NATIONAL ARTIFICIAL INTELLIGENCE STRATEGY ROADMAP 2.0 (NAISR 2.0)

Historical Note

The National AI Strategy Roadmap 2.0 (NAISR 2.0) was officially launched in July 2024 by the Department of Trade and Industry as part of the Philippine government's initiative to advance artificial intelligence capabilities and governance in the country. This document represents the collaborative efforts of various stakeholders from government, industry, academia, and civil society who contributed to its development.

This roadmap builds upon the foundation of the first National AI Strategy Roadmap launched in May 2021 and reflects the Philippines' continued commitment to responsible AI development and adoption. The concepts, frameworks, and strategic directions outlined in this document were presented during the July 2024 launch and have been referenced by national and international organizations for monitoring AI development in the Philippines, including initiatives such as the establishment of the Center for AI Research.

This live document serves as a reference for stakeholders engaged in AI development and policy in the Philippines.

1 INTRODUCTION

Innovation drives the development of new products, services, and business models that enhance trade, attract investments, increase economic output, and create quality employment—ultimately fueling economic transformation. Emerging technologies, such as Artificial Intelligence (AI), play a crucial role in powering innovation.

In 2019, the Philippines enacted the **Philippine Innovation Act (RA 11293)** to fund and promote Research and Development (R&D) efforts to drive national development. The Act strengthens industries' capabilities to innovate and compete in the global marketplace, fostering sustainable and inclusive growth. It highlights the essential role of emerging technologies in driving national competitiveness and promoting equitable development.

Among these technologies, AI is recognized as a key driver of industry transformation, significantly impacting businesses, societies, and economies. To effectively harness the potential of AI, the Philippines has laid the groundwork for integrating AI into its national development framework with the goal of becoming a **Center of Excellence in AI R&D**.

In 2021, the Philippines launched its National AI Strategy Roadmap (NAISR). It laid the foundation for the country's AI development prior to the rise of Generative AI (GenAI) systems. The rapid advancements in AI since then have been rapidly reshaping the global economy, with significant implications for the country. As industries worldwide transition to Industry 4.0, characterized by automation, data exchange, and cyber-physical systems, to Industry 5.0, which emphasizes human-centric solutions and sustainability, the role of AI becomes even more critical.

Building upon the foundation laid in 2021, the NAISR 2.0 integrates recent technological advancements, including GenAI, recalibrates the strategic actions considering recent developments, and addresses emerging themes such as ethics and governance.

In line with the country's **Science, Technology, and Innovation-driven Industrial Strategy**, the **NAISR 2.0** continues its strategic mission to effectively make use of AI's transformative capabilities across various sectors, emphasizing innovation, ethical considerations, and robust governance frameworks. By harnessing AI's potential, the roadmap seeks to drive economic growth, enhance national competitiveness, and improve the quality of life for Filipinos through actionable initiatives that position the country at the forefront of AI innovation

1.1 Artificial Intelligence

AI refers to the capability of machines to simulate human thinking and the ability to perform tasks by learning from data. AI can be divided into two types: Artificial General Intelligence (AGI) and Artificial Narrow Intelligence (ANI). AGI, still hypothetical, would enable machines to understand, learn, and perform any intellectual task a human can do. ANI, in contrast, specializes in specific or singular tasks, often outperforming humans in routine or repetitive jobs. Examples of ANI include medical diagnostics, predictive maintenance in factories, spam email classification, and chess playing.

AI encompasses various technologies, including traditional AI methods, natural language processing (NLP), and computer vision (CV). Traditional AI focuses on machine learning algorithms that can analyze data, recognize patterns, and make decisions. NLP enables machines to understand and interact with human language, leading to applications such as language translation, chatbots, and intelligent autonomous agentic systems. CV allows machines to interpret and process visual information from the world, with applications in facial recognition, autonomous vehicles, and medical imaging.

1.2 Macro Trends Shaping the Future of AI

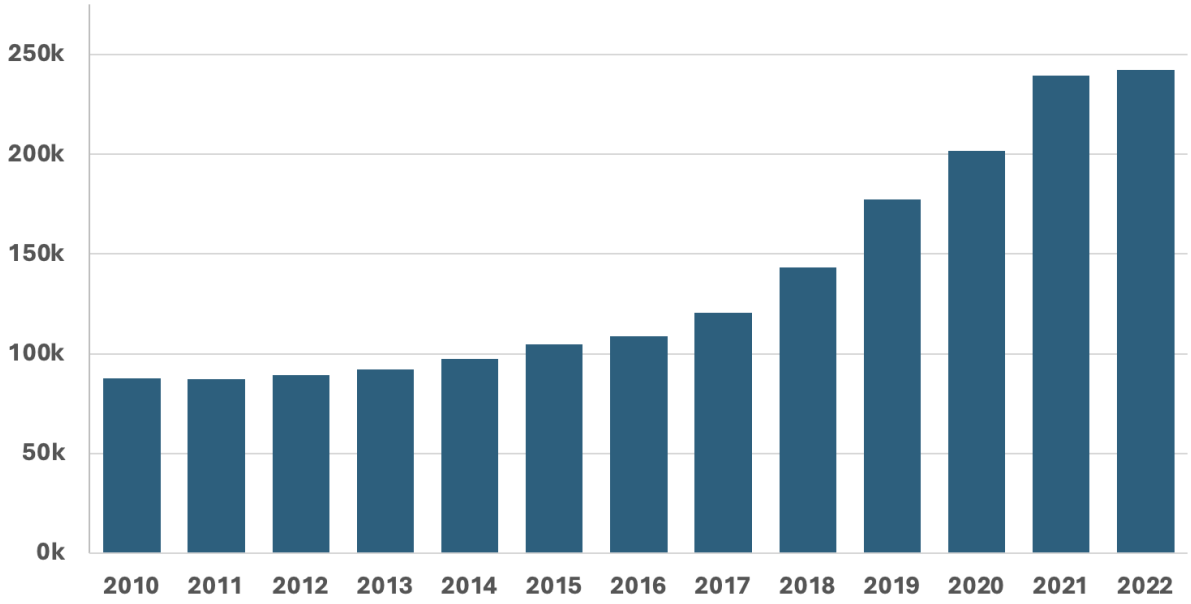
Since the launch of the initial AI Roadmap in 2021, the pace of AI adoption across industries and societies has significantly accelerated, exceeding initial expectations. Rapid technological advancements, such as genAI, , have introduced new disruptions, while AI-driven products are reshaping markets and competition. This rapid evolution has led to the emergence of new job roles and the transformation of existing ones, even as policymakers grapple with the challenges of responsible AI deployment.

1.2.1 Technology

The global AI research landscape has experienced unprecedented growth, as documented in the Artificial Intelligence Index Report 2024 (Center for Security and Emerging Technology, 2023, as cited in Stanford, 2024). This growth is evidenced by the substantial increase in academic publications and patent applications. AI publications have nearly tripled since 2010 (**Figure 1**), reflecting increased investment and prioritization by academic institutions, industry, and governments worldwide..

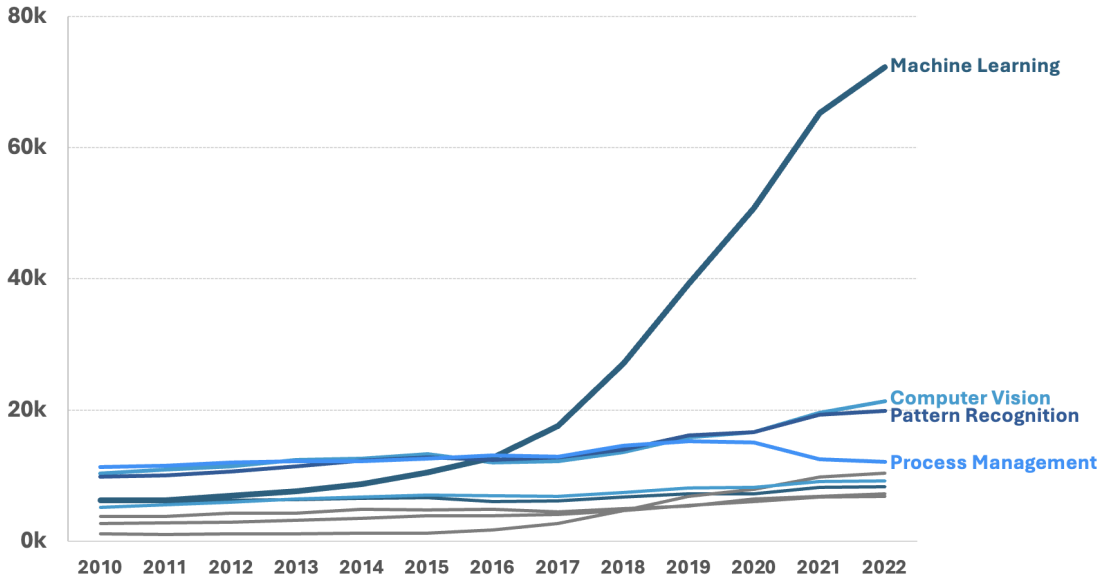
Machine learning, computer vision, and pattern recognition have emerged as dominant fields driving AI innovation, collectively shaping the development of intelligent systems across sectors (**Figure 2**). These systems are now capable of learning from data, interpreting visual information, and performing tasks autonomously, fueling applications across diverse sectors, from autonomous vehicles and medical diagnostics to facial recognition and beyond.

