these policies?*
    a. Sangat efektif - *very effective*
    b. Cukup efektif - *fairly effective*
    c. Tidak efektif - *not effective*
    d. Tidak ada kebijakan khusus - *no policy*
25. Bagaimana pandangan Bpk/Ibu/Sdr mengenai pemanfaatan aplikasi atau perangkat lunak berba-

sis kecerdasan artifisial di perusahaan/institusi - *What is your view on the use of AI-based software or applications in your company/institution?*
    a. Sangat bermanfaat dalam mendukung pekerjaan - *highly beneficial*
    b. Cukup bermanfat dalam mendukung pekerjaan - *fairly beneficial*
    c. Tidak bermanfaat - *not beneficial*
26. Bagaimana pandangan Bpk/Ibu/Sdr mengenai pemanfaatan aplikasi atau perangkat lunak berbasis kecerdasan artifisial di perusahaan/institusi dalam mendukung produktivitas - *What is your view on the use of AI-based software or applications in your company/institution in supporting productivity?*
    a. Sangat mendukung produktivitas perusahaan - *Highly supportive of company productivity*
    b. Cukup mendukung produktivitas perusahaan - *Fairly supportive of company productivity*
    c. Tidak mendukung produktivitas perusahaan - *Not supportive of company productivity*
27. Bagaimana pandangan Bpk/Ibu/Sdr mengenai potensi aplikasi/teknologi berbasis kecerdasan artifisial terkait bahaya yang dapat ditimbulkan - *What is your view on the potential risks posed by AI-based applications/technologies?*
    a. Membahayakan - *Dangerous*
    b. Netral (tergantung siapa yang memanfaatkan aplikasi/teknologi kecerdasan artifisial) - *Neutral depending who's using*
    c. Tidak membahayakan - *Not harmful*
28. Bagaimana pandangan Bpk/Ibu/Sdr mengenai implikasi penggunaan aplikasi/teknologi berbasis kecerdasan artifisial terkait dengan ketenagakerjaan - *What is your view on the implications of using AI-based applications/technologies on employment?*
    a. Menggantikan pekerjaan manusia dengan mesin (AI) - *replacing human jobs*
    b. Mengurangi jumlah pekerjaan yang dilakukan secara manual oleh manusia - *replacing manual labor and tedious tasks only*
    c. Tidak mengurangi pekerjaan yang dilakukan secara manual oleh manusia - *has no impact to jobs*
29. Bagaimana pandangan Bpk/Ibu/Sdr mengenai implikasi penggunaan aplikasi/teknologi berbasis kecerdasan artifisial terkait kelompok minoritas - *What is your view on the implications of using AI-based applications/technologies on minority groups?*
    a. Mendiskriminasi kelompok minoritas - *Discriminative*
    b. Bersifat netral (dapat mendiskriminasi kelompok minoritas dapat pula tidak mendiskriminasi kelompok minoritas) *Neutral, can be both discriminative and not*
    c. Tidak mendiskriminasi kelompok minoritas - *Not Discriminative*
30. Bagaimana pandangan Bpk/Ibu/Sdr mengenai implikasi penggunaan aplikasi/teknologi berbasis kecerdasan artifisial terhadap keamanan dan privasi data - *What is your view on the implications of using AI-based applications/technologies on data security and privacy?*
    a. Melindungi keamanan dan privasi data - *Protecting from risk*
    b. Tidak melindungi keamanan dan privasi data - *Not providing protection*
    c. Bersifat netral terhadap keamanan dan privasi data - *neutral*

