The Economic Impact of Generative AI:

THE FUTURE OF WORK IN INDONESIA

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Access Partnership   ELSAM

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Contents

Executive Summary

Artificial Intelligence (AI) holds immense promise for Indonesia, which has the largest digital economy in Southeast Asia.[1] The AI ecosystem in Indonesia has been growing rapidly and the Indonesian government has consistently supported digital investments in the country including adopting the National Strategy on AI 2020-2045 outlining a plan to develop the necessary infrastructure and talent pool, recommending the formation of a data ethics board to oversee AI development, as well as creating regulations and national standards for AI innovation.

Against this background, technology industry leaders have noted that AI is at an inflection point, with powerful new models like generative AI being introduced, and innovative new applications increasingly being used across society and capturing the imaginations of consumers. Generative AI has opened the door to more possibilities and is expected to play a role in tasks requiring creativity, curiosity, and looking at information differently. Therefore, the potential of generative AI lies in its ability to enable people to achieve greater creativity, effectiveness, and efficiency in their work.

This report seeks to contribute to this discussion by providing early insights and raising awareness of the economic opportunities that generative AI can create, and what it means for local industries and workforce readiness.

This study estimates that generative AI can potentially unlock **USD243.5 billion** of productive capacity in Indonesia, equivalent to close to one-fifth of GDP in 2022. Indonesia has an opportunity to better position its businesses and workers to unlock the potential of generative AI, as well as manage emerging risks. Policymakers will need to ensure that they have a clear national vision for AI, and that it focuses on preparing its workforce and establishing an enabling policy environment for AI adoption, including to answer the question *"what is required to achieve the aspirations of a brighter future enabled by generative AI?"*

Three channels of change

There are three main channels through which generative AI will change the processes of production within an economy and reprioritize the types of tasks undertaken, and skills needed in the workforce.

- **Unleashing Creativity:** Generative AI can contribute to the creative process by reducing the time and cost involved in generating new ideas and producing innovative outputs. The journalism industry in Indonesia have been exploring the use of generative AI in journalistic work, especially in providing initial inputs such as writing data-driven articles and summarizing long texts of research.[2]

- **Accelerating Discovery:** The use of generative AI can help accelerate the process of scientific research and discovery by reducing the cost of research and supporting better learning outcomes. EdTech organizations such as GovTech Edu have been collaborating with the Indonesian government to explore the use cases of generative AI in education.[3]

- **Enhancing Efficiency:** Generative AI can play a role in enhancing workplace efficiency by supporting tasks requiring parsing of big data sets and information sources. The use of generative AI can also help improve the usability of this data and information, making it more interpretable and useful for decision-making. The use of generative AI to help streamline digital service delivery is currently being explored in a number of government projects in key areas such as education and research, healthcare, bureaucratic reform, food security and smart city development.[4]

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[1]　Fulcrum (2022). *The State of Indonesia's Digital Economy in 2022.* Available at: https://fulcrum.sg/the-state-of-indonesias-digital-economy-in-2022/

[2]　Indotema (2023). *Mendukung jurnalis Indonesia bersiap untuk AI generatif.* Available at: https://www.indotema.com/2023/05/mendukung-jurnalis-indonesia-bersiap-untuk-ai-generatif.html

[3]　AC Ventures (2023), *How Indonesia's edtech stakeholders are approaching generative AI.* Available at: https://acv.vc/insights/podcast/ai-indonesia-edtech-stakeholders/

[4]　GovInsider (2023), *How Indonesia's new national strategy aims to accelerate the growth of Southeast Asia's largest AI ecosystem.* Available at:
https://govinsider.asia/intl-id/article/how-indonesias-new-national-strategy-aims-to-accelerate-the-growth-southeast-asias-largest-ai-ecosystem

The opportunity for Indonesia

Understanding the potential impacts on industries, jobs, and skills will allow policymakers, business leaders, and workers to better prepare for, and take advantage of the capabilities of generative AI.

Generative AI can unlock USD243.5 billion in productive capacity in Indonesia, with implementation by the Manufacturing and Construction sectors likely contributing close to half of the potential economy-wide gains.

Indonesia's Manufacturing and Construction sectors are potentially the biggest contributors to the economy-wide gains from generative AI, largely because it comprises a large share of the local workforce and account for high labor productivity. Furthermore, the workers within the Agriculture, and Wholesale and Retail Trade sectors are responsible for a large share of total work activities which could be transformed by generative AI given that they comprise a large share of the local workforce, which means that leveraging the benefit of generative AI in these sectors could transform the work experience for a large number of workers in Indonesia.

Generative AI will change the focus within jobs, rather than replace them entirely – and there is potential for most workers to use generative AI to some degree in their work.

While only a small share (1%) of the Indonesian workforce would see generative AI used in more than 20% of their work, more than half (52%) of workers in Indonesia will potentially use generative AI for between 5-20% of their regular work activities.

Capturing the economic opportunities that generative AI presents will require equipping the workforce with the future-ready skills to thrive in an AI-powered future. The basic skills of Reading, Writing, and Critical Thinking remain essential skills to engage with and interpret generative AI applications. The cross-functional skills of Operations Monitoring, Coordination, and Management of Material Resources should be evaluated as to how they are recontextualized for generative AI in the workplace.

Furthermore, it will be important to close the digital skills gap in Indonesia by continuing to focus on digital literacy, as well as to improve AI aptitude—the ability to operate in an AI environment and leverage AI tools.[5] This includes learning how to manipulate and apply AI technologies across a range of situations and use functions to enhance existing work tasks for more effective and efficient results.

Indonesia ranked 51st in the 2022 World Digital Competitiveness Ranking, signaling opportunities for improvement in areas such as training and education.[6] Over the past five years, the Indonesian government has introduced various initiatives to develop digital readiness and nurture high quality talent for a future workforce such as through the Digital Talent Scholarship, the Kampus Merdeka program and the Siberkreasi National Movement for Digital Literacy.[7] To better leverage the opportunities of generative AI, it will be important to further improve digital literacy education in the Indonesian workforce.

[5]   Kenan Institute of Private Enterprise (2023). The Must-Have Skills in the Era of Artificial Intelligence: How AI's Democratization Will Impact Workers. Available at:
      https://kenaninstitute.unc.edu/commentary/the-must-have-skills-in-the-era-of-artificial-intelligence-how-ais-democratization-will-impact-workers/

[6]   IMD (2022). Digital Competitiveness Ranking. Available at: https://worldcompetitiveness.imd.org/countryprofile/ID/digital

[7]   Tech for Good Institute (n.d.). National-level priorities to grow the digital economy: Spotlight on Indonesia. Available at:
      https://techforgoodinstitute.org/blog/articles/advancing-digital-economy-through-national-level-priorities-spotlight-on-indonesia/

Harnessing the potential of generative AI

Leveraging generative AI to accelerate economic growth will require a comprehensive, coordinated approach that addresses not only the technological aspects of AI, but also the social, economic, and ethical implications of the technology. A policy framework that takes these factors into account will be necessary to maximize the gains from AI whilst mitigating the risk from such economic transformation. We present a framework of recommendations to drive AI use for consideration by government and business leaders, focused on three main policy objectives.

1. **Increasing access and adoption:** Ensuring the development of the necessary AI-ready infrastructure with fit-for-purpose, enabling digital policies and regulations. This includes supporting the AI-transition for businesses and having the right workforce readiness policies.

2. **Mitigating risks:** Recognizing that there are risks and this requires a coordinated effort particularly on guiding responsible and ethical use of AI and establishing the necessary organizational checks and balances when using AI.

3. **Inspiring innovation:** Finding the right balance between protecting and promoting innovation.

To capture the abundant economic opportunities that generative AI could unlock, a coordinated effort will be necessary to prepare for its widespread adoption. This will require multiple stakeholders, from government, industry, academia, civil society, and the broader community to engage in the topics of how to best leverage generative AI and manage its risks.

1 Introduction

Artificial Intelligence (AI) holds immense promise for Indonesia, which has the largest digital economy in Southeast Asia.[i] Indonesian companies have the highest rates of AI adoption in the region,[ii] the e-commerce market is thriving, and there is a vibrant AI and machine learning (ML) start-up ecosystem.[iii] The Indonesian government has also supported digital investments in the country. This includes creating an enabling policy environment to advance the economy by adopting the National Strategy on AI 2020-2045. The Strategy outlines a plan for developing the necessary infrastructure and talent pool, recommends the formation of a data ethics board to oversee AI development, as well as create regulations and national standards for AI innovation.

Against this background, technology industry leaders have noted that AI is at an inflection point, with powerful new models like generative AI being introduced, and innovative new applications increasingly being used across society and capturing the imaginations of consumers. Generative AI has opened the door to more possibilities and is expected to play a role in tasks requiring creativity, curiosity, and looking at information differently. Therefore, the potential of generative AI lies in its ability to enable people to achieve greater creativity, effectiveness and efficiency in their work.

Indonesia has an opportunity to better position its businesses and workers to take advantage of generative AI, as well as manage emerging risks. Policymakers may need to re-examine the country's economy-wide approach to generative AI, and consider how to prepare its workforce and policy environment for generative AI, including to answer the question "what is required to achieve the aspirations of a brighter future enabled by generative AI?" **This report seeks to contribute to this discussion by providing early insights and raising awareness of the economic opportunities that generative AI can create, and what it means for local industries and workforce readiness.**

Some of the public discourse surrounding generative AI has involved concerns about the potential effect on jobs. Such concerns are understandable, as history has shown that the introduction of new productive technologies have changed the way labor is used in production, sometimes significantly, for example, the industrial revolution, and the introduction of the internet. However, based on the findings of this study, it is likely that the implementation of generative AI will change the focus within certain jobs rather than replace jobs entirely. To achieve this potential, workers, employers, and authorities will need to make conscious choices to make the most of the new technology—similar to when horses were replaced with cars, it was a long process that required authorities to build roads, and people to learn to drive.

The AI Strategy for Indonesia supports the implementation of Visi Indonesia 2045 which outlines the economic, social, and technology development strategy of the nation and noted the need to develop the right talent in the country, along with the development of digital and data infrastructure, and promotion of industries and innovation.[v] The Strategy outlined a framework for Indonesia to develop its AI talents through: (1) education to produce skilled workers, researchers and entrepreneurs in the field of AI; (2) the growth of AI market/product research and the creation of new AI products; and (3) providing financial resources, facilities and infrastructure, including devices, tools and data needed in increasing talent competence in the field of AI.[vi] The Strategy also considers governance issues around the development of ethical AI and plans to establish a Data Ethics Board to prevent misuse.