Figure 1. Number of AI publications in the World



Source: Center for Security and Emerging Technology, 2023, as cited in Stanford (2024)

Figure 2. Number of AI by Subfield (% of total), 2010-2022

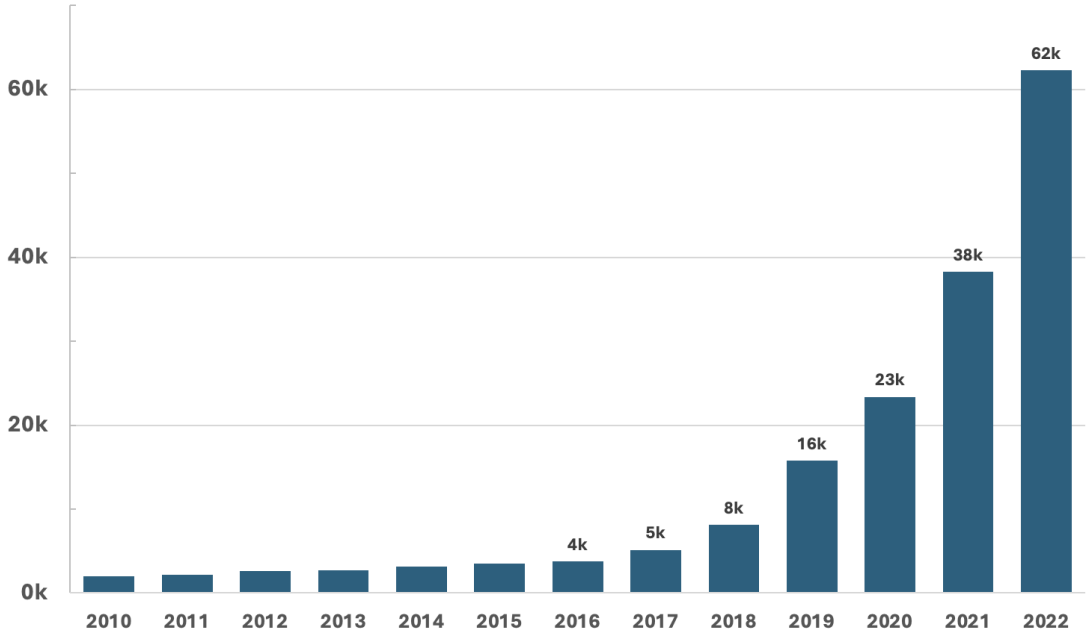


Source: Center for Security and Emerging Technology, 2023, as cited in Stanford (2024)

The same report also highlights the dramatic rise in AI patent registrations, particularly in 2021-2022, signals a crucial shift from theoretical research to practical applications (**Figure 3**). This trend reflects the increasing maturity of AI technologies and their growing commercial viability .

It is also worthy to note the increasing involvement of various sectors in AI research. While academia remains a primary contributor, growing participation from industry and government underscores the recognition of AI's strategic importance. This collaborative effort is essential for translating research into practical applications and ensuring responsible development.

Figure 3. Number of AI Patents Granted, 2010-2022



Source: Center for Security and Emerging Technology, 2023 as cited in Stanford (2024)

GenAI, particularly large language models (LLMs) like OpenAI's GPT models powering ChatGPT, has emerged as a major disruptive force in the AI landscape. The success of ChatGPT, along with similar LLMs such as Google's Gemini and Microsoft's Copilot, demonstrates the transformative potential of these technologies. Their ability to generate human-quality text is revolutionizing how organizations operate, disrupting traditional processes and driving innovation across sectors. This opens up new avenues in areas like customer service, content creation, and personalized education, promising to reshape how businesses and individuals interact with technology **(Table 1)**.

Table 1. Generative AI Capabilities

Text	Written language outputs presented in an accessible tone and quality, with details and complexity aligned with the user's needs
Code	Computer code in a variety of programming languages with the capacity to autonomously summarize, document, and annotate the code for human developers
Audio	Much like textual outputs, audio outputted in natural, conversational, and even colloquial styles with the capacity to rapidly shift among languages, tine, and degrees of complexity
Image	Textual or visual prompts lead the model to create images with varying degrees of realism, variability, and "creativity."
Video	Similar to imagery, Generative AI models can take user prompts and output videos with scenes, people, and objects that are entirely fictitious and created by the model.
3D	From text or two-dimensional inputs (e.g., images), models can extrapolate and generate data representing 3D objects

Source: Deloitte (nd)

The impact of GenAI is projected to intensify in the coming years, permeating numerous facets of daily life. McKinsey (2023) reports that a significant majority of organizations already adopting AI are leveraging GenAI, with further investment anticipated. Early use cases are concentrated in areas like marketing and sales, product and service development, and service operations, but the potential spans diverse dimensions. Deloitte (nd) sees GenAI as a critical driver of cost reduction and process efficiency, fueling business growth and innovation, generating valuable discoveries and insights, and even enhancing government-citizen services (**Table 2**).

Table 2. Generative AI Impact

Cost Reduction	Reduce cost, typically by 30% or greater, primarily through automating functions and then undertaking job simulations
Process efficiency	Create process efficiencies through automating standard tasks and reducing manual interventions
Business Growth	Increase revenue generation through hyper-personalized marketing for target customers
Public services	Increase accuracy of various federal and local programs and create easier access for at-risk populations
Accelerating innovation	Increase accuracy of various federal and local programs and create easier access for at-risk populations

New discovery	Uncover new ideas, insights, and questions and generally unleash creativity

Source: Deloitte (nd)

Furthermore, it has been reported that GenAI can unlock USD 79.3 billion in productive capacity in the Philippines, where 54% of the potential economy-wide gains would come from manufacturing and wholesale and retail trade (Access Partnership, 2023).

Beyond the transformative potential of GenAI, broader AI applications are poised to revolutionize specific sectors. In manufacturing, AI-driven predictive maintenance can anticipate equipment failures, minimizing downtime and driving cost savings. In agriculture, AI-powered precision farming can mitigate losses from pests and natural disasters, significantly increasing crop yields. Developing the necessary talent, technology, and infrastructure to support these advancements is crucial. This not only generates wealth but also fosters inclusivity by providing essential infrastructure – such as housing, transportation, and food security – that empowers citizens to be productive and thrive.

1.2.1.1 AI in Agriculture

The use of AI is gaining traction and popularity in Agriculture. Applications that can detect soil shortages and crop diseases, as well as suggest crops to plant, have been made possible by advances in computer vision and machine learning.

In addition to this, AI also supports "precision agriculture," in which farmers employ AI to examine weather trends to forecast and schedule plantings, choose which crops are best to raise, respond to pest attacks, determine the pH and soil conductivity.

Furthermore, farmers can harvest crops faster and more effectively than human laborers because of the combination of AI and robotics.

1.2.1.2 AI in Semiconductor and Electronics

For semiconductor businesses, AI has the potential to create enormous financial value at every stage of their operations, from research and chip design to production and sales.

AI can generate $85 billion to $95 billion for semiconductor companies over the long term (Göke, Staight, & Vrijen, 2021). This is through raising the fab's throughput, lowering costs, or enhancing yields. Moreover, AI can boost productivity and portfolio optimization for semiconductor companies when they perform research and design

chips. Businesses can reduce the amount of money needed to sustain yield, prevent time-consuming iterations, and speed up the yield ramp-up by getting rid of faults and out-of-tolerance process stages.