Pertanyaan esai/isian

31. Apakah Bpk/Ibu/Sdr berencana melakukan perekrutan karyawan yang mempunyai keahlian terkait AI? (Ya/Tidak) - jika Ya - *Does your company/institution plan to recruit employees with AI-related skills? (Yes/No) – if Yes:*
    a. Sebutkan jumlah lowongan yang direncanakan akan dibuka - *Specify the number of planned job openings*
    b. Sebutkan nama posisi-posisi yang akan direkrut tersebut - *Specify the job titles being recruited*
32. Berapa (dalam persen) kira-kira karyawan/pegawai/anggota dalam institusi Bpk/Ibu/Sdr saat ini, yang sekiranya mempunyai kemampuan dalam bidang-bidang terkait AI (programming, *data science*, signal processing, etc) - *What percentage of employees/staff in your institution currently possess AI-related skills (programming, data science, signal processing, etc.)?*
33. Apakah Bpk/Ibu/Sdr berencana mengadopsi AI dalam proses bisnis/pelayanan yang dilakukan oleh institusi Bpk/Ibu/Sdr? (Ya/Tidak) - jika Ya - *Does your company/institution plan to adopt AI in its business processes/services? (Yes/No) – if Yes*:
    a. Apa langkah yang Bapak/Ibu/Sdr gunakan untuk memitigasi potensi AI melakukan hal-hal yang *harmful* bagi pengguna/konsumen/bagian masyarakat yang Anda layani - *What steps*

are you taking to mitigate potential harm caused by AI to users/consumers/sections of society you serve?

b. Apa langkah yang Bapak/Ibu/Sdr gunakan untuk memitigasi potensi AI mendiskriminasi kelompok-kelompok tertentu dalam penerapannya - *What steps are you taking to mitigate potential AI discrimination against certain groups in its application?*

c. Apa langkah yang Bapak/Ibu/Sdr gunakan untuk memitigasi potensi AI menggantikan lapangan kerja karena otomasi - *What steps are you taking to mitigate potential job replacement due to automation?*

34. Apakah Bpk/Ibu/Sdr atau manajemen terkait sudah/sedang berencana melakukan upskilling bagi karyawan/pegawai/anggota dalam institusi Bpk/Ibu/Sdr saat ini keahlian terkait AI? (Ya/Tidak) - Jika Ya - *Is your company/institution or management planning to upskill employees/staff in AI-related skills? (Yes/No)*:
    a. Sebutkan bentuk-bentuk inisiatif yang dilakukan - *state the initiatives*
35. Apakah Bpk/Ibu/Sdr mengetahui upaya-upaya pemerintah terkait adopsi teknologi AI? (Ya/Tidak) - Jika Ya - *Are you aware of government efforts regarding AI technology adoption? (Yes/No) – if Yes*:
    a. Sebutkan bentuk upaya-upaya yang Bpk/Ibu/Sdr ketahui - *state the initiatives you know*
    b. Sebutkan opini Bpk/Ibu/Sdr terhatap upaya-upaya tersebut - *express your opinions about the initiatives*
    c. Menurut Bpk/Ibu/Sdr apa saja langkah-langkah yang perlu dilakukan pemerintah terkait adopsi teknologi AI - *what are the steps the government needs to do in terms of AI adoption?*
36. Apakah anda mengetahui tentang inisiatif AI Readiness Assessment Methodology oleh UNESCO? Jelaskan secara singkat pemahaman Anda - *Are you aware of UNESCO's AI Readiness Assessment Methodology initiative? Briefly explain your understanding*
37. Secara umum, apa hal-hal yang anda harapkan dari pemerintah dalam meregulasi penggunaan AI di masyarakat - *In general, what do you expect from the government in regulating the use of AI in society*?