Beyond this, it is important for Indonesia to establish an enabling regulatory environment to foster AI adoption while carefully balancing potential risks. The rapid advancement of AI technologies offers immense potential for economic growth, innovation, and societal development. However, to harness these benefits responsibly, a robust regulatory framework is crucial. This includes ensuring proper enforcement of the recently introduced Personal Data Protection Law, as well as furthering the discussion to introduce an overarching cybersecurity and resilience bill. It may also involve reviewing relevant regulations on competition and consumer protection to ensure that such regulations continue to drive progress and innovation, while mitigating risks of algorithmic biases, discrimination, or other unintended consequences.

To capture the abundant economic opportunities that generative AI could unlock, a coordinated effort will be necessary to prepare for its widespread adoption. This will require multiple stakeholders, from government, industry, academia, civil society, and the broader community to engage in the topics of how to best leverage generative AI and manage its risks.

2 Defining the potential of generative AI

> *Generative AI refers to a category of artificial intelligence (AI) algorithms that generate new outputs based on the data they have been trained on. Unlike traditional AI systems that are designed to recognize patterns and make predictions, generative AI creates new content in the form of images, text, audio, and more.*
>
> — World Economic Forum (WEF) 2023[vii]

The WEF provides a succinct definition of generative AI. However, rather than the sophistication of the technology driving it, the public's imagination has generally been ignited by consumer-based examples of how generative AI has been used, often in innovative ways.

This application of the technology to specific work tasks is the basis of our analysis of the Future of Work. The analysis assumes that generative AI can find applications across many work activities. Along these lines, its effects are likely to be broad-based like that following the introduction of the internet, rather than like that of automation technologies which have slightly narrower applications.

While the attention has largely focused on consumer-based use cases of generative AI, it is expected that the use cases for generative AI will grow, and increasingly find relevance in business settings (Box 1). There are already examples of enterprise use cases, for example, Panasonic has begun a large-scale deployment of generative AI to assist with tasks such as document drafting, in order to help improve productivity.[viii] As more and more businesses identify instances where application of generative AI can lift the burden on its workforce, it is likely that adoption rates will rise.

BOX 1

Moving from consumer to enterprise use cases

While many of the current use cases are largely consumer-based, Deloitte predicts that "the far-reaching impacts and potential value when deploying generative AI are accelerating experimental, consumer, and soon, enterprise use cases."[ix] They also note that the frequently cited criteria for enterprise adoption of generative AI models are:

1. Ease of use: Integrations into systems and workflows via out-of-the-box connections and low/no code tooling, reducing expensive IT resources and enabling frontline users.

2. Security and privacy: Compliance with data security standards and access control over confidential data.

3. Robust ecosystems: Broad set of development and service partners to extend, customize, and co-develop specialized data sets, use cases, and applications.

4. Transparency and explainability: Understanding how model outputs and responses are derived and the ability to perform root cause analysis on inaccurate results.

5. Flexibility and customizability: Ability to create parameters, train on proprietary data, and customize embeddings while maintaining privacy and ownership of data and tuning.

2.1 The basis of this study

As the full potential of generative AI is still being discovered, the approach taken in this study is to look across the universe of work activities and determine what generative AI would not do—the inverse of which is what generative AI could do.

This exclusionary assessment seeks to exclude three types of work activities, that require:

1. Human judgement, such as to provide checks and balances.

2. Management of inter-personal relationships, which assumes that humans still want some connection to other humans.

3. Interacting with the physical environment, such as repairing mechanical machinery, or serving food at a restaurant.

The result of this approach is a list of work activities that could potentially leverage generative AI to different degrees. Similarly, an assessment of the skills that are potentially affected by generative AI is based on an analysis of the skills most relevant to the affected work activities. More than 2,000 work activities were assessed individually, and then assessed again in the context of close to 900 occupations. The exclusionary approach effectively allows the identification of occupations and skills that could potentially leverage generative AI. The analysis does not distinguish between those occupations that will be displaced and those that will be augmented by the use of generative AI. Ultimately, the impact of technology on the workforce will depend on whether communities, businesses, and governments are prepared to reap the benefits and manage the risks.

Digitalization has often been associated with automation, but generative AI is shaping up differently and is expected to have wide-spread implications for the way we work in future:

- Generative AI will hold potential for occupations that have a higher share of non-routine work activities, moving away from the idea of affecting the most "automatable" jobs.

- Generative AI will be most transformative for work activities contributing to decision-making, including by processing large amounts of information and creating new content.

- Generative AI will transform occupations requiring greater preparation—that is, more years of education and training—and those demanding higher pay.

The determinant of what effect generative AI will have for economies will be the pace of adoption, enabling policies, and effective management of risks.

3 Three channels of change

Generative AI is about increasing access to the tools for content creation; lowering the barriers for thinkers to discover new ideas; and lifting productivity broadly. At the same time, human participation in new content creation remains important, particularly as an instigator of curiosity and an arbiter of common-sense.

On the latter point, human oversight in generative AI-produced outputs remains critical to ensuring that new content is relevant, accurate, and ethical. In part, this will help to ensure that its creative and research-related outputs avoid unwanted biases. The need for human oversight is also abundant during the AI training process, which can incorporate a large amount of human feedback to reinforce good behaviors. For example, the ChatGPT model was trained to align with human values to deliver responses that are *"helpful (the question is answered in an appropriate manner), honest (the answer can be trusted), and harmless (the answer is not biased nor toxic)."* [x]

There are three main channels through which generative AI will change the processes of production within an economy and transform the types of tasks undertaken and skills needed in the workforce. These three channels are: (1) unleashing creativity; (2) accelerating discovery; and (3) enhancing efficiency.

3.1 Unleashing creativity

Generative AI can contribute to the creative process by reducing the time and cost involved in generating new ideas and producing new outputs. It will be important to ensure that the guardrails placed around the responsible use of generative AI include recognition for the input and contributions of human creators. Innovation will continue to need a human spark, and generative AI can play a role in supporting the creative process. Many traditionally "creative" occupations have a high share of tasks that could be transformed by generative AI, for example, workers within the Arts, Design, Entertainment, Sports, and Media sector (Exhibit 1).

The use of generative AI in content creation is widely reported, particularly in knowledge and creative industries. For example, Deloitte experimented with the use of generative AI for coding and found a 20% improvement in code development speed for relevant projects.[xi] Given generative AI's ability to provide outputs in a variety of formats—for example, text, images, video, audio, computer code, synthetic data—its potential for content generation is wide-ranging.

The use of generative AI can support the more efficient creation of new content, including in the conceptualization stage of the creative process, such as to help journalists generate story ideas, as well as in later stages, such as by providing first drafts of data-driven articles (Box 2).[xii] Workers are also optimistic about generative AI's capacity to enhance creativity, with a recent Microsoft report finding that 3 in 4 people believe it will help them formulate ideas for their work. 87% of workers in creative roles have also indicated that they would be comfortable using generative AI in their jobs.[xiii]

Furthermore, leveraging generative AI models in content creation can facilitate the production of higher quality content. Generative AI models learn from large amounts of input data, effectively enabling users to draw from a wide range of information sources (potentially across different formats and languages), as well as leverage insights identified by such models, to produce more accurate and informative outputs. These creation capabilities of generative AI are used to produce synthetic data to help self-driving car companies to better prepare vehicles for real-world situations.[xiv]

The use of generative AI could also facilitate the drafting of new content, as well as produce content in new forms. This provides an opportunity for content creators to produce more diverse and engaging content for their audiences, as well as tailor content more readily for specific audiences. For example, Coca-Cola has announced its use of generative AI to generate personalized ad copy at scale.[xv]

EXHIBIT 1

Generative AI's potential in the Arts, Design, Entertainment, Sports, and Media sector, adjusted for likelihood, by occupation (% of total affected work activities)
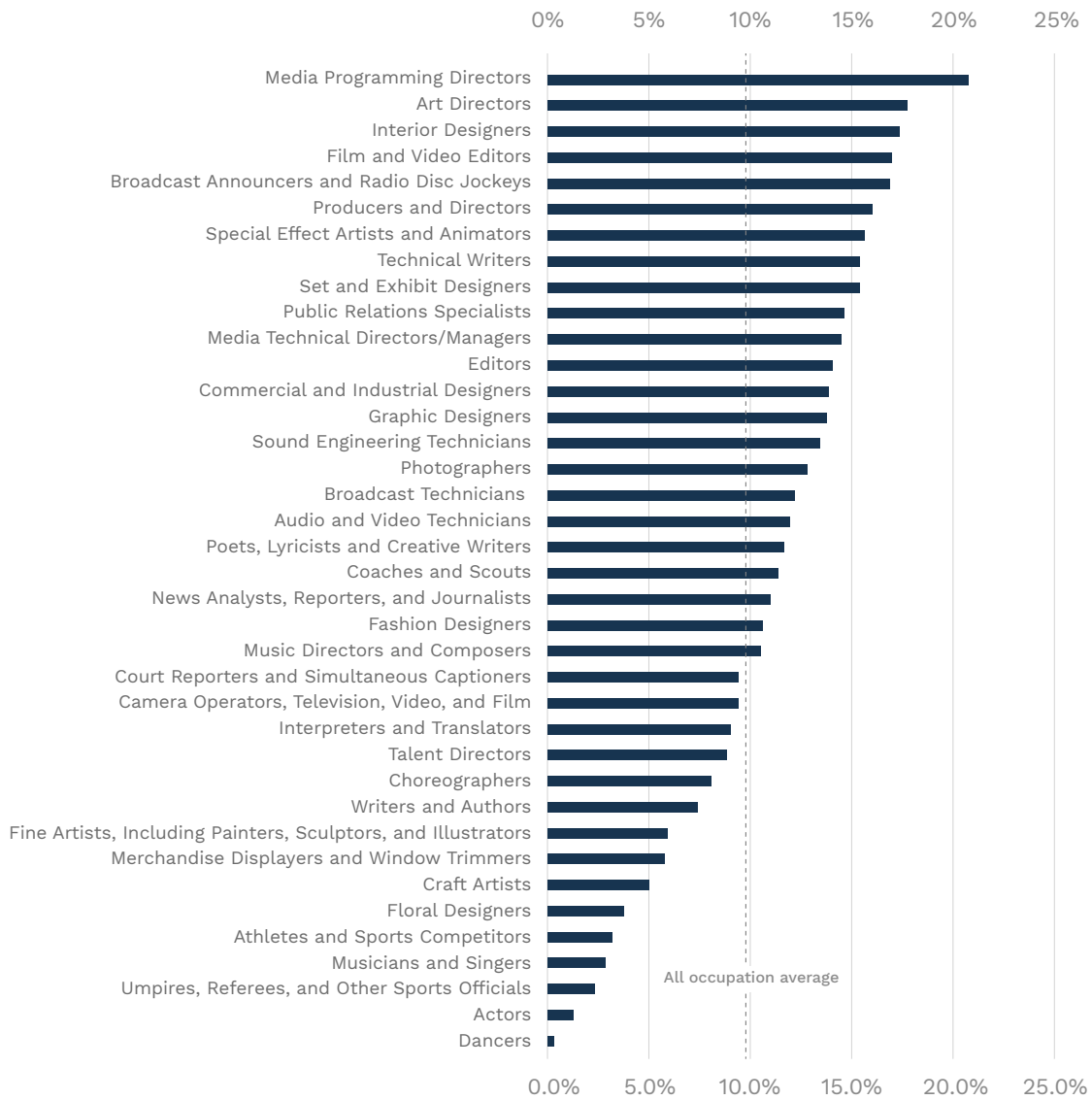
Notes: The analysis is done on a global level. These impacts have been adjusted for 'likelihood'. The adjustment for likelihood considers the potential degree of implementation of generative AI. This adjustment is categorical (i.e., low / medium / high) according to the relative pay levels for each occupation, based on an assumption that the motivation to implement is greater for higher paid jobs.
Sources: Access Partnership analysis, National Center for O*NET Development

BOX 2

Supporting content creation in the Indonesian media industry

Workers within the media industry have significant opportunities to leverage generative AI to support their work activities.