1.2.1.3 AI in Energy and Power

Energy and power industries are well-positioned to lead in utilizing the latest advancements in AI due to their reliance on data, analytics, and engineering. AI applications in the sector enhance inputs across various energy market functions, such as improving battery life performance and refining oil refinery design, while also accelerating operational improvements like enhanced digital monitoring and the use of "digital twinning" for physical energy assets as AI becomes necessary to remain competitive (Jacobs & Gardett, 2024).

1.2.1.4 AI in Manufacturing

The application of GenAI in the supply chain offers the chance to significantly speed up the time from design to commercialization. Businesses are using their own data sets to train models and identify AI-enabled methods to increase efficiency and production. GenAI can also be used in predictive maintenance to identify the individual machines or lines that have the highest probability of failing in the next few hours or days.

1.2.1.5 AI in Supply Chain and Logistics

AI applications in Supply Chain and Logistics, like in most applications, drastically improves the efficiency of operations. Around 40% of supply chain organizations are already investing in GenAI (Steinberg & Burton, 2024).

Tsidulko (2024) reports applications of ML that help in mapping out logistics facilities, ensuring maximized and efficient use of space, and identifying abnormal behavior in both humans and machines far sooner than people can. As such, producers, warehouse managers, and shipping firms are teaching algorithms to identify inefficiencies in their processes, human errors, and shortcomings in their products. Cameras mounted in delivery vans, assembly lines, and logistics centers feed data into computer vision systems that employ AI to inspect work and minimize returns, recalls, and rework.

1.2.1.6 AI in Wholesale and Retail

AI can provide support for retail operations, increasing profits and optimizing business processes. With data being the fuel for greater AI use, stakeholders in the wholesale and retail sector can utilize consumer data to drive more targeted sales

efforts (Yili, 2023). Through the analysis of data from multiple sources, AI can offer a window into the behaviors of customers and consumers by highlighting patterns, trends, needs, and preferences. AI can also suggest the best times to reach out consumers based on variables like irregular purchase frequency, decreased order size, no recent contact, etc.

1.2.1.7 AI in Mobility

The widespread application of AI in the mobility sector is unsurprising, given its significant impact on enhancing various processes, enabling automation, and addressing long-standing challenges (Kelkar, Möller, & Ziegler, 2024). First, automobile R&D builds and manages virtual environments using applied AI so they can train the algorithms needed for autonomous driving. AI algorithms have several advantages, one of which is their ability to spot flaws in existing models. They can produce hundreds or even millions of extra scenarios for testing, an amount that would not be feasible without this technology. OEMs have enhanced manufacturing quality control by applying AI in conjunction with vision cameras, lidar, and radar. One well-known automaker, for example, uses AI-controlled robots to process each vehicle individually while upholding strict quality standards.

1.2.1.8 AI in Healthcare

AI has also entered the medical industry as its accuracy has increased. AI assists administrators with data processing, scheduling, file organization, and medical note transcription. AI is being used for machine-led surgeries which may operate around the clock, are less intrusive and more exact, and have a lower margin of error. Through the use of wearable technology to track health and identify issues before people become aware of them, AI can help with medical diagnosis. AI has also been used by some programs to read body scans (such as MRIs) and detect dangerous medical conditions more quickly and accurately.

1.2.1.9 AI in Education

Even though human workers still hold a major role in education, AI helps teachers efficiently carry out their tasks and functions. AI is frequently utilized to enable automation in repetitive, data-intensive operations such as assigning grades for homework, setting up meetings, overseeing several online courses concurrently, personalized messages being sent to students, and making or digitizing study materials and lectures.

1.2.1.10 AI in Finance

The application of AI in finance has also become increasingly prevalent. AI can be used by customers to obtain information about their investing and banking accounts. Similarly, AI is used by banks and credit card companies to identify trends in transactional data and identify fraudulent activity early on.

AI is also used by lenders to forecast and evaluate the risk levels of their borrowers and make loan choices. Likewise, AI is used by venture capital organizations to provide tailored insights and financial risk management choices.

1.2.1.11 AI in the Creative Industries

We are witnessing augmentation experiments in more creative work since the advent of GenAI (De Cremer, Morini Bianzino, & Falk, 2023).

Designers, filmmakers, and advertising executives have been adopting image generators like DALL-E 2, MidJourney, and Stable Diffusion more recently. Rather being seen as a threat, GenAI software is seen as a tool allowing humans to do the work they already perform, but simply accomplish their tasks with greater speed and efficiency .

GenAI enables video game developers and animators to explore exciting new possibilities to produce realistic graphics, immersive gameplay, and captivating content (Marr, 2024). Game developers and animators can extensively use AI in procedural and terrain generation as well as automated modeling, vastly improving their efficiency.

Web design is also greatly improved by AI as it can streamline the design process, enhance user experience, and optimize performance and accessibility for many users and stakeholders.

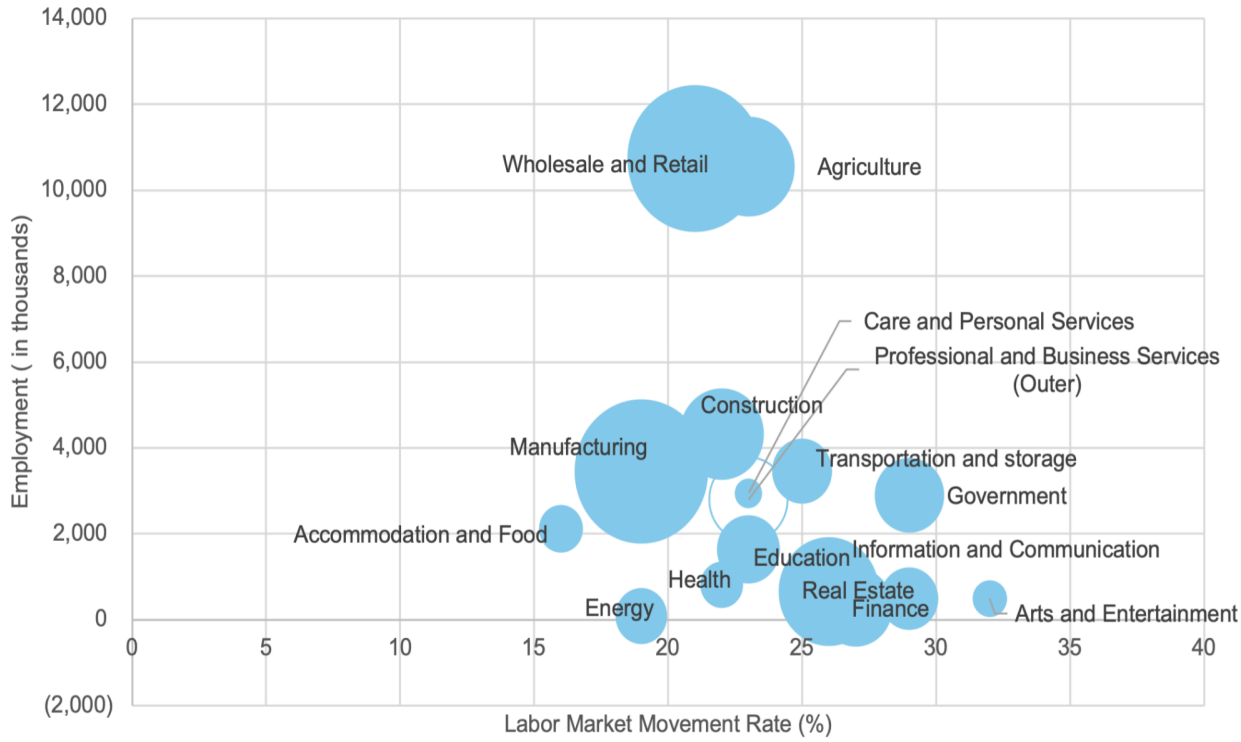
1.2.2 Jobs

Rapid digitalization after the COVID-19 pandemic has revolutionized job structures within organizations, creating entirely new jobs and requiring new skill sets in traditional jobs. Within the next five years, digital technologies like AI will remain a key driver of business transformation with an expected net-positive outcome. In the Philippines, it is projected that 56% of workers will potentially use GenAI for 5-20% of their regular work activities. With all these changes, the World Economic Forum (WEF) (2023) predicts that six in ten global workers will require training before 2027, with a strong emphasis on creative thinking, analytical thinking, and AI and big data competencies.