References

1. AI Singapore. (2023, November 19). SEA-LION. *AI Singapore*. https://aisingapore.org/aiproducts/sea-lion/
2. Aji, A. F., Winata, G. I., Koto, F., Cahyawijaya, S., Romadhony, A., Mahendra, R., Kurniawan, K., Moeljadi, D., Prasojo, R. E., Baldwin, T., Lau, J. H., & Ruder, S. (2022, May). *One Country, 700+ Languages: NLP Challenges for Underrepresented Languages and Dialects in Indonesia*. https://aclanthology.org/2022.acl-long.500/
3. Alibaba News. (2019, May 15). Data Center Pertama Alibaba Cloud di Indonesia Resmi Beroperasi - AlibabaNews Bahasa Indonesia. *Alibaba Group*. https://id.alibabanews.com/data-center-alibaba-cloud-pertama-di-indonesia/
4. Arief, I. (2018, September 3). How We Build a Multimillion Dollar AI for Indonesia. *Medium*. https://medium.com/inside-bukalapak/how-we-build-a-multimillion-dollar-ai-for-indonesia-9b5ce556a053
5. ASEAN. (2024). *ASEAN Guide on AI Governance and Ethics.* ASEAN. https://asean.org/wp-content/uploads/2024/02/ASEAN-Guide-on-AI-Governance-and-Ethics_beautified_201223_v2.pdf
6. Asian Development Bank. (2017, April). Emerging Indonesian Data Center Market and Energy Efficiency Opportunities. *Asian Development Bank*. https://www.adb.org/publications/ino-data-center-market-energy-efficiency
7. Badan Pengembangan SDM Kominfo. (n.d.). *Digital Talent Scholarship*. Digitalent Kominfo. https://digitalent.kominfo.go.id/program#
8. Baharudin, H. (2024, June 24). String of data breaches may hurt Indonesia's reputation: Experts. *The Straits Times*. https://www.straitstimes.com/asia/se-asia/indonesia-gradually-restores-public-services-as-experts-warn-of-impact-from-alleged-data-breach
9. Bakti Kominfo. (n.d.). *Bakti Kominfo Homepage*. Bakti Kominfo. https://www.baktikominfo.id/
10. Balea, J. (2016, July 14). Indonesia becomes Grab's biggest market as car, motorcycle services grow 250-fold. *Tech in Asia*. https://www.techinasia.com/indonesia-grab-biggest-market
11. Batik Fractal. (n.d.). *Batik Fractal*. Batik Fractal: Tech Meets Tradition. Retrieved October 29, 2024, from https://batikfractal.com/
12. BPPT. (2020, August). Strategi Nasional Kecerdasan Artifisial Indonesia 2020 – 2045. https://korika.id/document/strategi-nasional-kecerdasan-artifisial-indonesia-2020-2045/
13. Bromham, L., & Hua, X. (2021, December 16). Global predictors of language endangerment and the future of linguistic diversity. https://www.nature.com/articles/s41559-021-01604-y
14. BSKAP. (2024). *Kajian Akademik Kurikulum Merdeka*. Pusat Kurikulum dan Pembelajaran BSKAP Kemendikbudristek. https://kurikulum.kemdikbud.go.id/file/1711503412_manage_file.pdf