The media industry in Indonesia has been exploring the use of generative AI in journalistic work, especially in providing initial inputs such as writing data-driven articles and summarizing long texts of research. An example is Indotema, an Indonesian firm specializing in cyber media development. The firm has developed several free tools facilitated by AI, such as photo compression and conversion tools, to support journalists in their creative process, and is looking to expand their suite of generative AI-facilitated tools.[xvi]

While the use of generative AI can support content creation in these instances, the role of journalists and other content creators remains critical to ensuring the relevance, accuracy, and integrity of any initial drafts produced by generative AI tools. As current generative AI models are susceptible to factual errors, in use cases where misinformation can be particularly detrimental, it will be necessary for adequate checks and balances to be put in place.[xvii]
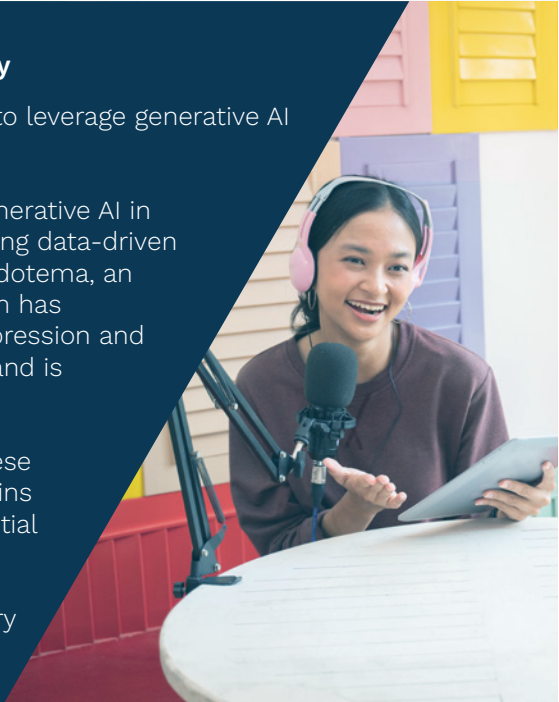
3.2 Accelerating discovery

Generative AI has the potential to play an important role as a tool in scientific progress. The use of generative AI can help accelerate the process of scientific research and discovery by reducing the cost of research and supporting better learning outcomes. Those occupations with the greatest share of tasks that can be transformed by generative AI are occupations related to science, healthcare, and education (Exhibit 2).

EXHIBIT 2

Generative AI's potential, adjusted for likelihood, top ten occupations (% of total affected work activities)
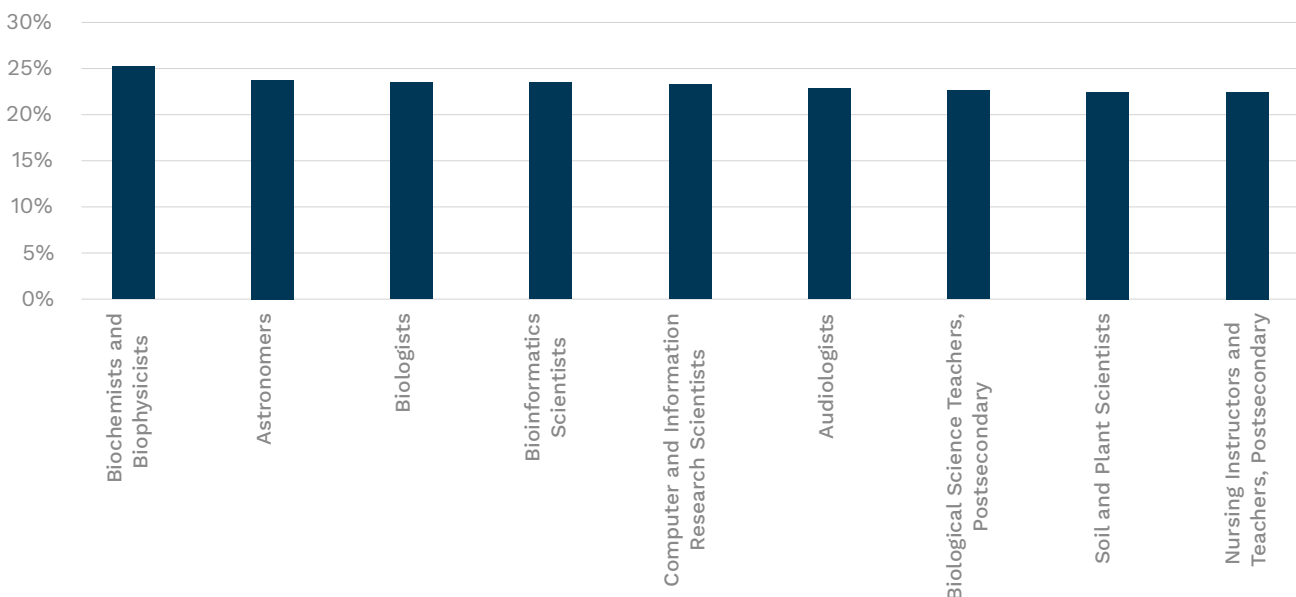
Notes: The analysis is done on a global level. These results represent occupations with the greatest share of tasks that are transformed by generative AI. The adjustment for likelihood considers the potential degree of implementation of generative AI within each occupation. This adjustment is categorical (i.e., low / medium / high) according to the relative pay levels for each occupation, based on an assumption that the motivation to implement is greater for higher paid jobs.
Sources: Access Partnership analysis, National Center for O*NET Development

Scientific breakthroughs often involve curiosity, creativity, and trial and error, but the methodical process of iterative questioning and answering is costly and time-consuming. Generative AI can help develop and test hypotheses leveraging its capabilities to interrogate the vast datasets to field and answer research questions based on the data it has been trained on. For example, generative AI has been used in the development process to create new designs for materials and medicines, significantly reducing the costs and time required from years to weeks.[xviii]

Furthermore, generative AI can be used as a tool to improve student learning outcomes. Increasing access and quality of school education will contribute to securing opportunities for future scientists and researchers who will contribute to future scientific discoveries.

Generative AI can also be used to tailor curriculums to students. For example, generative AI could be used to create personalized learning experiences based on an analysis of a student's learning patterns and preferences (Box 3).[xix] Personalized learning can be effective in improving student learning outcomes and can be useful for engaging students with learning challenges.[xx]

Many occupations within the Educational Instruction sector have an above average share of tasks that can be transformed by generative AI (Exhibit 3), suggesting significant opportunity.

BOX 3

### Supporting the education industry in Indonesia

EdTech organization GovTech Edu has been collaborating with the Indonesian government to implement tech solutions in the education sector, including through the use of AI-facilitated tools such as AI-powered homework help, to make learning more personalized, engaging and effective.[xxi] Other EdTech start-ups such as CoLearn and Ruangguru have also integrated machine learning and AI into their products, and are currently exploring ways to leverage generative AI in the education sector, including using generative AI to detect plagiarism. Nonetheless, teachers and facilitators are expected to remain an important human connection to students, though they are likely to see their role change from providing information to supporting students in assimilating and understanding information.[xxii]

In addition, public-private partnerships such as KORIKA, a multi-stakeholder program to support the nation in sustainable AI development and use,[xxiii] has committed to collaborating with the government to leverage generative AI for educational purposes, including to support individual learning needs and to prepare AI-powered teaching materials.[xxiv]

EXHIBIT 3

Generative AI's potential in the Educational Instruction sector, adjusted for likelihood, by occupation (% of total affected work activities)
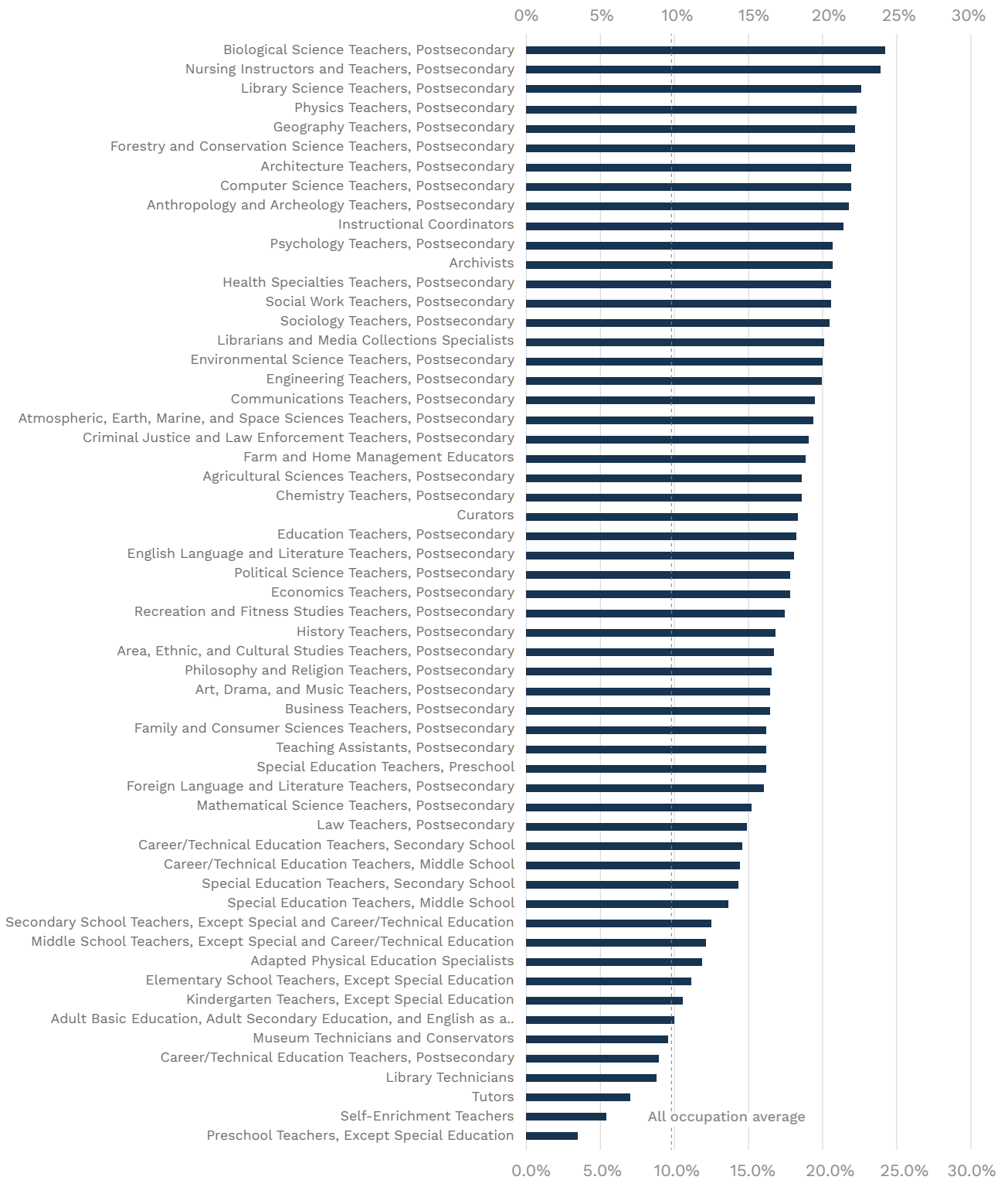
Notes: The analysis is done on a global level. These impacts have been adjusted for 'likelihood'. The adjustment for likelihood considers the potential degree of implementation of generative AI. This adjustment is categorical (i.e., low / medium / high) according to the relative pay levels for each occupation, based on an assumption that the motivation to implement is greater for higher paid jobs.
Sources: Access Partnership analysis, National Center for O*NET Development