Globally, it is expected that digital technologies will induce job movements for 23% of the current workforce within the next five years – either via job creation or destruction (WEF, 2023). This transformation will happen across all industries with varying magnitude, from a minimum of 16% in the Accommodation and Food sector and up to 32% in the Media and Entertainment sector.

Figure 4 depicts the magnitude of these projected labor market movements vis-a-vis the industries' contribution to employment and value-added in the Philippines.

Figure 4. Employment, Economic Contribution, and Labor Market Movement Rate



Note: Bubble size represents Gross Value Added (in constant 2018 prices)
Data Source: Philippine Statistics Authority (2024); World Economic Forum Future of Jobs Report (2023). Illustration by DTI.

The two largest economic contributors, namely, wholesale & retail (18.6%) and manufacturing (18%) will experience a 21% and 19% labor market disruption, respectively.

Meanwhile, while Agriculture merely contributes 8.6% to the country's GDP, it employs a whopping 10.5 million workers, equivalent to 22% of employment, and 23% of these jobs are expected to be transformed within the next five years.

Finally, the labor markets in the Information and Communication, and Professional and Business Services sectors, where the Information Technology and Business

Process Management (IT-BPM) industry is classified, are set to be disrupted by 23% and 29% respectively. The IT-BPM sector is expected to be impacted by the automation of routine tasks and the creation of new roles in AI development and data science. For example, call centers will be disrupted by automating routine customer queries through chatbots and virtual assistants, while also creating new roles in AI-driven customer service optimization and data analytics.

At a regional level, Chitturu, Lin, Sneader, Tonby, & Woetzel (2017) reported that AI could open up opportunities in Southeast Asia in that it can "automate about 50% of the work activities performed in ASEAN's four biggest economies", including the Philippines.

Table 3. Employment, Economic Contribution, and Labor Market Movement Rate

	Employment Share (%)	Gross Value-Added Share (%)	Labor Market Movement Rate (%)
Agriculture	21.9	8.6	23
Manufacturing	7.2	18.0	19
Energy	0.2	2.7	19
Construction	9.0	7.2	22
Wholesale and retail trade	22.3	18.6	21
Transportation and storage	7.2	3.6	24
Accommodation and food	4.4	1.9	16
ICT	1.0	3.4	29
Finance	1.4	10.3	26
Real estate	0.6	5.5	27
Professional and business services	5.8	6.3	23
Government	6.0	4.9	29
Education	3.4	4.0	23
Health	1.7	1.9	22
Arts and Entertainment	1.0	1.2	32
Care and Personal Services	6.1	0.8	23

Data Source: Philippine Statistics Authority (2024); World Economic Forum Future of Jobs Report (2023). Illustration by DTI.

1.2.3 Market

In an October 2020 report by EDBI and Kearney, AI is expected to boost Southeast Asia's Gross Domestic Product (GDP) by up to USD 1 trillion by 2030. In addition, Kearney's analysis estimates a USD 92 billion uplift in the Philippine GDP by 2030, equivalent to 12% of the economy.

With the tremendous value that AI innovations have demonstrated thus far, investors and consumers alike have been more comfortable and less apprehensive of AI uptake.

New market signals validate this growing market interest in AI and predict increases in company-level capital spending on the technology.

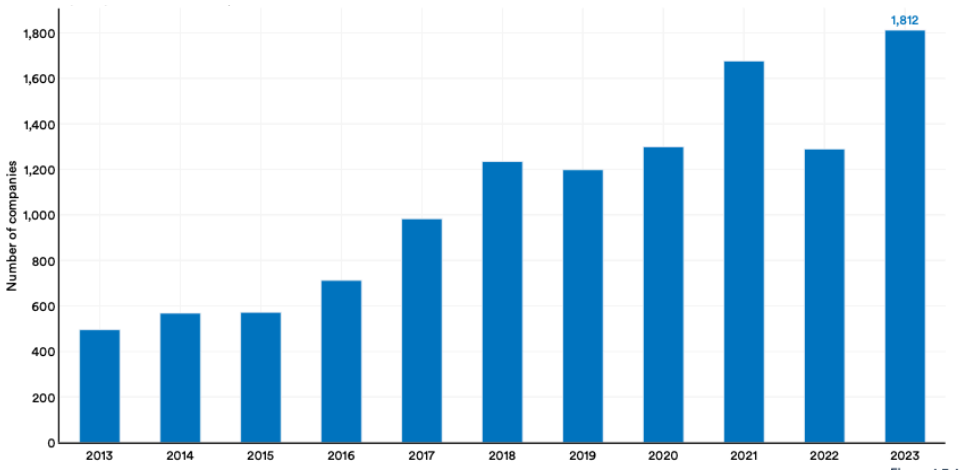
In 2023, Goldman Sachs found that 16% of companies in the Russell 3000 had already mentioned AI in their earnings call, up from 1% in 2016. The report further reveals that 50% of which had been triggered by the launch of GenAI in 2022. In another source, Boston Consulting Group (BCG), one of the world's largest management consulting firms, expects that 20% of its revenues will be generated from AI consultancy in 2024, a share that is expected to rise to 40% by 2026 (Financial Times, 2024).

International Data Corp. (IDC) reports that the largest organizations in Asia and the Pacific are seen to allocate more than 50% of their information technology budget for the adoption of AI starting 2025, with an insight that these companies will be AI-proofed by 2028 (Rosales, 2024).

The promising productivity gains that businesses and consumers are craving have likewise opened the floodway for venture capital to flow into the AI economy. In 2023 alone, Stanford University reported that more than 1,800 AI companies were created which received fresh funding (**Figure 5**).

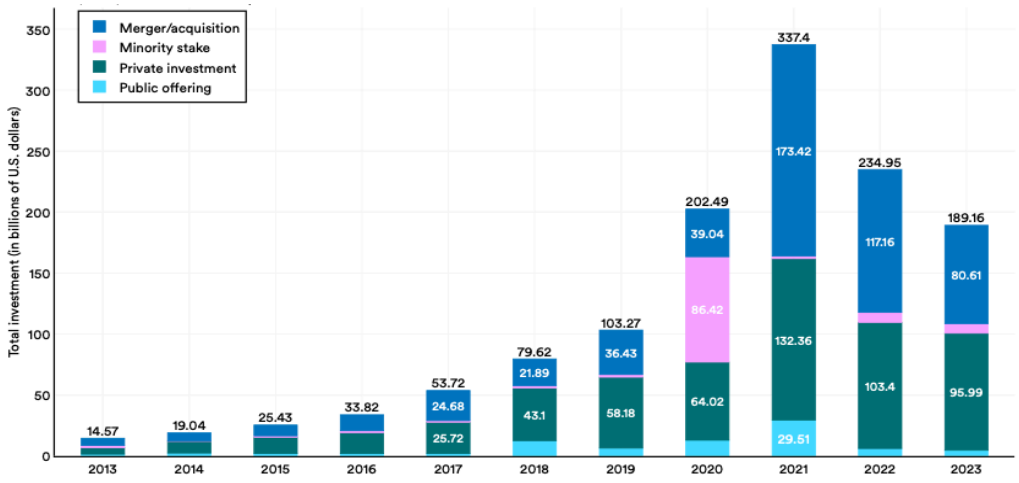
In terms of global AI investments, 2021 was a breakthrough year as it reached more than USD 337 billion, up by 66% from the previous year. In 2023, it recorded more than USD 189 billion, marking, however, a two-year consecutive decline due to the wave of technology crunch (**Figure 6**).