15. CNN Indonesia. (2021, August 3). Kemendikbud Beberkan Dana Laptop Chromebook buat Pelajar. *CNN Indonesia*. https://www.cnnindonesia.com/teknologi/20210803132820-185-675767/kemendikbud-beberkan-dana-laptop-chromebook-buat-pelajar
16. Crozier, R. (2022, May 19). Traveloka scales its recommendations with Amazon Personalize - Case Studies - Cloud - Software - Data and Analytics. *iTnews Asia*. https://www.itnews.asia/news/traveloka-scales-its-recommendations-with-amazon-personalize-580223
17. de Guzman, C. (2024, September 5). *Endang Aminudin Aziz: The 100 Most Influential People in AI 2024 | TIME*. Time. Retrieved October 29, 2024, from https://time.com/7012839/endang-aminudin-aziz/
18. Department for Science, Innovation and Technology & AI Safety Institute. (2024). *International Scientific Report on the Safety of Advanced AI*. UK Government. https://www.gov.uk/government/publications/international-scientific-report-on-the-safety-of-advanced-ai
19. DIKTI. (n.d.). Dikti AI Center. *Dikti AI Center*. Retrieved October 30, 2024, from https://www.ai-dikti.id/
20. DIKTI. (2022, January 27). Kembangkan Talenta di Bidang Artificial Intelligence, Ditjen Diktiristek Jalin Kerja Sama dengan NVIDIA. https://dikti.kemdikbud.go.id/kabar-dikti/kabar/kembangkan-talenta-di-bidang-artificial-intelligence-ditjen-diktiristek-jalin-kerja-sama-dengan-nvidia/
21. DIKTI. (2024, February 23). Bangkit 2024 Siap Bekali Mahasiswa dengan Kompetensi di Bidang AI. *Kabar DIKTI*. https://dikti.kemdikbud.go.id/kabar-dikti/bangkit-2024-siap-bekali-mahasiswa-dengan-kompetensi-di-bidang-ai/
22. DIKTI-b. (2024, April 26). Tingkatkan Pembelajaran Digital melalui Pemanfaatan GenAI dalam Perguruan Tinggi. *Siaran Pers Kemendikbudristek*. https://www.kemdikbud.go.id/main/blog/2024/04/tingkatkan-pembelajaran-digital-melalui-pemanfaatan-genai-dalam-perguruan-tinggi
23. Dinas Komunikasi dan Informatika Provinsi Kalimantan Timur. (n.d.). Satu Data Kalimantan Timur. Retrieved October 29, 2024, from https://data.kaltimprov.go.id/home
24. Dinas Komunikasi, Informatika dan Statistik Provinsi DKI Jakarta. (n.d.). Satu Data Jakarta. https://satudata.jakarta.go.id/home
25. DTS Kominfo. (n.d.). D*igital Talent Scholarship*. Digital Talent Scholarship Kominfo. Retrieved September 17, 2024, from https://digitalent.kominfo.go.id/
26. Firdaus, A. (2024, May 20). Ministry, Starlink facilitate internet access in remote health centers. *ANTARA News*. https://en.antaranews.com/news/313848/ministry-starlink-facilitate-internet-access-in-remote-health-centers
27. Firdausi, A. B. (2024, May 7). *Kominfo: AI investment in Indonesia will reach IDR 120 trillion in 2023*. DailySocial. https://en.dailysocial.id/post/kominfo-investasi-ai-di-indonesia-mencapai-rp120-triliun-di-2023
28. Google. (n.d.). *Kickstart your tech career with Bangkit*. Grow with Google. Retrieved September 17, 2024, from https://grow.google/intl/id_id/bangkit/?tab=machine-learning

29. Google, Temasek, Bain & Company. (2022, October 22). *e-Conomy SEA 2022 Report*. Temasek. https://www.temasek.com.sg/content/dam/temasek-corporate/news-and-views/resources/reports/e_Conomy_SEA_2022_report.pdf

30. Grab. (n.d.). AI in Action. *Grab*. https://www.grab.com/sg/inside-grab/ai-in-action/solutions/

31. Habibie, M. H. (2020, Agustus 12). Menuju Transformasi Digital Pendidikan Indonesia. https://pusdatin.kemdikbud.go.id/menuju-transformasi-digital-pendidikan-indonesia/

32. Hart, D., & Harshman, R. (2020, June 24). The new Google Cloud region in Jakarta is now open. *Google Cloud*. https://cloud.google.com/blog/products/infrastructure/new-google-cloud-region-in-jakarta-now-open

33. Haryo Limanseto. (2022, April 11). Coordinating Minister Airlangga: Digital Economy in Indonesia is The Highest Among Southeast Asia Countries. *Kementerian Koordinator Bidang Perekonomian*. https://www.ekon.go.id/publikasi/detail/4026/coordinating-minister-airlangga-digital-economy-in-indonesia-is-the-highest-among-southeast-asia-countries

34. Hidayat, J. A. J. (2024, June 13). Telkom sebut Kota Batam jadi hub data center berbasis AI. *ANTARA News*. https://www.antaranews.com/berita/4150830/telkom-sebut-kota-batam-jadi-hub-data-center-berbasis-ai