3.3 Enhancing efficiency

Generative AI can play a role in enhancing workplace efficiency by supporting tasks requiring parsing of big data sets and information sources. The use of generative AI can also help improve the usability of this data and information, making it more interpretable and useful for decision-making. The use of generative AI has applications across all industries and will hold more significant potential for industries that typically work with large amounts of data or involve complex tasks, such as financial services, professional services, scientific research, and ICT (Exhibit 4).

Generative AI's potential by industry, adjusted for likely impact on occupations (% of total affected work activities)
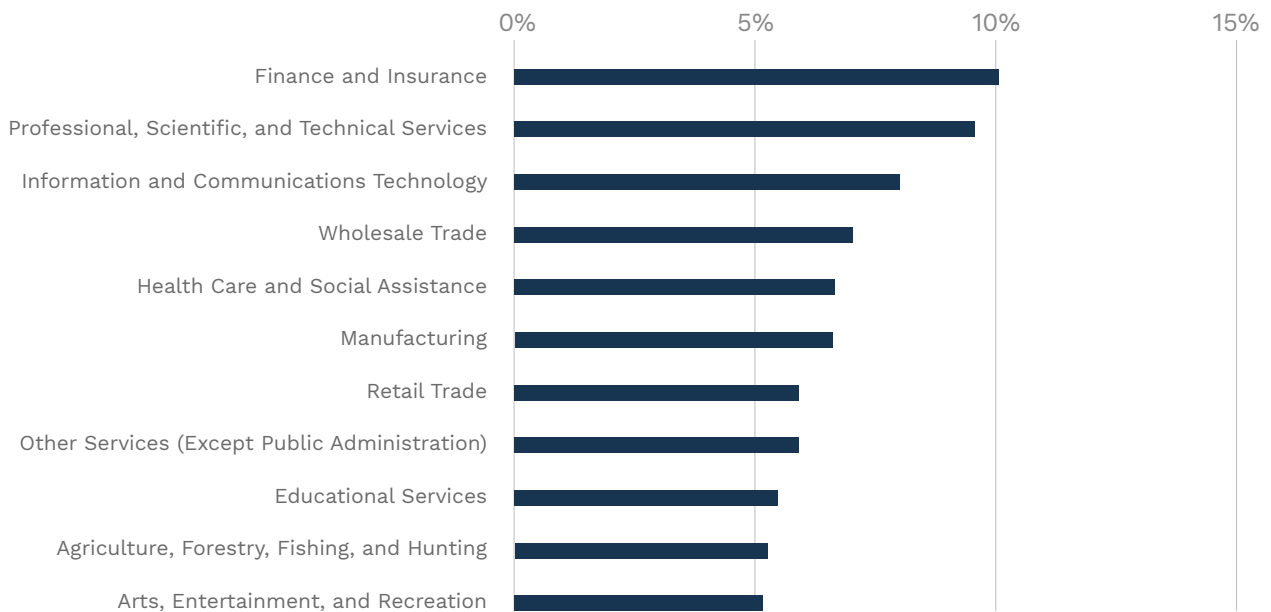

Notes: Excludes public sector, real estate, and utilities. The analysis is done on a global level. These impacts have been adjusted for 'likelihood'. The adjustment for likelihood considers the potential degree of implementation of generative AI. This adjustment is categorical (i.e., low / medium / high) according to the relative pay levels for each occupation, based on an assumption that the motivation to implement is greater for higher paid jobs.
Sources: Access Partnership analysis, National Center for O*NET Development

Nonetheless, in addition to complex tasks, a recent study of customer support agents found that those given access to generative AI tools were able to successfully solve client problems more quickly—with productivity gains of around 14%.[xxv] Workers are also prepared to leverage these productivity benefits—a recent report by Microsoft found that 70% of people would delegate to AI to lessen their workloads, and 3 in 4 people are comfortable with using AI for administrative tasks.[xxvi] The study also noted that the least skilled workers were among those that benefited, reporting that they could get their work done 35% faster. This also suggests that the application of generative AI tools to administrative work activities could create benefits. For example, Indonesian businesses and startups, such as Kata.ai, Ruangguru and EngageRocket, as well as the Indonesian government are already considering its use to help streamline administrative work and reshape digital service delivery in some of Indonesia's key sectors (Box 4).[xxvii]

BOX 4

Streamlining the public sector with generative AI

The Indonesian National Research and Innovation Agency (BRIN) developed a National Strategy on AI 2020-2045 to guide Indonesia in employing AI technologies including the use of generative AI tools in five priority areas, namely education and research, healthcare, bureaucratic reform, food security and smart city development.[xxviii] This marks a step forward towards unlocking new opportunities for Indonesians and improving the efficiency and accessibility of government programs.

The use of generative AI to help streamline digital service delivery is currently being explored in several government projects in these key areas. In the public sector, the use of conversational chatbots in public service applications can make it easier for people to submit business forms and make transactions, while certain government agencies are also promoting the development of generative AI for use in schools and teaching facilities.[xxix] In healthcare, the use of generative AI is being considered in telemedicine to help speed up the process of diagnosing patients' illnesses and provide recommendations for appropriate action.[xxx] The Ministry of Administrative and Bureaucratic Reform is also developing the Public Service Portal, which uses generative AI to help predict and fulfil each user's needs.[xxxi]
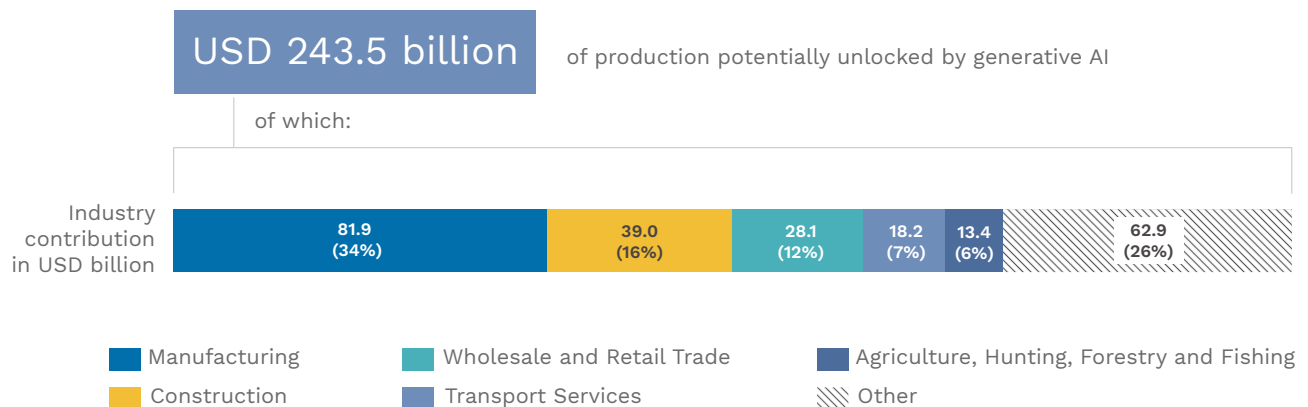
4 The opportunity for Indonesia

Although generative AI brings opportunities for all economies, its implications for Indonesia are related to the country's industry structure, workforce composition in each sector, the level of productivity and existing stock of skills in the labor force. By understanding the potential implications of generative AI on industries, jobs, and skills, policymakers, business leaders, and workers can better prepare for, and take advantage of the effects of generative AI.

4.1 Generative AI implementation can unlock economy-wide gains in productive capacity equivalent to one-fifth of GDP

The successful application of generative AI technologies across industries could help unlock additional productivity capacity. Based on an analysis of the relationship between labor and production in the Indonesian economy, it is estimated that use of generative AI to supplement work activities could help unlock **USD243.5 billion** of productive capacity across the economy, equivalent to 18% of GDP in 2022 (Exhibit 5). The Manufacturing and Construction industries are the largest contributors to this potential, largely due to the fact that they comprise a large share of the workforce and account for high labor productivity.

EXHIBIT 5

Production in Indonesia potentially unlocked by generative AI (USD billions)

USD 243.5 billion of production potentially unlocked by generative AI

of which:

Industry contribution in USD billion

| 81.9 (34%) | 39.0 (16%) | 28.1 (12%) | 18.2 (7%) | 13.4 (6%) | 62.9 (26%) |

- Manufacturing
- Construction
- Wholesale and Retail Trade
- Transport Services
- Agriculture, Hunting, Forestry and Fishing
- Other

Note: Other includes: Agriculture, Hunting, Forestry, and Fishing; Mining and Quarrying; Hotels and Restaurants; Telecommunications; Transport Services; Financial Intermediation; and Other Personal Services. The analysis excludes the Public Sector and Utilities.
Sources: Access Partnership analysis, ILO, National Center for O*NET Development.

There is also significant potential to leverage generative AI technology across many workforce activities. Based on an analysis of the total work activities undertaken by the workforce in Indonesia, work activities undertaken by workers within the Agriculture and Wholesale and Retail Trade industries comprise the largest share of work activities potentially transformed by generative AI (Exhibit 6).[8] These activities include helping farmers manage compliance requirements, and drafting trade contracts and marketing materials. While the type of work activities within these industries may not hold the highest potential compared to other industries (Exhibit 4), they comprise a large share of the local workforce, and therefore account for a large share of total work activities within the economy. This means that leveraging the benefit of generative AI in these sectors could transform the work experience of a large number of workers in Indonesia.