Figure 5. Number of Newly Funded AI companies in the world, 2013-2023



Source: Stanford University (2024)

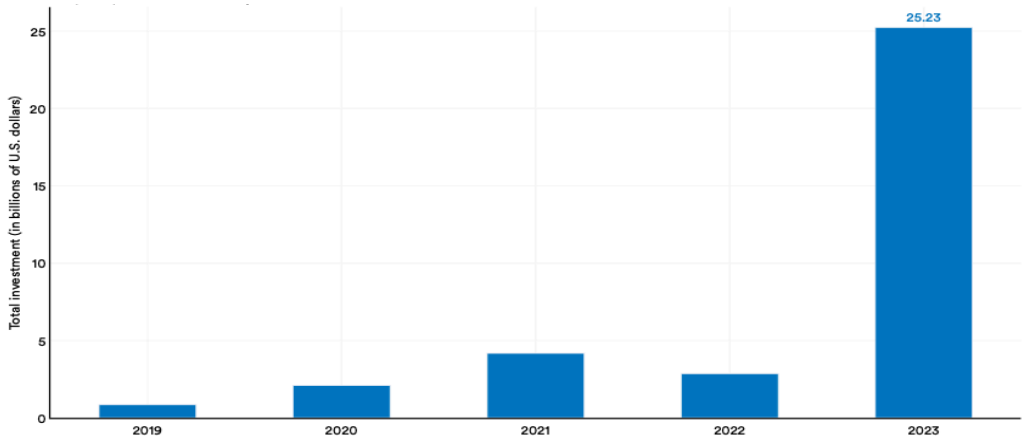
Figure 6. Global Corporate Investments in AI by Investment Activity, 2013-2023



Source: Stanford University (2024)

Despite the recent declines in global AI investments, GenAI emerges as a bright spot for continued investments within the AI space, as it weathers the storm and attracts $25.2 billion in funding in 2023, nearly 9 times the investment in 2022 and about 30 times the amount from 2019 (**Figure 7**).

Figure 7. Private investment in GenAI, 2019-2023



Source: Stanford University (2024)

With the rapidly expanding AI market, the Philippines sector is poised to capitalize on these vast market opportunities within the global AI ecosystem. The IT-BPM sector's

global leadership and large footprint in the global business services outsourcing is ripe for innovation and services upgrading. This development promises to deliver greater economic value and more resilient employment opportunities across every stage of the AI value chain in the Philippines.

1.2.4 Policy

In the realm of public policy, the high-speed diffusion of AI innovations triggered public and private sectors to also push for governance frameworks that balance AI innovation and responsible AI adoption. Globally, countries like the United States (US), United Kingdom (UK), Japan, and European Union (EU) members, have been at the forefront of taking steps to institutionalize a global consensus on responsible AI.

Consistent with the country's AI roadmap, the Philippines joined in 2021 the 192 Member States of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in adopting the *Recommendation on the Ethics of Artificial Intelligence*, which recognizes universal principles in AI adoption and recommends policy actions in critical areas with respect to data governance, environment, gender, and research, among many other spheres (UNESCO, 2021).

Following the first roadmap's recommendation to create an 'AI conscience', the DTI published the pioneering *Developing an AI Governance Framework for the Philippines* report in 2022, that identifies the elements of a national AI governance framework that the country should consider. This is further discussed in Section 3.3.

Citing the country's AI roadmap, the University of the Philippines (UP) likewise formed in 2023 the *UP AI Advancement Committee (AIAC),* which was tasked to discuss the benefits and concerns associated with using AI, and prepare university issuances to operationalize the development and use of responsible and trustworthy AI (University of the Philippines, n.d.).

In the private sector, the IT and Business Process Association of the Philippines (IBPAP), one of the country's biggest business groups, established an AI Council to partner and collaborate with government, the academe, and organizations to upskill talent in the areas of programming, data science and analytics, and data and AI ethics (Dagooc, 2023).

More recently, the 10-member Association of Southeast Asian Nations (ASEAN) launched the *ASEAN Guide on AI Governance and Ethics* in 2024, which fosters the alignment and interoperability of AI frameworks across ASEAN, and recommending national- and regional-level initiatives to design, develop, and deploy AI systems responsibly.

To promote responsible AI in government, the Philippine Department of Information and Communications Technology (DICT) and the Civil Service Commission (CSC) are also set to issue in 2024 a Circular on the *Principles and Guidelines for an Ethical and Trustworthy Use of Artificial Intelligence (AI) in the Government.*

1.3 Philippine Advantages and Opportunities for Growth

Amid recent developments, the Philippines is still positioned to transform itself into an AI-driven economy, and be a Center of Excellence in AI R&D. With a sustained national direction in place, the assets of the country will be the drivers of the country's leadership in the global AI arena.

1.3.1 People

AI is powered by human intellect and the creative and analytical capacities of people to use the technology to actually drive innovation. This places the Philippines at an advantageous position. The Philippines has a vast young and tech-savvy talent pool that can be tapped to drive the country's AI and data science workforce. With 118 million people, a median age of 26 – one of the youngest in the world – and a tech-savvy attitude, having high exposure to the digital space, the Philippines is in a bright spot in terms of availability of talent ripe for training.

The country produces more than 800,000 college graduates every year; more than 200,000 of which come from Science, Technology, Engineering, and Mathematics (STEM) courses. The workforce is deemed highly trainable by industries owing to Filipinos' ability to adapt in the workplace and their fluency in the English language.

While the talents in the workforce are readily available, the critical challenge lies in upskilling and reskilling millions of Filipinos to fulfill various roles at each stage of the value chain in the AI economy. Once equipped with the necessary skills aligned with industry needs, these trained professionals can significantly bolster the edge of the Philippines, with millions of Filipinos driving innovation, developing cutting-edge technologies, and delivering AI solutions across industries around the world.

In the quest to churn out more AI talents in the country, many Philippine universities and colleges have begun offering more specialized data science and AI programs at the graduate and undergraduate levels. Notably, the Asian Institute of Management's (AIM) Master of Science in Data Science (MSDS) program is one of the globally renowned data analytics masters' programs in the region. AIM has also launched a Bachelor of Science in Data Science and Business Administration program and a Ph.D. in Data Science program. In addition, the University of the Philippines - Diliman introduced its doctoral program in AI at the College of Engineering in 2022, to expand the field of AI via state-of-the-art dissertation research.

The Department of Science and Technology (DOST) and the Development Academy of the Philippines (DAP) implemented the *Smarter Philippines through Data Analytics,*

R&D, Training, and Adoption (SPARTA) Project, which offered online education scholarships for thousands of individuals in Data Science and Analytics (PCIEERD Innovations, nd).

The Philippines also hosts an active ecosystem of global technology providers, offering accessible and structured learning pathways for new learners and practitioners. In 2022, Amazon Web Services (AWS) launched the re/Start program to provide free skills training to inspire Filipinos to transition into a career in cloud computing (Dela Cruz, 2024). In 2023, Google Philippines launched a free AI skills development course to help bring AI and machine learning education to Filipinos (Ronda, 2023). In 2024, Microsoft committed to train 100,000 Philippine women on AI and cybersecurity (France-Presse, 2024).

1.3.2 Industries

The Philippines possesses robust global industrial capabilities in the fields of Information Technology (IT) and Business Process Management (BPM), boasting more than 1,300 companies, an annual revenue of USD 35.5 billion, and a workforce of 1.7 million individuals (Desiderio, 2024). It is a global leader in providing voice and non-voice services, enabling it to be the country's top services export, and a major strength of the Philippine economy. It remains to be a top destination for global investments in outsourced services serving many of the world's biggest brands in various industries.

More recently, global companies have made investments into R&D services activities in the country, signaling the capacity of the Philippines to move up to higher-value services activities. Dyson, a global appliance brand, invested PhP 11 billion in its Technology Centre in Batangas to perform innovations in software, AI, robotics, and electronics (Crismundo, 2023). Samsung, one of the world's biggest semiconductor and electronics companies, continues to expand their strong pool of Filipino software engineers at its R&D Center in Taguig and is engaged in developing cutting-edge solutions related to Cloud, Web, and Data Intelligence.

Beyond the league of large corporations, the Philippines is also witnessing the rise of AI-as-a-service and AI-enabled startups, leveraging AI to deliver specialized solutions and services. Startups like Senti AI and Instalimb offer a range of AI capabilities catering to diverse industry needs such as automation, data analytics, and predictive modeling. In the Philippines, this trend is expected to rise given the country's burgeoning tech-savvy talent pool and increasing digital adoption rates.

1.3.3 Economy

Located at the heart of the dynamic Southeast Asia, the Philippine economy continues to be one of the rising economies in the world, on track to be an upper middle-income economy by 2025, classified as those with Gross National Income (GNI) per capita between $4,466 and $13,845.

It exhibits robust and sustained economic growth with a solid 5.6% growth in 2023, followed by an impressive 5.7% in the first quarter of 2024 (PSA, 2024). Looking ahead, optimistic projections foresee continued growth rates of above 6% for both 2024 and 2025, highlighting the country's strong potential for continued expansion (World Bank, 2024).