35. Humas BRIN. (2022, November 4). BRIN Kenalkan Layanan Komputasi Artificial Intelligence (AI) dengan NVIDIA DGX A100. *BRIN*. https://www.brin.go.id/news/110796/brin-kenalkan-layanan-komputasi-artificial-intelligence-ai-dengan-nvidia-dgx-a100

36. Humas Sekretariat Kabinet Republik Indonesia. (2020, November 17). Pemerintah Beri Intensif Fiskal Dorong Riset dari Badan Usaha. *Sekretariat Kabinet Republik Indonesia*. https://setkab.go.id/pemerintah-beri-intensif-fiskal-dorong-riset-dari-badan-usaha/

37. Indonesia Vision AI. (2023). *Awesome Indonesia Computer Vision Research - Conference Publication*. Awesome Indonesia Computer Vision Research - Conference Publication. https://github.com/indonesia-vision-ai/awesome-indonesia-vision-research-conference

38. IndoNLP. (2022, June 12). *IndoNLP Github Repositories*. IndoNLP Github Repositories. https://github.com/IndoNLP

39. International Trade Administration. (2023, July 3). Indonesia Cybersecurity. *International Trade Administration*. https://www.trade.gov/market-intelligence/indonesia-cybersecurity

40. ITU. (2024). Global Cybersecurity Index. *ITU*. https://www.itu.int/en/ITU-D/Cybersecurity/pages/global-cybersecurity-index.aspx

41. Kedaireka DIKTI. (n.d.). *Kedaireka - Kampus Merdeka*. Kedaireka. Retrieved September 17, 2024, from https://kedaireka.id/

42. Kementerian Investasi dan Hilirisasi / BKPM. (2020). *Klasifikasi Baku Lapangan Usaha Indonesia (KBLI)* 2020. https://oss.go.id/informasi/kbli-detail/137e137f-e21e-4b1a-9dcf-ff270c0661fe

43. Kementerian Kominfo. (2016, December 1). Peraturan Menteri Komunikasi dan Informatika Nomor 20 Tahun 2016. *JDIH Kominfo*. https://jdih.kominfo.go.id/produk_hukum/view/id/553/t/

44. Kementerian Kominfo. (2020). *Peraturan Menteri Komunikasi dan Informatika Nomor 5 Tahun 2020*. JDIH Kominfo. https://jdih.kominfo.go.id/produk_hukum/view/id/759/t/peraturan+menteri+komunikasi+dan+informatika+nomor+5+tahun+2020

45. Kementerian Kominfo. (2021). *Peraturan Menteri Komunikasi dan Informatika Nomor 3 Tahun 2021*. JDIH Kominfo. https://jdih.kominfo.go.id/produk_hukum/view/id/765/t/peraturan+menteri+komunikasi+dan+informatika+nomor+3+tahun+2021

46. Kementerian Kominfo. (2023). Ministerial Circular Letter No. 9/2023 by Kominfo. JDIH Kominfo. https://jdih.kominfo.go.id/produk_hukum/view/id/883/t/surat+edaran+menteri+komunikasi+dan+informatika+nomor+9+tahun+2023

47. Kementerian PPN. (n.d.). RPJPN 2045. *Indonesia 2045*. https://indonesia2045.go.id/

48. Kementerian PPN/Bappenas. (n.d.). Data.go.id. Retrieved October 29, 2024, from https://data.go.id/home

49. KORIKA. (2023, November 16). ClimateSmart Indonesia Berbasis AI untuk Atasi Wabah Penyakit Akibat Perubahan Iklim – KORIKA. *KORIKA*. https://korika.id/en/press-release/climatesmart-indonesia-berbasis-ai-untuk-atasi-wabah-penyakit-akibat-perubahan-iklim/