However, gains in the Agriculture industry will require upskilling and take time, especially since agriculture is currently one of the least digitized sector in Indonesia.[xxxii] While wages of agricultural workers in Indonesia are relatively low compared to other industries, research have found the cost of

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[8]   This analysis is based on a ground-up estimate of the detailed work activities that are undertaken within every occupation, which is then scaled up by an estimate of the composition of occupations within each industry, which is then scaled up by the size of the workforce within each industry.

producing staple crops to be up to 50% higher than in neighboring countries.[xxxiii] This suggests that there are gains to be made from implementing productivity enhancing technologies, and the government and industry associations can play a role to help businesses move in the right direction. For instance, initiatives such as the joint research conducted by The Agroindustri Research Center of the National Research and Innovation Agency (BRIN) and Telkom University help to identify new areas where generative AI can be leveraged, including in forecasting commodity prices and tracking food availability data.[xxxiv]

EXHIBIT 6

Work activities in Indonesia potentially transformed by generative AI, industry contribution (%)

Industry contribution	25%	23%	17%	9%	7%	19%

- ■ Agriculture, Hunting, Forestry and Fishing
- ■ Wholesale and Retail Trade
- ■ Manufacturing
- ■ Education, Health and Social Work
- ■ Construction
- ▨ Other
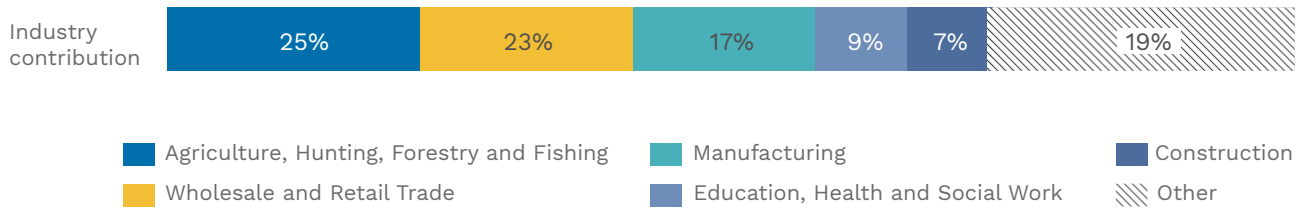
Note: Other includes: Mining and Quarrying; Hotels and Restaurants; Telecommunications; Transport Services; Financial Intermediation; and Real Estate, Renting and Business Activities; and Other Personal Services. The analysis excludes the Public Sector and Utilities.
Sources: Access Partnership analysis, ILO, National Center for O*NET Development.

4.2 Generative AI will change the focus within jobs, rather than replace them entirely

The application of generative AI will change the way that labor is used in production, and it will have implications for the workforce across all industries. However, it is likely that the implementation of generative AI will change the focus within certain jobs rather than replace jobs entirely. Furthermore, many work activities, such as managing teams and interacting with customers, will still be largely undertaken person-to-person. Based on an analysis of the local workforce, the extent to which generative AI could be used will vary according to the nature of work for specific occupations. Almost every worker could use generative AI to some degree—although the level of adoption by businesses will vary in the short term. Importantly, more than half (52%) of the workforce could incorporate generative AI in 5-20% of their work activities (Exhibit 7)—it is estimated that only 1% of the Indonesian workforce would see generative AI used for more than 20% of their work.

As will be discussed in Section 5, this has relevance for policymakers and industry, as it illustrates that while there will be a broad demand for AI skills, the demand will be more pronounced for the share of the workforce expected to use generative AI more extensively in their work.

EXHIBIT 7

The potential to leverage generative AI in the Indonesian workforce (% of total workforce)
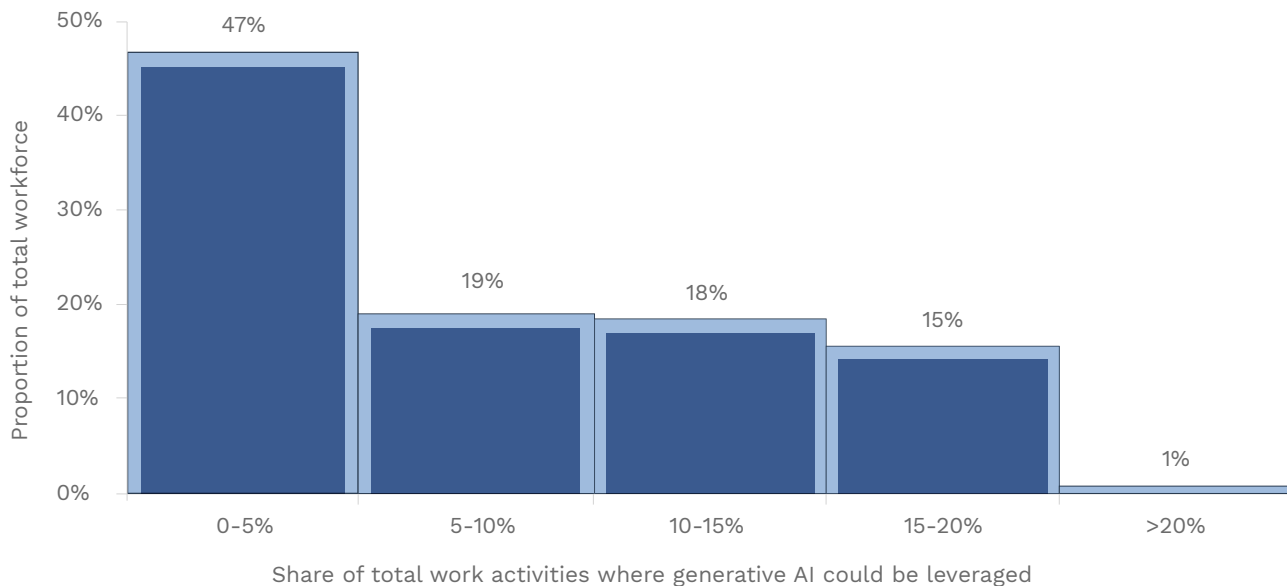
Note: The analysis excludes the Public Sector and Utilities.
Sources: Access Partnership analysis, ILO, National Center for O*NET Development.

4.3 An AI-ready workforce will require upskilling in current and future-ready skills

To capture the potential economic opportunities of generative AI, it will be important to identify the existing stock of workforce skills which will need to be uplifted, as well as the sets of new skills which will need to be developed.

4.3.1   Uplifting the current stock of skills

The basic skills of Reading, Writing, and Critical Thinking are relevant across most occupations, albeit used in differing degrees of frequency and to differing levels of proficiency. Nonetheless, the input-and-output style of generative AI, particularly when applied to content creation work activities, would seem to suggest that for such tasks, these basic skills become less important. However, it is arguable that skills such as critical thinking, particularly in context of generative AI still being susceptible to errors of data and ethics, remain a key part of the input-and-output equation. At the same time, reading and writing skills are fundamental building blocks for thinking, as well as essential skills to engage with and interpret generative AI applications. It will be necessary to rethink how such basic skills should develop in the context of generative AI, but it's likely that the answer lies in strengthening such skills rather than abandoning them.

Beyond basic skills, there are cross-functional skills specific to certain types of occupations. Based on an analysis of all the cross-functional skills that are likely to be affected by generative AI, across most industries, Operations Monitoring, Coordination, and Management of Material Resources are found to be most impacted (Exhibit 8).[9,10] This means that such priority should be given to evaluating how these skills should be recontextualized in the context of using generative AI in the workplace.

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[9]   These cross-functional skills are based on O*Net's taxonomy of 25 cross-functional skills across five categories: (1) Complex Problem Solving Skills; Resource Management Skills; Social Skills; Systems Skills; and Technical Skills.

[10]   Operations Monitoring is defined as watching gauges, dials, or other indicators to make sure a machine is working properly. Coordination is defined as adjusting actions in relation to others' actions. Management of Material Resources is defined as obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.

EXHIBIT 8

**Generative AI and its potential impact on cross-functional skills
(% of total impacted cross-functional skills)**
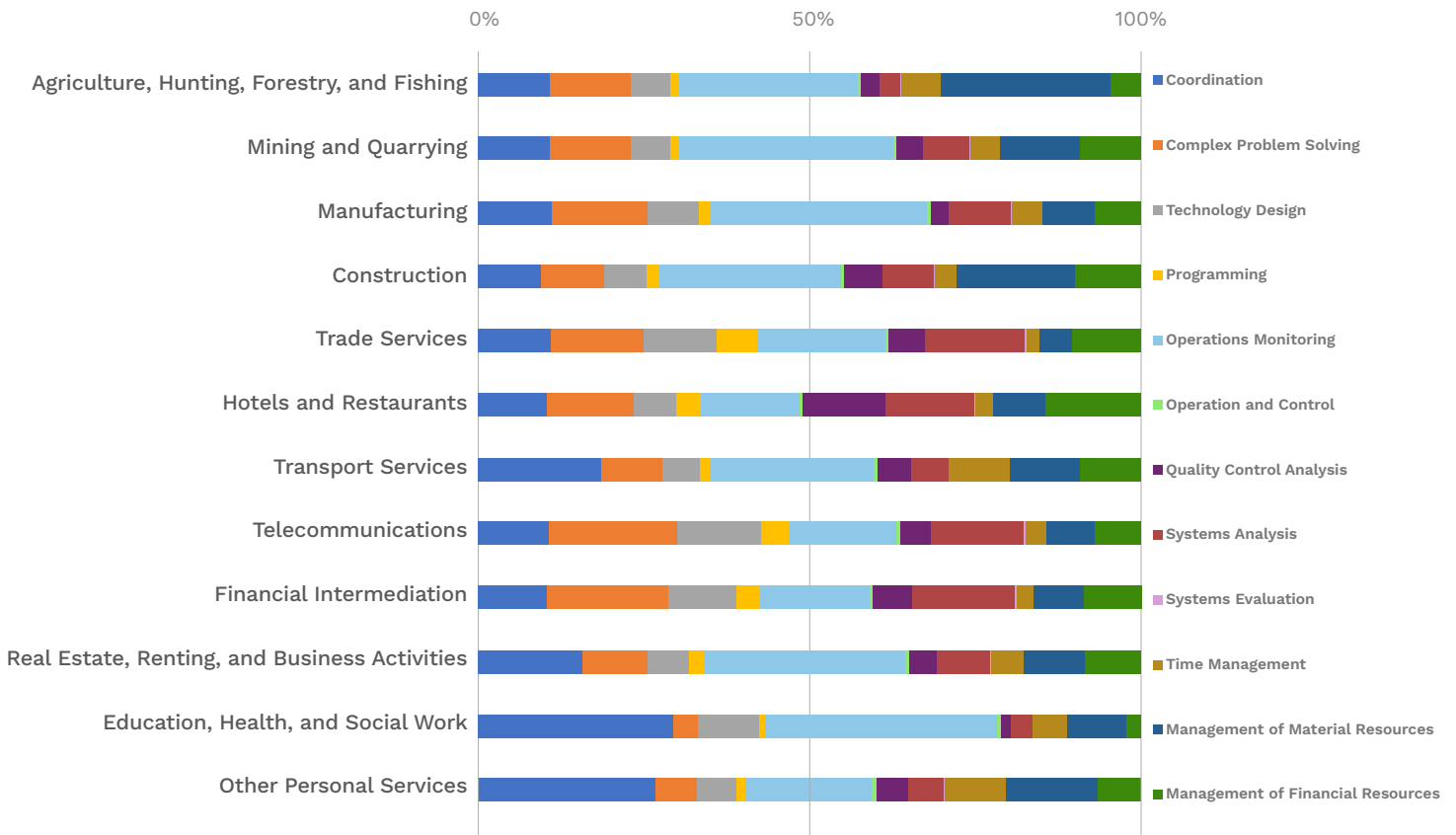
Note: The analysis is done on a global level. The analysis excludes the Public Sector and Utilities.
Sources: Access Partnership analysis, National Center for O*NET Development.