According to S&P (2023), the Philippines has fully regained its high growth momentum after the pandemic, and is on track to breach the USD 1 trillion economy mark by 2034 alongside China, Japan, South Korea, Taiwan, and Indonesia .

The country's huge and growing domestic market signals greater economic activities that will increasingly require new technologies like AI to enhance efficiency, innovation, and competitiveness across various sectors, crucial for economic transformation.

With a population that has a large footprint in the digital economy, the 2023 Google e-Conomy Southeast Asia Report likewise reports that the Philippine digital economy is in a fast growth momentum. It is projected to reach USD 35 billion by 2025 in Gross Merchandise Value (GMV) and is estimated to grow even more in the coming years, potentially reaching USD 80-150 billion by 2030. This digital economy's rapid growth brings with it increasing market opportunities for data science and AI services.

1.4 Barriers

Since the launch of the first roadmap, significant strides have been made in alleviating the previously identified barriers to AI development in industries. However, alongside these advancements, new challenges have emerged that require more targeted solutions. The NAISR 2.0's strategic framework continues to prioritize dismantling the barriers to AI development and adoption in the Philippines, namely:

(1) **Limited Local Use Cases.** While GenAI has made the concept of AI more relatable and tangible for the general population, especially the youth, the challenge among industries, especially for Small and Medium Enterprises (SMEs), is to navigate how they can maximize its use to specifically help their products and processes across various business areas. Consequently, companies are not willing to invest money and other resources into something whose value and impact are not explicit nor tangible to them.

There is still a scarcity of information on potential local use cases of AI in industries. While many concrete examples exist outside of the Philippines that are readily accessible via the news and from online resources, many local enterprises cannot connect or relate to these examples. Many still seem far-fetched to local enterprises and the workforce. There is a need for more potential use cases that are locally generated, so as to paint a more compelling picture for local stakeholders.

(2) **Limited Human and Physical Resources.** This constraint is categorized into two forms: equipment (computational resources) and manpower (human resources). First, many enterprises, mostly SMEs, in the Philippines are resource-challenged in terms of the capability to set up their own computational resource, including cloud computing resource, and/or even acquiring business intelligence (BI) software to aid them in their data and system analysis.

Second, most, if not all, industries in the country, especially those that have started to invest in AI and Data Science, have been restricted by the scarcity of data experts, which include data analysts, data scientists, machine learning engineers, data engineers, data architects, and data stewards, among others. Furthermore, many of the data-skilled talents lack the required business skills to make AI R&D projects practical and profitable for the enterprises.

This hinders enterprises to fully adopt AI to optimize their processes and more so to perform product or service innovation using AI.

(3) **Lack of Enterprises' Capacity to Develop Data Strategies.** Data Strategy or AI strategy is essentially a vision for how organizations should invest their resources towards building capabilities in data science and AI, anchored particularly on each company's strategic imperatives and business objectives. A common misunderstanding is that a data strategy is all just about the data and the technology—e.g., how/what to collect, where to store, what BI platforms to use, etc. Rather, it is about how acquiring technologies and technical capabilities can help enterprises achieve their strategic goals.

Without the right tools, concepts, and guidance, the adoption of AI by enterprises, especially SMEs, can be risky and costly. Most SMEs lack the technical expertise to develop a robust data strategy and the financial resources to engage business consultancy services for this purpose.

(4) **Emerging Legal & Regulatory Uncertainties.** Despite the growing consciousness about the risks on AI development, the existence of global AI frameworks, and local efforts to institutionalize governance measures, the discovery of new AI application in various areas inevitably give rise to new risks and challenges, such as the proliferation of deep fakes and false information, infringements on intellectual property especially in creative content, plagiarism on educational outputs, and other emerging concerns. New areas of concern are anticipated to emerge alongside new discoveries and innovations using AI.

By setting out universal principles for AI use and effectively implementing targeted and application-specific guidelines, the rights of Filipinos will be protected and innovations in AI will be promoted.

2 THE STRATEGY FRAMEWORK

Anchored on the vision of making the Philippines a **Center of Excellence in AI R&D**, the objectives of NAISR 2.0 are as follows:

1. Increase regional and global competitiveness of local industries through AI-driven industrial growth;

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2. Identify key areas for investment in R&D and technology application to advance new processes, products, and services;

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3. Promote triple-helix collaborations in R&D, crucial for national development;

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4. Prepare the workforce for future jobs;

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5. Attract major industries to create jobs in the Philippines;

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6. Ensure responsible rollout and governance of AI technologies, emphasizing ethics, data privacy, and minimizing the negative impacts on society, including the creation of regulatory frameworks to guide the AI technology deployment, promoting transparency and accountability, and fostering public awareness.

2.1 A Whole-of-Nation Approach

The success of NAISR 2.0 is anchored on a whole-of-nation approach implementation. This approach necessitates breaking down silos that hinder collaboration across various sectors and stakeholders, including government, industry, academia, and civil society. By fostering a culture of cooperation and open communication, ecosystem

players can integrate diverse perspectives and expertise, ensuring that AI development is inclusive, ethical, and aligned with national priorities. This collaborative framework will also enable more efficient resource allocation and accelerate innovation more effectively, enabling the country to fully harness the transformative potential of AI.

2.1.1 Government

NAISR 2.0 underscores the need for a coordinated multi-agency approach to achieving a dynamic AI-driven economy. Key government bodies are tasked with providing the necessary infrastructure, funding, and regulatory support, forming the backbone of this strategy. This integrated effort addresses all facets of AI implementation, from innovation and technological development to ethical considerations and workforce readiness. Through collaboration, government agencies can ensure that initiatives are well-coordinated, resources are efficiently allocated, and efforts are aligned with the overarching goals of enhancing competitiveness, fostering innovation, and promoting inclusive growth.

2.1.2 Industry

Businesses and enterprises are the primary drivers of AI adoption and innovation. They are responsible for integrating AI into their operations, developing new AI-driven products and services, and fostering a culture of innovation. Industry players must collaborate with government agencies to ensure that AI technologies are deployed effectively and ethically. They also play a crucial role in providing real-world data, funding research initiatives, and creating job opportunities in the AI sector. Furthermore, businesses are expected to provide enabling environments for their employees within their own organizations, craft learning and development strategies to upskill and reskill the workforce, and facilitate, promote, and invest in R&D projects.

2.1.3 Academe

A robust AI ecosystem stems from a strong core of human capital, as AI is driven by human intellectual power. The academe plays a pivotal role in this by conducting foundational research, training skilled professionals, and partnering with industry to translate innovations into practical applications. These efforts ensure that AI advancements are aligned with market needs and societal goals, fostering a dynamic and effective AI landscape.

2.1.4 Civil Society

Engaging civil society is essential to ensuring that AI development and deployment align with societal values and public interests. **Civil society organizations (CSOs)** play a crucial role by providing insights into the ethical, social, and cultural implications of AI technologies. They advocate for transparency, accountability, and inclusivity in AI initiatives, ensuring that AI's benefits are widely shared while potential risks are mitigated.