50. Kusumawardani, S. S., Wulandari, D., Pannen, P., Ekadiyanto, F. A., Wiryana, I. M., Purwarianti, A., & Alfarozi, S. A. I. (2024). *Panduan Penggunaan GenAI pada Pembelajaran di Perguruan Tinggi.* Direktorat Jenderal Pendidikan Tinggi, Riset, dan Teknologi. https://dikti.kemdikbud.go.id/epustaka/122191/

51. Lim, Y.-X. (2019, December 8). An Introduction to Gojek's Machine Learning Platform - 4 min read. *Gojek*. https://www.gojek.io/blog/an-introduction-to-gojeks-machine-learning-platform

52. Mahrofi, Z. (2023, July 24). Kemendes PDTT-Kominfo perkuat kolaborasi percepat internet masuk desa. *Antara News*. https://www.antaranews.com/berita/3649734/kemendes-pdtt-kominfo-perkuat-kolaborasi-percepat-internet-masuk-desa

53. Meutia, I. (2024, May 7). *6 Kampus di Indonesia dengan Jurusan AI, Plus Prospek Kerjanya*. glints.com. https://glints.com/id/lowongan/jurusan-ai/

54. Muhamad, N. (2024, January 31). Indonesia, Penyumbang Kunjungan Aplikasi AI Terbanyak ke-3 di Dunia. *Databoks*. https://databoks.katadata.co.id/teknologi-telekomunikasi/statistik/a49ed3eb121983b/indonesia-penyumbang-kunjungan-aplikasi-ai-terbanyak-ke-3-di-dunia

55. Ng, M., & Haridas, G. (2023, September 25). *The Economic Impact of Generative AI: The Future of Work in Indonesia*. Access Partnership. https://accesspartnership.com/the-economic-impact-of-generative-ai-the-future-of-work-in-indonesia/

56. Nizam, Tjahjandarie, T. S., Rustam, D., Basaruddin, T., Nuraida, L., Muhidong, J., Affandi, A., Sakti, S. P., Sakti, S. C. W., Ramadhan, D. A., Hermita, M., & Solistama, P. (2024). *Buku Panduan Program Dana Padanan 2024*. Direktorat Jenderal DIKTI

Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia. Retrieved September 16, 2024, from https://backoffice.kedaireka.id/Buku%20Panduan%20Program%20Dana%20Padanan%202024%20-%20Ditjen%20Diktiristek.pdf

57. NusaCrowd. (n.d.). *NusaCrowd Github Repository*. GitHub. Retrieved October 29, 2024, from https://github.com/IndoNLP/nusa-crowd
58. OECD. (2024). *OECD AI Principles*. OECD AI Policy Observatory. Retrieved October 30, 2024, from https://oecd.ai/en/ai-principles
59. Owen, L. (2024, March 26). Komodo-7B: The First LLM for Regional Languages in Indonesia. *Tech @ Yellow.ai*. https://tech.yellow.ai/p/komodo-7b-the-first-llm-for-regional
60. Pemerintah Indonesia. (n.d.). *Rancangan Undang-Undang Republik Indonesia Nomor 11 Tahun 2020 Tentang Cipta Kerja*. Kementerian Koordinator Bidang Perekonomian. Retrieved October 30, 2024, from https://ekon.go.id/source/info_sektoral/RUU%20Cipta%20Kerja.pdf
61. Pemerintah Indonesia. (1999). Undang-Undang Nomor 8 Tahun 1999 tentang Perlindungan Konsumen. *JDIH Kemendag*. Https://jdih.kemendag.go.id/peraturan/undang-undang-nomor-8-tahun-1999-tentang-perlindungan-konsumen
62. Pemerintah Indonesia. (1999). *Undang-Undang Republik Indonesia No. 39 Tahun 1999*. Komnas HAM. https://www.komnasham.go.id/files/1475231474-uu-nomor-39-tahun-1999-tentang-$H9FVDS.pdf
63. Pemerintah Indonesia. (2008). Undang-undang (UU) Nomor 14 Tahun 2008. *JDIH BPK*. https://peraturan.bpk.go.id/Details/39047/uu-no-14-tahun-2008
64. Pemerintah Indonesia. (2010). Peraturan Pemerintah Nomor 61 Tahun 2010. *PPID Kominfo*. https://eppid.kominfo.go.id/storage/uploads/1_2_Nomor_61_Tahun_2010.pdf
65. Pemerintah Indonesia. (2016). In *Undang-Undang Nomor 19 Tahun 2016 tentang Perubahan Atas Undang-Undang Nomor 11 Tahun 2008 tentang Informasi dan Transaksi Elektronik*. https://jdih.kominfo.go.id/produk_hukum/view/id/555/t/undangundang+nomor+19+tahun+2016#:~:text=suatu%20masyarakat%20demokratis.-,Undang%2DUndang%20Nomor%2011%20Tahun%202008%20tentang%20Informasi%20dan%20Transaksi,di%20bidang%20pemanfaatan%20Teknologi%20Inf
66. Pemerintah Indonesia. (2019). *Peraturan Pemerintah Nomor 71 Tahun 2019*. JDIH Kominfo. Retrieved October 30, 2024, from https://jdih.kominfo.go.id/produk_hukum/view/id/695/t/peraturan+pemerintah+nomor+71+tahun+2019
67. Pemerintah Indonesia. (2019). Peraturan Presiden Republik Indonesia Nomor 39 Tahun 2019 Tentang Satu Data Indonesia. *JDIH Sekretariat Kabinet*. https://jdih.setkab.go.id/PUUdoc/175860/Perpres_Nomor_39_Tahun_2019.pdf
68. Pemerintah Indonesia. (2019). *UU No. 11 Tahun 2019*. Peraturan BPK. https://peraturan.bpk.go.id/Details/117023/uu-no-11-tahun-2019