Furthermore, the work activities which are expected to be less affected by generative AI also point to both basic and cross-functional skills which will continue to be important for the workforce. These work activities relate to people-to-people interactions and tasks such as coaching, developing, and caring for others (Exhibit B.2 in Appendix B). This means that social skills around persuasion, negotiation, and giving instructions, as well as management skills around personnel management will remain core parts of the toolkit for all workers. Furthermore, in a world experiencing constant technological change, the basic skill of having learning strategies will be critical for all workers.[11] Along these lines, a recent Microsoft report found that 'analytical judgment,' 'flexibility,' and 'emotional intelligence' are at the top of the list of skills essential for employees in AI-powered future.[xxxv] The report also noted that 82% of leaders said that "their employees will need new skills to be prepared for the growth of AI". Businesses and individuals should continue to value strengthening of these skills.

4.3.2   Developing new future-ready skills

Future-ready skills in the context of AI have been considered to consist of three types: (1) skills to develop and manage AI; (2) skills to work with AI; and (3) skills to live with AI.[xxxvi] The specific skills required include hard skills in areas such as computer science and data analytics for more specialized AI roles, as well as softer skills such as creativity, critical thinking, and problem-solving as AI technologies become more accessible.

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[11]   Learning Strategies refers to the capacity to select and use training/instructional methods and procedures appropriate for the situation when learning or teaching new things.

While the ubiquity and level of proficiency of required skills within a population will be achieved to varying degrees of success (particularly related to developing and managing AI), to ensure that the economic opportunity from the application of generative AI can deliver widespread benefit will require the population to achieve some minimum level of digital literacy.

Indonesia ranked 51st in the 2022 World Digital Competitiveness Ranking, signaling opportunities for improvement in areas such as training and education.[xxxvii] An OECD assessment ranks Indonesia lower than average on basic literacy competencies that are a requisite to digital readiness,[xxxviii] with educational disparities across regions as well. Students receive different access to quality education depending on socioeconomic status and distance to more urban areas, for example the island of Java compared to regions such as Papua and Maluku.[xxxix] In line with this, research has found that 50% of the Indonesian workforce has basic to intermediate digital skills with only less than 1% showing mastery of advanced digital skills.[xl] ICT training has been delivered to 32% of the workforce with university-level education while less than 2% of the secondary, junior-secondary educated workforce received it.[xli]

According to McKinsey, by 2030, depending on spending and investment trends, automation and AI is estimated to create up to 46 million new jobs in Indonesia.[xlii] In light of such opportunities and to increase digital readiness, the government has introduced the 2021 Digital Talent Scholarship to develop 9 million highly skilled digital talents by 2030.[xliii] The Kampus Merdeka program, also introduced in 2021, promotes innovation and entrepreneurship in students to prepare them for the future workforce.[xliv] The 2018 Siberkreasi National Movement for Digital Literacy is a collaborative initiative involving private sector organizations, government entities, civil society groups, media outlets, and academic institutions which advances digital literacy through initiatives focused on digital ethics, digital culture, digital skills, and digital safety.[xlv] Realizing the need to inculcate digital skills early, the government has also introduced an ICT component across all subjects in schools, instead of it being a stand-alone subject.[xlvi]

Furthermore, building upon digital literacy will be the need to improve digital fluency in AI—the ability to operate in an AI environment and leverage AI tools.[xlvii] This includes learning how to manipulate and apply AI technologies across a range of situations and use functions to enhance existing work tasks for more effective and efficient results. This will require on-the-job training and industries to work with schools, universities, and vocational training institutions to ensure that curricula and syllabi provide learners with job-ready skills for an AI environment.

5 Harnessing the potential of generative AI

Generative AI has the potential to create significant opportunities for the Indonesian economy by revolutionizing the way in which work is currently done—by improving efficiency, increasing productivity, and supporting innovation. Anything that revolutionizes the production process has the potential to disrupt labor markets, particularly in the short-term. At the same time, how policymakers, businesses, and workers choose to anticipate and prepare for the revolution will determine how effectively its benefits can be harnessed to support more sustainable and inclusive economic growth.

Implementing generative AI with the aim of harnessing its potential to drive economic growth will require a comprehensive approach that addresses not only the technological aspects of generative AI, but also the social, economic, and ethical implications of the technology. A national vision, which includes a policy and regulatory framework, that encompasses these factors will be necessary to ensure that the benefits of generative AI are maximized. One of the key purposes of such a framework would be to provide clarity for businesses and other potential users of generative AI technologies on the policy and regulatory stance, as well as the guardrails that need to be put in place.

It may be necessary for policymakers to reimagine existing government policies and regulations and create new ones that are fit-for-purpose and adaptable—such as facilitating access and adoption and securing innovation—while guiding participants on responsible use. Policies to support broader digital transformation may help facilitate adoption of AI, and in some instances this can be particularly important for the public sector–some key enabling policies are discussed in Box 5. Businesses should consider investments to prepare its systems, processes, and people to make the most from generative AI's opportunities, as well as being cognizant of its potential risks. Furthermore, workers will need to be open to adjusting to the changing work environment, including by gaining new skills and engaging in lifelong learning.

BOX 5

Enabling policies for digital transformation and AI

Cross Border Data Flows: Government could take guidance from multilateral approaches to governing cross border data flows, such as the APEC Cross-Border Privacy Rules (CBPR), Data Free Flow with Trust (DFFT), ISO/IEC 27701:2019, and ASEAN Model Contractual Clauses for Cross Border Data Flows and create policies that enable cross border data flows which are important inputs into many AI applications.[xlviii, xlix, l]

National Cloud Strategy: Government could consider developing a national cloud strategy and encourage use of cloud, potentially through a 'Cloud First Policy'. Clear policy direction on how agencies could adopt hyperscale public cloud would enable the infrastructure needed to manage the substantial data storage requirements of AI. Government could also consider establishing a centralized public sector procurement process for public cloud and provide guidance on multi-year financing rules, which could help ease and accelerate public hyperscale cloud adoption and therefore, the use of technology such as machine learning and AI within the public sector.[li]

Data Classification Framework: Government could adopt a simple and risk-based data classification framework for public sector data. Most governments have three or four tiers of data classification, with most public sector data permitted to be stored in hyperscale public cloud. This would allow government to benefit from advanced computing capabilities afforded by hyperscale public cloud including AI.

Adoption of Digital Identity: Developments in AI have implications for digital identity, both in terms of risks and opportunities. The risk of potential misuse of increasingly powerful AI tools for purposes of fraud and identity theft strengthens the case for the need for a strong digital identity.[lii] At the same time, AI technologies can potentially be used to enable more robust digital identity authentication.[liii] There will need to be appropriate guardrails to mitigate such risks and optimize the benefits of integrating AI in digital identity reflected in relevant regulations concerning digital ID. In the case of Indonesia, this may involve updating the Population Administration Law and the Electronic Information and Transaction Law.

The Indonesian government has taken steps to develop AI-related regulations since 2018 with the Making Indonesia 4.0 which aimed to revitalize its key industrial sectors and thereby the economy by promoting the uptake of AI and other emerging technologies.[liv] The National Strategy on AI 2020-2045, based on Indonesia's Pancasila values, underscores the need for AI development to be transparent to promote trust, enhance welfare for all, and holds social justice, diversity, and non-discrimination at the core of its AI developmental plans. It emphasizes the need for multistakeholder collaboration to ensure that policies are relevant and fit-for-purpose to govern a rapidly evolving technology.[lv]

While the development of AI-related regulations is an encouraging step forward, it will take time to develop comprehensive AI-specific regulations, given Indonesia is still in the process of implementing regulations associated to digital governance such as its Personal Data Protection Law. The experience of applying these associated regulations can be a useful reference point for the government when developing its AI regulations in terms of processes, resources, and time required for enforcement. Additionally, when developing AI regulations, the government could consider using a risk-based approach to safeguard AI use.
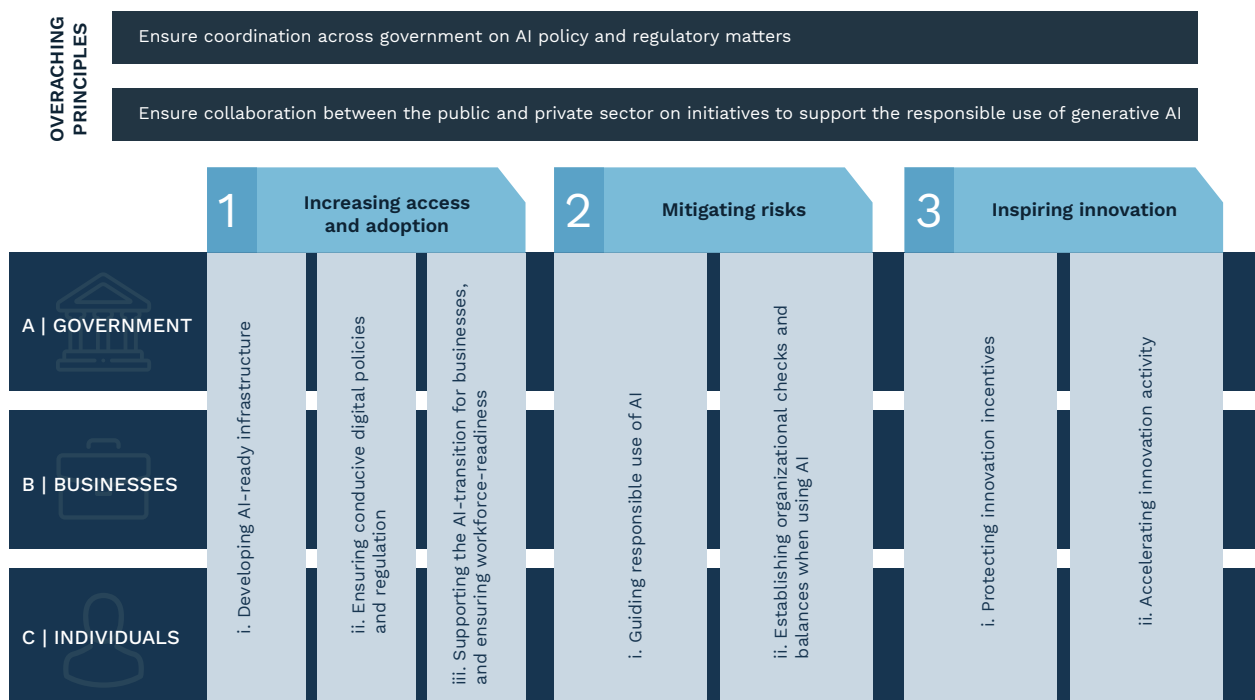
The recommendations in this section are aligned with the direction of Indonesia's National Strategy for AI which recognizes the potential of AI to galvanize the nation's digital transformation and reform government, industry, and society to accelerate economic growth.