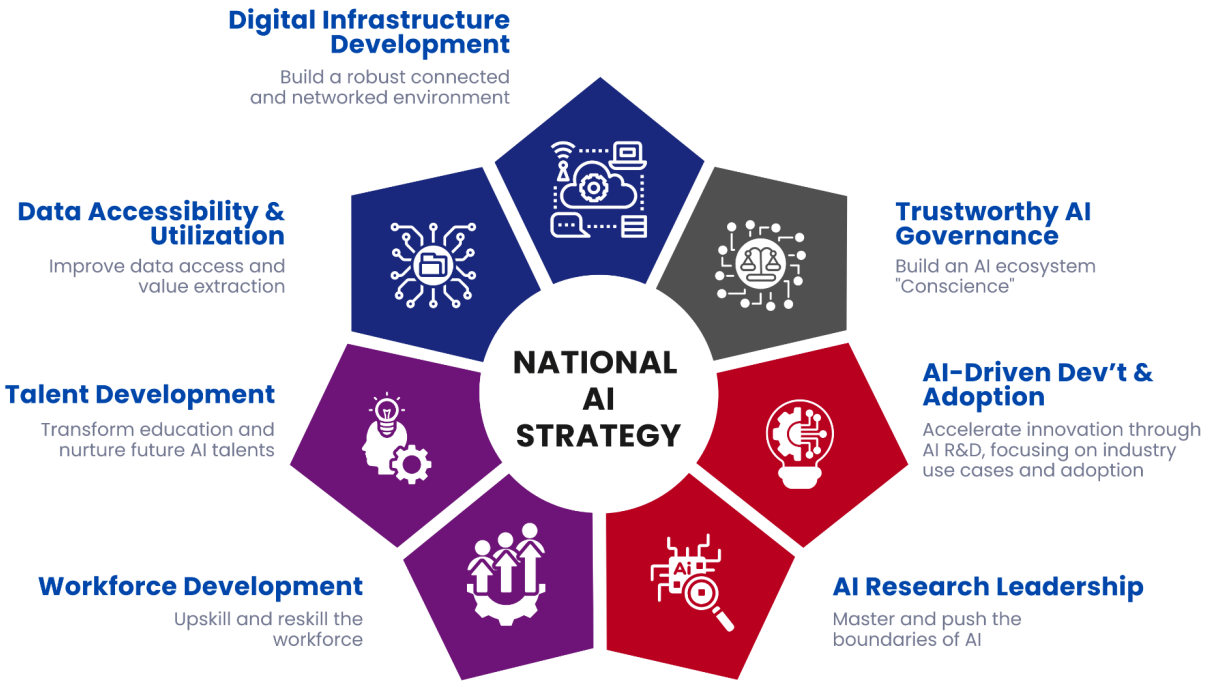
Moreover, Filipinos are encouraged to upskill through government programs and actively hold other sectors accountable, ensuring ethical standards are upheld and AI technologies are used to improve their communities.

Together, these sectors form a comprehensive AI ecosystem, ensuring that AI technologies drive economic growth, foster social progress, and support sustainable development under the National AI Strategy.

2.2 COMPONENTS OF THE NAISR 2.0

To achieve the Philippines' AI vision and strategic goals, NAISR 2.0 is structured around two main pillars and four strategic dimensions.

It outlines **seven strategic imperatives** and **thirty strategic tasks**, guiding stakeholders across government, industry, and academia. By emphasizing innovation, fostering a robust AI ecosystem, upholding ethical standards, and preparing the workforce, it aims to harness AI's full potential to spur economic growth, boost industry productivity, enhance public services, and improve the quality of life for all citizens.



Given the rapid evolution of AI, NAISR 2.0 will undergo continuous review and adaptation to keep pace with emerging developments, ensuring a competitive AI economy and a sustainable, inclusive future for all Filipinos.

2.2.1 Two Pillars and Four Strategic Dimensions

The roadmap's strategic framework draws inspiration from the **Global AI Index (GAII)**, focusing on two fundamental pillars: **Innovation** and **Implementation**. Innovation encompasses the development of new technologies, methodologies, and research that expand AI capabilities, while Implementation addresses the practical application and integration of AI across sectors. Though the GAII includes Investment as a third pillar, this roadmap incorporates investment considerations within the Innovation pillar through R&D and commercialization initiatives.

These pillars are operationalized through four strategic dimensions.

Under the **Innovation** pillar (1):

The **Research and Development (R&D)** dimension forms the cornerstone of innovation through collaborative efforts across academia, industry, and government. Universities play a crucial role in conducting fundamental research and developing AI talent, while innovation groups within the private sector focus on applied research and commercial applications. Government research institutions contribute to public sector innovation and national priority areas. A key initiative under this dimension is the establishment of the Center for AI Research (CAIR), which will serve as a hub to foster synergistic partnerships among these stakeholders. Together, these R&D efforts aim to elevate the Philippines as a global leader in AI research and innovation, driving socio-economic growth, enhancing industry competitiveness, and improving the quality of life for all Filipinos.

Under the **Implementation** pillar (3):

1. The **Digitization and Infrastructure** dimension aims to build a robust digital foundation necessary for AI development and deployment. This encompasses initiatives to enhance internet access and quality, promote data accessibility and meet computational needs. These efforts are critical for supporting AI-driven programs and ensuring that the digital infrastructure meets the demands of an AI-powered economy.

2. **Workforce Development** prepares current and future workforce with the skills needed to thrive in an AI-driven economy. This includes implementing reskilling and upskilling programs and developing AI and Data Science training modules.

3. The **AI Governance and Ethics** dimension seeks to create a supportive regulatory environment while ensuring the responsible and ethical deployment of AI. AI offers immense opportunities for development, but it is crucial to balance these benefits with potential challenges. This balance can be achieved by adhering to principles of responsible AI, which include transparency, accountability, and fairness.

2.2.2 Seven Imperatives

Building on the four strategic dimensions, the strategy roadmap further breaks these dimensions down into seven strategic imperatives. This detailed breakdown is critical to ensure that each objective is truly manageable and actionable.

1. **Build a robust connected and networked environment.**

   It is imperative that all localities should have fixed, reliable, and fast Internet connectivity.

2. **Improve data access and data value extraction.**

   Data accessibility be improved, and cross-sector data utilization be supported as it powers AI. In addition to opening up public datasets, the government also needs to explore how private datasets can be tapped and, at the very least, insights be democratized.

3. **Transform education and nurture future AI talents**

   The Philippines needs to invest in AI-enabling resources and develop a deep appreciation for **Science, Technology, Engineering, and Mathematics (STEM)** and DSA. In particular, there is a need to include the DSA foundations (mathematics, statistics, and computing) in secondary education and general courses of data analytics, business analytics, and introductory AI in **Higher Education Institutions (HEIs)**. The country must increase the number of research-oriented graduate students in business analytics, data science, and AI trained in quality AI and DS degree programs. It is also imperative to train competent and confident AI modules teachers with the help of local and international organizations. Finally, local academic institutions must be incentivized to have practitioners engage with graduate students to maximize impact of AI research to other fields.

4. **Upskill and reskill the workforce**

   There is a need to incentivize industries to offer Learning & Development (L&D) programs related to data extraction, data cleaning, data analysis, and machine learning, among others, that are aligned with the Philippine Skills Framework.

5. **Master and push the boundaries of AI**

   To be recognized as one of the AI hubs in ASEAN, the Philippines must fortify its understanding of AI technology and contribute to the global body of AI knowledge. Furthermore, there is a need to improve the immediate recruitment of international talent and enhancement of international collaboration to increase international visibility. Pushing the boundaries of knowledge in AI translates quantitatively to publications in peer-reviewed indexed journals and presentations in international conferences related to AI and computing.

6. **Accelerate innovation with AI**

   There is a need to invest in AI R&D on strategic areas where the Philippines can perform well and compete globally. These strategic areas should attract big MNCs maximizing local AI talent. Furthermore, startups must be incentivized, in line with the Innovative Startup Act, to accelerate economic growth through creating more jobs, wealth, new markets, and effect innovations.

7. **Build an AI Ecosystem "Conscience"**

   To foster ethical and responsible AI deployment, the Philippines must develop a robust and adaptive AI governance framework. This multifaceted effort involves collaboration across government agencies, including the National Privacy Commission, Intellectual Property Office, Philippine Competition Commission, and relevant departments, as well as academia and civil society. The framework necessitates a comprehensive review and update of existing laws, development of AI-specific legislation, and creation of sector-specific guidelines. Organizations are encouraged to integrate AI considerations into their compliance and complaints processes, while a certification system for AI auditors and products will be established. The initiative also focuses on boosting public engagement and AI literacy through education and awareness campaigns. International cooperation will be prioritized to align with global best practices. By implementing incentives for responsible AI development, supporting ethical AI research, and maintaining a flexible approach to governance, the Philippines aims to position itself as a leader in responsible AI innovation, balancing technological advancement with ethical considerations and societal well-being.

2.2.3 Thirty Strategic Actions

NAISR 2.0 comprises thirty tasks distributed across various government agencies, with each task assigned to specific agencies based on their mandates. While lead agencies are identified for each task, this framework encourages cross-agency collaboration, recognizing that successful implementation often requires shared responsibilities and coordinated efforts. This clear delineation of primary responsibilities, combined with collaborative flexibility, ensures focused execution and effective monitoring of progress.