69. Pemerintah Indonesia. (2021). *Peraturan Pemerintah Nomor 5 Tahun 2021*. JDIH Kominfo. https://jdih.kominfo.go.id/produk_hukum/view/id/761/t/peraturan+pemerintah+nomor+5+tahun+2021
70. Pemerintah Indonesia. (2022). *Presidential Regulation No. 132 of 2022*. Direktorat Jenderal Peraturan Perundang-undangan. https://peraturan.go.id/id/perpres-no-132-tahun-2022
71. Pemerintah Indonesia. (2022). *Undang-Undang Nomor 27 Tahun 2022 tentang Pelindungan Data Pribadi*. JDIH Kominfo. https://jdih.kominfo.go.id/produk_hukum/view/id/832/t/undangundang+nomor+27+tahun+2022
72. Pemerintah Indonesia. (2023). Peraturan Presiden (Perpres) Nomor 82 Tahun 2023 tentang Percepatan Transformasi Digital dan Keterpaduan Layanan Digital Nasional. *JDIH BPK*. https://peraturan.bpk.go.id/Details/273981/perpres-no-82-tahun-2023
73. Pemerintah Indonesia. (2024). JDIH Kemkominfo - Undang-Undang Nomor 1 Tahun 2024. *JDIH Kominfo*. https://jdih.kominfo.go.id/produk_hukum/view/id/884/t/undangundang+nomor+1+tahun+2024
74. Pemerintah Provinsi Jabar. (n.d.). Open Data Provinsi Jabar. https://opendata.jabarprov.go.id/id
75. Permatasari, P. A. (n.d.). *iWareBatik: Digital Information System for Enhancing Batik Learning in the Framework of Heritage Preservation and Sustainable Tourism*. UNESCO Chair. https://www.unescochair.usi.ch/iwarebatik-digital-information-system-for-enhancing-batik-learning-in-the-framework-of-heritage-preservation-and-sustainable-tourism
76. Purbasari, D. P., & Darmanto, E. S. (2022, November 25). How this country used EdTech to add 14 million jobs during the pandemic. *World Economic Forum*. https://www.weforum.org/agenda/2022/11/indonesia-edtech-financial-inclusion/
77. Pusat Informasi Kemdikbud. (2024). *Apa itu Asisten Guru?* Asisten Guru. https://pusatinformasi.guru.kemdikbud.go.id/hc/id/articles/28896684408217-Apa-itu-Asisten-Guru
78. Putri, D. B. (2024, April 3). Minister Of Communication And Information: NVIDIA And Indosat Will Invest To Create Indonesian AI Nation. *VOI*. https://voi.id/en/technology/371066
79. Quantum Temple. (n.d.). Quantum Temple. Retrieved October 29, 2024, from https://quantumtemple.xyz/
80. Renaldi, A., Flores, C., & Lau, Y. (2024, May 21). Indonesia is using AI to preserve some of its 700 languages. *Rest of World*. https://restofworld.org/2024/indonesia-ai-700-langagues/
81. Republik Indonesia. (1945). Undang-undang Dasar Negara Republik Indonesia Tahun 1945. *Dewan Perwakilan Rakyat*. https://www.dpr.go.id/jdih/uu1945