Exhibit 9 presents a framework of 15 recommendations to drive generative AI use for consideration by government and business leaders, focused on three main policy objectives: (1) increasing access and adoption; (2) mitigating risks; and (3) inspiring innovation.

Two overarching principles should guide the approach to considering these recommendations:

1. Ensure coordination across government on generative AI policy and regulatory matters, such as through establishing a cooperation mechanism like the UK's Digital Regulatory Cooperation Forum.[lvi] Given the broad-based potential for generative AI to have applications across all industries, there will need to be alignment in the approaches taken by sector regulators towards applications of generative AI within their regulatory purview.

2. Ensure collaboration between the public and private sector on initiatives to support the responsible use of generative AI, with a view to maximizing the benefits for the country, including through hosting Public-Private Forums.

EXHIBIT 9

OVERACHING PRINCIPLES

Ensure coordination across government on AI policy and regulatory matters

Ensure collaboration between the public and private sector on initiatives to support the responsible use of generative AI

1 Increasing access and adoption

2 Mitigating risks

3 Inspiring innovation

A | GOVERNMENT

B | BUSINESSES

C | INDIVIDUALS

i. Developing AI-ready infrastructure

ii. Ensuring conducive digital policies and regulation

iii. Supporting the AI-transition for businesses, and ensuring workforce-readiness

i. Guiding responsible use of AI

ii. Establishing organizational checks and balances when using AI

i. Protecting innovation incentives

ii. Accelerating innovation activity

Source: Access Partnership

5.1 Increasing access and adoption

Government should have a coherent national vision that includes a fit-for-purpose policy and regulatory framework to guide the development and deployment of generative AI technologies to maximize its benefits for the country.

Developing AI-ready infrastructure

1. Government should review the current state of access to digital infrastructure and investments to improve access, with a focus on high speed broadband and hyperscale cloud. In particular, Government should review households' access to digital tools, such as computers and the internet, and investments to improve access, with a focus on women, the elderly, populations in underserved communities as well as those residing in rural areas.[lvii] The full potential of generative AI for Indonesia will only be achieved through a wider effort to address the digital divide.

2. Government should conduct an assessment of the local generative AI ecosystem with a view to understand strengths and potential gaps, including model and application developers, and service providers who can assist businesses with adopting generative AI technologies.

Ensuring conducive digital policies and regulations

3. Government should take stock of the national and local data ecosystems. Appropriate data protection frameworks that enable responsible data collection, management, and sharing will be a key driver of generative AI adoption.[lviii]

4. Government should further the discussion on introducing a comprehensive cybersecurity and resilience bill to proactively safeguard the country's critical infrastructure, sensitive data, and digital assets from evolving cyber threats. These safeguards will also help in mitigating potential cyber-risks associated with widespread use of AI tools. Existing regulations such as Presidential Regulation No. 47/2003 on National Cyber Security Strategy and Crisis Management, and Presidential Regulation No. 82/2022 on the Protection of Vital Information Infrastructure could serve as the basis for this overarching cybersecurity and resilience bill. Public consultation of the bill should be considered to ensure more inclusive representation of multi-stakeholders' concerns and solutions.

5. Government should promote a technology-neutral approach to developing policies and regulations for digital technologies, such as in the revision of the Anti-Monopoly Practice and Unfair Business Competition Law, and the Consumer Protection Law.

6. Businesses should review their operations to ensure compliance with national privacy law (Indonesia Law No. 27 of 2022 on Protection of Data). This will enable them to adopt generative AI models to process unstructured data while ensuring that personal data remains protected.[lix, lx]

Supporting the AI-transition for businesses, and ensuring workforce-readiness

7. Government should build on existing digital literacy programs and promote generative AI-specific skills through reskilling and upskilling initiatives aimed at different population segments to ensure fair transition for workers at all levels.

8. Government should review initiatives to support MSMEs to identify the specific job roles and the tasks that would be affected by generative AI implementation. Based on this, job roles should be rescoped and relevant training could be offered to employees to improve labor market outcomes. This, in addition to Governments working closely with businesses on the development of basic skills around learning, social, and management skills for employees, will continue to be an important part of an employee's toolkit.

9. Government could establish a regulatory sandbox to provide a controlled environment in which AI systems can be tested and scaled up, and support adoption by businesses. Government could also consider supporting an AI innovation hub offering businesses access to resources, expertise, and funding that might otherwise be challenging for a business to obtain individually, particularly for MSMEs that are typically resource constrained.[lxi]

5.2 Mitigating risks

In national and global discourses on AI, concerns around privacy, security, discrimination, and exclusion, are often cited as risks associated with the use of AI. Safeguards to mitigate these potential risks are thus necessary to encourage ethical, responsible, and inclusive use of AI. Guardrails introduced should aim to minimize the risks and prevent harmful use of technology and be reflected in policies and regulations aligned with Indonesia's national AI vision. Such guardrails should encompass national, sectoral, and organizational level measures to guide the use and deployment of generative AI in a fair and safe manner that respects human rights and organizational values.

Guiding responsible use of AI

10. Government should consider adopting responsible and ethical AI principles at the national level to address unintended consequences such as discrimination, bias and malicious use and support businesses to implement it. This should be in line with global best practices or principles and focus on protecting human rights and ensuring digital safety, such as the United Nations Guiding Principles on Business and Human Rights, and the US National Institute of Standards and Technology's AI Risk Management Framework.[lxii]

11. Businesses should review and adhere with national guidelines and consider implementing organizational-level AI governance frameworks with policy/standards for research and deployment that are aligned with the company's core mission and vision, and built on global best practices, such as those mentioned above.

Establishing organizational checks and balances when using AI

12. Government should consider initiatives to promote awareness of the limitations and risks of generative AI and support efforts of industry associations to develop guidance to businesses in the form of organizational roadmaps with risk management frameworks, with a focus on MSMEs. This could involve, for example, support for MSMEs to conduct assessments for risk identification and prevention for especially high-risk generative AI applications.

13. Businesses should undertake risks assessments ahead of implementing generative AI, and proactively work to align their AI risk management framework with the organization's broader risk management efforts.

5.3 Inspiring innovation

Close collaboration will be required between government and the private sector to enable an innovative environment that ensures generative AI can fulfil its role as an accelerator of innovation.

Protecting innovation incentives

14. Government should review its broader innovation policy frameworks in the context of generative AI, with a view to achieving the right balance between adequate intellectual property protection and maintaining incentives for human innovation.

Accelerating innovation activity

15. Government should assess the innovation landscape to identify existing gaps and potential opportunities to promote research, development, and implementation of generative AI to foster an AI-ready culture at regional and national levels. This could involve working with businesses, industry associations, and community groups to collectively explore open data initiatives and Public Private Partnership (PPP) models to leverage diverse sets of data and knowledge to boost AI-enabled innovation.[lxiii]

Appendix A: Methodology

The potential of generative AI is a ground-up estimation, comprising two related assessments of the expected effect of generative AI on: (1) the undertaking of specific work activities (i.e., tasks); and (2) the need for specific skills. The analysis starting with such a ground-up estimation reflects that generative AI will have implications for tasks within jobs. A limitation of the quantitative estimates is that it does not consider new jobs that could be created as generative AI becomes increasingly prevalent—that is, it only reflects the impact on existing types of jobs ("occupation").

The size of the reported impact of generative AI on jobs represents the share of tasks within a particular occupation that could be affected by implementation of generative AI. It does not reflect the number of jobs that will be replaced. It is likely that generative AI will change what tasks people focus on in their work rather than replacing entire occupations.

The determination of the skills most affected by generative AI is based on an assessment of the skills that are most prevalent (i.e., most frequently in use) among the tasks impacted by generative AI, how prevalent those tasks are among occupations, how prevalent those occupations are within industries, and the industry-structure of the country.

The analysis uses the following data sources:

- This analysis leverages O*Net data on tasks involved in all occupations, developed by the National Centre for O*Net Development. While the data are based on US surveys, it is expected that the types of tasks involved in an occupation should not materially differ between countries. That is, the tasks of a retail bank teller are the same whether it is based in the US or Indonesia.

- The analysis also leverages O*Net data on occupations related to the Work Context, including degree of automation; groupings of occupations by Job Zone, which is an assessment of the extent of preparation required; and its mapping of basic and cross-functional skills to occupations.

- The mapping of basic and cross-function skills to tasks, was developed by Access Partnership, was mapped at a detailed work activity-level.

- The mapping of occupations to industry is based on data by the US Bureau of Labor Statistics. The assumption is that the composition of the workforce by industry does not vary significantly between countries.

- The analysis of sector-level impacts by country uses data on workforce composition by sector from the UN International Labor Organization (ILO), and supplemented by data from national statistics offices where necessary.

- The analysis of production impacts by country uses data on gross output from Asian Development Bank, as well as employment data from the ILO and national statistics offices. This assumes that each task within an occupation in an industry has an equivalent value – which is proxied by a pro rata of gross output per worker within the relevant industry.

This analysis in this report provides an initial assessment of the potential economic impact of generative AI. It can provide a basis for future research to understand the broader implications of generative AI for economies, including in terms of gender, poverty, and regional dimensions.

Appendix B: Disentangling generative AI from automation

Generative AI is not the same as automation. Previous research on the impact of digitalization on the workforce had a focus on the idea of automation, where the jobs most affected contained mostly routine tasks, and were generally in lower paid occupations.

It is expected that generative AI will transform tasks across a wide range of occupations, particularly occupations that involve tasks that are more complex. In these types of occupations, the use of generative AI is unlikely to supplant human participation—there will still need to be human judgement to account for algorithmic bias, as well as person-to-person interaction to manage important stakeholder relationships.

Used well, generative AI is not about replacing people in jobs. Instead, it is about supporting greater effectiveness and efficiency in their work tasks.