No.	Strategic Task	Leads
	Build a robust connected and networked environment.	
1	Ensure equitable access to reliable, quality, and fast internet connectivity	DICT
	Improve data access and data value extraction.	
2	Make public data open, available, and digestible for analysis	PSA, All Agencies
3	Establish a robust, reliable, and secure network of data centers and expand access to the cloud for government, educational, and research institutions	DICT
4	Encourage and promote data analysis (at least descriptive analytics) across all functions of industries and government agencies.	DTI, DOST, DICT, and All Agencies
5	Extensive training of analysts and data scientists to extract and communicate actionable insights	CHED, DTI, DOST, TESDA
	Transform education and nurture future AI talents.	
6	Promote data literacy for all	DepEd, CHED, DOST
7	Ensure proper training of teachers in Data Science and Analytics (DSA)	DepEd, CHED
8	Include data science and analytics, including data visualization and storytelling, as general education subjects and courses in schools and universities.	DepEd, CHED

9	Develop AI-centered undergraduate and graduate programs aligned with the PSF	CHED
10	Increase business analytics, data science, and AI graduates	DepEd, CHED
11	Promote lifelong learning and design learning pathways for various individuals, including out-of-school, who want to learn the latest trends and technologies in AI, aligned with the PQF and PSF	DepEd, CHED, TESDA
12	Work with technology companies to provide sufficient computing resources and equipment to students and teachers.	DepEd, CHED, TESDA
	Upskill and reskill the workforce	
13	Incentivize industries to offer data literacy and L&D programs, and send employees for graduate studies that focus on R&D to develop a scientific culture within organizations.	DTI, DOLE, DICT
14	Develop sector-specific curricula or stackable training programs with varying degrees of specialization which include BI and other AI tools, aligned with the PQF and PSF	DepEd, CHED, TESDA
15	Track and analyze the quality and quantity of job displaced, created, and transformed as a result of AI adoption	DOLE, DTI
	Master and push the boundaries of AI.	
16	Develop competency in AI research as measured by publications, patents, and technology disclosures.	DOST
17	Invite and recruit international experts who can bring in new capabilities, serve as AI mentors, and promote international	DTI, DOST, DICT,

	collaborations.	CHED
	Accelerate Innovation with AI.	
18	Identify and prioritize sector-specific R&D projects that can be commercialized and maximize the impact of AI research aligned with the country's priority industries.	DTI, DOST
19	Ensure appropriate funding for AI innovations	NEDA, DOF, DBM, DTI, DOST, DICT
20	Strengthen industry-academe partnerships in AI R&D	DTI, DOST, CHED
21	Incentivize HEIs to promote R&D internships in industries	DTI, DOST, DOLE, CHED
22	Incubate, accelerate, and internationalize AI startups	DTI, DOST, DICT
23	Improve government regulation in the areas of visa issuances, tax breaks, and stock issuances to foreign technologists and startups.	DTI, DOST, DICT
24	Encourage and incentivize investors and venture capitalists to support promising AI startups.	DTI, DOST, DICT
25	Host AI hackathons and events to foster collaboration with global AI experts and startups.	DTI, DOST, DICT
26	Build the Center for AI Research (CAIR).	DTI

	Build an AI Ecosystem "Conscience"	
27	Ensure a level playing field for industries, including MSMEs, to freely compete in an AI-driven and data-driven environment to support their growth. This involves implementing policies that support fair competition and the growth of businesses at all scales.	DTI, PCC, IPOPHL, NPC
28	Review and transform business regulations for ease of business, especially in launching new AI platforms, products, and services. Simplify administrative procedures and set clear guidelines to encourage innovation while ensuring compliance with ethical standards.	DTI, DICT, ARTA, NPC
29	Strengthen and establish clear policies and guidelines on intellectual property governance for AI-generated innovations and IP protection mechanisms for AI-driven research	IPOPHL, DTI, DOST
30	Form a committee of AI and data ethics experts to oversee AI usage, ensure compliance with the governance framework, and act as guardians of responsible AI deployment by providing oversight, guidance, and regulatory updates in response to technological advancements.	NPC, DICT, DTI, DOST, DICT

3 IMMEDIATE PRIORITIES

3.1 Increasing AI R&D Spending

Investments in AI R&D are crucial for fostering innovation, industry sophistication, and driving economic transformation. The Philippines must prioritize adequate and sustained financing for AI R&D and innovation to meet UNESCO's recommended target of spending 1% of GDP on research and development. Currently, the Philippine Gross Expenditure on R&D (GERD) stands at approximately 0.3% of GDP, significantly below both global averages and UNESCO's benchmark.

Enhancing R&D funding to meet this target will strengthen the country's industrial capabilities, boost productivity, and develop high-value activities in priority industries, particularly in high-tech sectors such as advanced manufacturing, biotechnology, and information technology. Strategic investments in innovation will not only position the Philippines as a hub for groundbreaking discoveries but also stimulate job creation, attract foreign investments, and catalyze long-term economic growth.

3.2 Operationalizing the Center for AI Research

Established and operationalized by the DTI in 2024, the Center for AI Research (CAIR) is a game-changer that will position the Philippines as a leader in AI research and innovation. It will aggregate the country’s AI expertise, talent, and resources to develop a central hub that will be critical in establishing a solid global branding and credibility for Philippine AI R&D.

At the core of CAIR's mission is the drive to elevate the Philippines into a premier destination for AI-driven innovation and investments. Advancing the frontiers of AI research emphasizes both theoretical developments and practical applications. This includes traditional machine learning, natural language processing, computer vision, and the rapidly evolving field of GenAI, which will enhance capabilities, opening new avenues for creativity and efficiency. By building a strong research environment, CAIR will drive innovation and AI adoption in key areas, such as AI tools for optimizing industrial processes, enhancing decision-making, improving customer experiences, and automating routine tasks. Its goals are as follows:

1. Actively engage in applied research and development collaborations with various industries to create tailored AI solutions that address specific industry challenges and opportunities, ensuring practical applicability and market relevance;

2. Encourage the production of high-quality scholarly research that pushes the boundaries of algorithmic innovations, contributing to the global AI knowledge base and establishing the Philippines as a leader in AI research;
3. Cultivate local AI talent and implement initiatives to attract skilled AI professionals from abroad;
4. Develop advanced research facilities and laboratories dedicated to AI and machine learning within existing institutions; and
5. Facilitate partnerships between researchers and industry practitioners to develop and commercialize AI tools that optimize industrial processes and enhance decision-making.

3.3 Producing More AI Talents

Upskilling and reskilling the current workforce, alongside increasing the number of graduates in AI and data science, is also a compelling priority for the Philippines. The country can only seize the economic opportunities arising from AI only if the current workforce is empowered with AI skills and AI professionals are nurtured. Without an adequate and skilled talent pool in AI and data science, the country risks falling behind in harnessing the full potential of technological advancements, missing out on opportunities for innovation-driven growth, and facing challenges in staying competitive on the global stage.

In 2024, the DICT officially launched the Philippine Skills Framework for Analytics & AI (PSF-AAI), developed by the AAP. The PSF-AAI outlines the career path for aspiring Data Analytics & AI professionals in the country. Their collaboration on the PSF is proof of a successful public-private partnership for the analytics and AI industry.

3.4 Establishing the National AI Governance Framework

To institutionalize responsible AI adoption, a National AI Governance Framework is important as it establishes the agreeable scope and limitations of what developers and stakeholders can do and AI's intended function, keeping in mind the economic, political, and socio-cultural impact to society.

In 2022, the DTI has gathered almost a hundred stakeholders, from government, industry, academe, and CSOs, to collect ideas and recommendations in the formulation of the national framework. The rich insights and discussions were reflected in a White Paper which was published and now serves as a concrete foundation for the framework's formulation.

Some of the AI principles identified in this work are the following:

- AI should promote inclusive growth, sustainable development, and well-being;
- An AI system has to be human-centric and fair, and fairness is essential to treating people with dignity and respect;
- An AI system has to be robust, performing reliably and safely;
- There should be proper functioning of AI systems which depends on AI actors assuming responsibility and accountability in their roles, environments, or contexts;
- Transparency of policies, rules, and regulations governing AI systems is indispensable; and
- AI should be trustworthy. With trust, people are willing to experience whether AI systems can be operated safely, reliably, and consistently even under difficult (if not unexpected) conditions.

Towards this end, the DTI has already been convening an AI Working Group, composed of government agencies, academe, technology providers, and other organizations, which is in-charge of identifying ways by which the framework can harmonize the various policies and programs and determine gaps in the country's policies to develop the country's AI ecosystem. Institutional mechanisms have to be in place to advance and expand the work in formulating the national AI governance framework.

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