82. Ridwan, R., Gunawan, W., Kadir, A., Suprijadi, Lusida, I., Wijaya, H., Adiono, T., Wahyuni, H. I., Aksono, B., Wungu, T. D. K., Sumpeno, S., Setyawati, N., Puspaputri, E., & Indra, M. D. (2021). *Buku Panduan Pusat Unggulan Ipteks Perguruan Tinggi*. Direktorat Kelembagaan Ditjen DIKTI Kementerian Pendidikan dan Kebudayaan. https://dikti.kemdikbud.go.id/wp-content/uploads/2021/06/Panduan_PUI-PT-2021-fix.pdf

83. Riyanto, G. P., & Nistanto, R. K. (2021, December 15). AWS Resmikan Data Center di Indonesia, Investasi hingga Rp 71 Triliun. *Tekno Kompas*. https://tekno.kompas.com/read/2021/12/15/12410077/aws-resmikan-data-center-di-indonesia-investasi-hingga-rp-71-triliun

84. Suparman, S. (2024, June 13). Can technology help to create better, employment-ready university graduates? *The Jakarta Post*. https://www.thejakartapost.com/culture/2024/06/13/can-technology-help-to-create-better-employment-ready-university-graduates.html

85. Teresia, A. (2024, June 26). More than 40 Indonesian agencies hit by cyberattack on data centres. Reuters. https://www.reuters.com/world/asia-pacific/more-than-40-indonesian-agencies-hit-by-cyberattack-data-centres-2024-06-26/

86. UN AI Advisory Body. (2023). UN. https://www.un.org/sites/un2.un.org/files/ai_advisory_body_interim_report.pdf

87. UNESCO. (2022). Recommendation on the Ethics of Artificial Intelligence. https://unesdoc.unesco.org/ark:/48223/pf0000381137

88. Wang, C., Zhang, M., Sesunan, A., & Yolanda, L. (2023). T*echnology-Driven Education Reform in Indonesia*. OliverWyman. https://www.oliverwyman.com/our-expertise/insights/2023/dec/technology-driven-education-reform-indonesia.html

89. Yean, T. S. (2023, September 29). Rise of Unicorns in Southeast Asia. *Fulcrum*. https://fulcrum.sg/aseanfocus/rise-of-unicorns-in-southeast-asia/

90. Yellow AI. (n.d.). *Komodo 7b Hugging Face Page*. Hugging Face. Retrieved October 29, 2024, from https://huggingface.co/Yellow-AI-NLP/komodo-7b-base

91. Yulianti, C. (2022, September 16). Kominfo: Indonesia Masih Kekurangan 9 Juta Talenta IT di Tahun 2030. *Detik*. https://www.detik.com/edu/edutainment/d-6934224/kominfo-indonesia-masih-kekurangan-9-juta-talenta-it-di-tahun-2030peraturan+menteri+komunikasi+dan+informatika+nomor+20+tahun+2016+tanggal+1+desember+2016

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