There are three findings that show how the impact of generative AI is different from automation, as it could transform: (1) non-routine work activities; (2) work activities that contribute to decision-making; and (3) occupations requiring greater preparation and demanding higher pay.

B.1 Generative AI holds potential for non-routine work activities

Generative AI is not expected to have the same workforce impact as digitalization. It holds potential for occupations that have a higher share of non-routine work activities, moving away from the idea of digitalization only affecting the most "automatable" jobs. For example, the job of a post-secondary school teacher is considered less automatable (that is, less routine), but they could benefit from the application of generative AI to support curriculum planning and delivering more personalized learning.

The occupations for which generative AI holds potential cuts across all occupations, including those assessed to have low degrees of automation (Exhibit B.1). That is, there does not appear to be a strong relationship between occupations with higher generative AI potential and their degree of automation.

EXHIBIT B.1

**Generative AI impact on occupations, by occupation degree of automation**
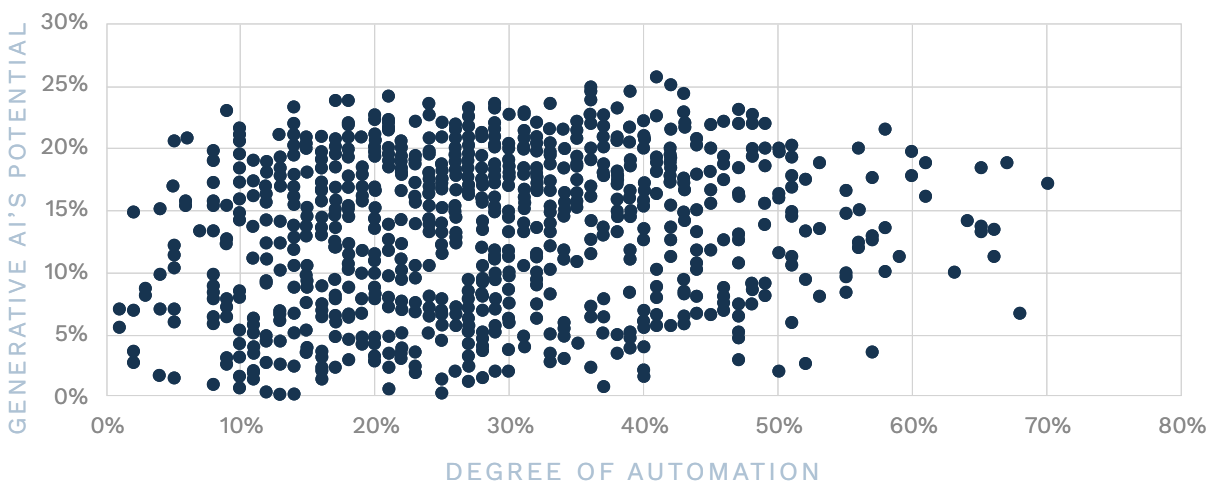
Notes: The analysis is done on a global level. n=873; each dot represents one occupation, e.g., investment fund manager. "Generative AI's potential" for each occupation is based on the share of work activities within each occupation that could be transformed by generative AI. "Degree of Automation" for each occupation is based on an assessment of occupations against a scale of being "not at all automated" to "completely automated", based on the O*Net Work Context data.
Sources: Access Partnership analysis, National Center for O*NET Development

B.2   Generative AI will transform work activities contributing to decision-making

Generative AI will be most transformative for work activities contributing to decision-making – those work activities related to monitoring and optimizing processes (e.g., work schedules), analyzing and processing large information (e.g., estimating and evaluating information and situations) (Exhibit B.2).

EXHIBIT B.2

Generative AI potential for work activities (z-score)

Generative AI Impact (z-score)

LOWER IMPACT   HIGHER IMPACT
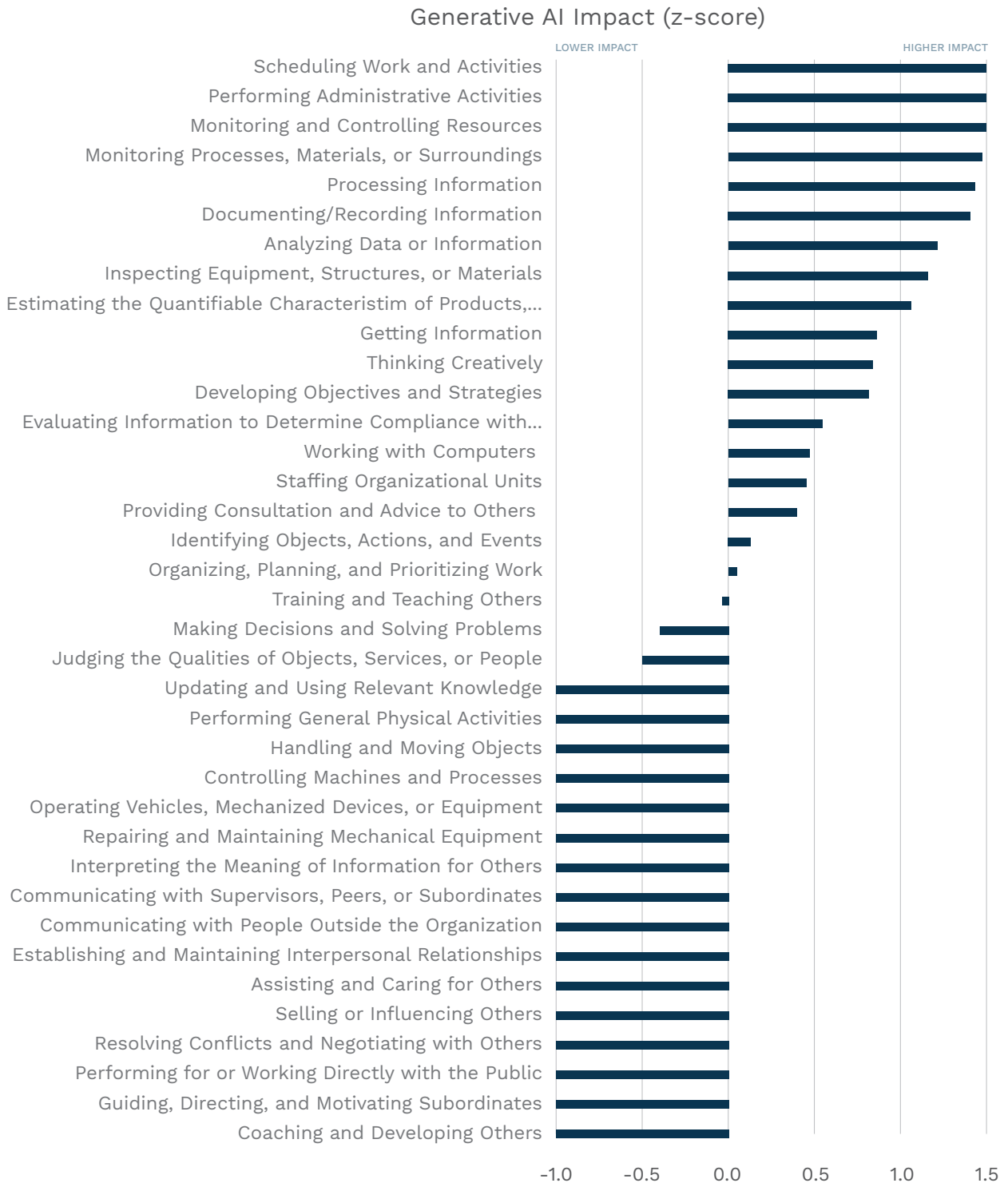
Notes: The analysis is done on a global level. "Generative AI impact" for each work activity is based is based on the share of sub-tasks within each work activities that could be transformed by generative AI.. The work activities listed are groupings of detailed work activities based on O*Net defined work activity elements. Z-score of greater than 0 represents an above average impact, while a z-score below 0 represents a below average impact.
Sources: Access Partnership analysis, National Center for O*NET Development

B.3 Generative AI will transform occupations demanding higher pay

Generative AI will transform occupations requiring greater preparation—that is, more years of education and training—and those demanding higher pay (Exhibit B.3). That is, there appears to be a positive relationship between occupations with higher generative AI potential and their pay level. For example, the job of a biologist is associated with considerable preparation and often higher pay, and they could benefit significantly from the use of generative AI to support their research and development efforts.

Again, this diverges from the impact of digitalization being attributed to highly automatable, and generally lower paid occupations that involve more routine tasks.

EXHIBIT B.3

Generative AI impact on occupations, by occupation pay level
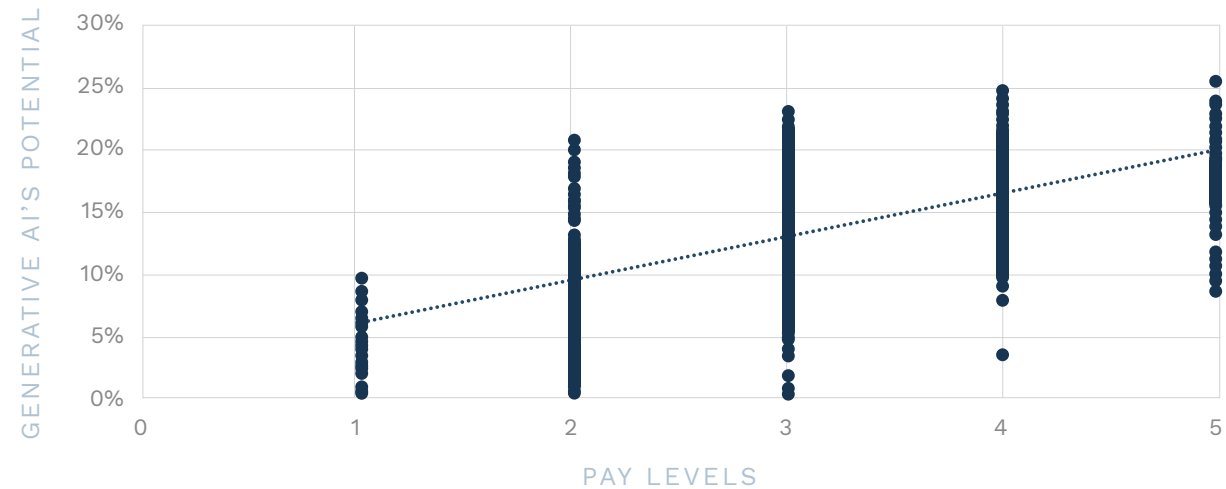
Notes: The analysis is done on a global level. n=873; each dot represents one occupation, e.g., investment fund manager. "Generative AI's potential" for each occupation is based on the share of work activities within each occupation that could be transformed by generative AI. "Pay Levels" is a grouping of occupations proxied according to the extent of preparation required for an occupation, based on the O*Net Job Zones data.
Sources: Access Partnership analysis, National Center for O*NET Development

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