

Advancing National Development through AI: Policy Recommendations for Enhancing AI Research and Applications in the Philippines

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Abstract

The Philippines, a developing nation, has been leveraging artificial intelligence (AI) to enhance national development and innovation. Through strategic capacity-building efforts led by the Department of Science and Technology (DOST), projects like ALAM and iTANONG are pioneering in AI research and application, optimizing workflows for machine learning and enhancing AI capabilities. These initiatives aim to leverage economies of scale by pooling existing resources, refining data utilization and computing infrastructure, and fostering collaboration across sectors, democratizing AI to advance the nation toward achieving sustainable development goals through targeted AI solutions.

Founded in 1987, DOST-ASTI operates under DOST, undertaking R&D activities to modernize science and technology infrastructure, primarily focusing on information and communication technology (ICT) and electronics. Over the years, DOST-ASTI has emerged as a technology enabler at the forefront of local R&D initiatives in cutting-edge technologies.

By leveraging economies of scale and pooling our S&T infrastructure and resources, DOST-ASTI aims to drive research and innovation, explore and implement practical solutions that address our country's critical challenges, such as Climate Change Adaptation, Disaster Risk Reduction & Management, optimizing agricultural production, and building intelligent systems for resilient and smart communities, among others.

DOST-ASTI's steadfast commitment to leveraging cutting-edge technologies for societal impact and national development underscores its pivotal role as a catalyst for innovation in the Philippines. With a robust science and technology (S&T) infrastructure at its disposal, our S&T infrastructure – such as the Computing and Archiving Research Environment (COARE), Philippine Research, Education and Government Information Network (PREGINET), Philippine Earth Data Resource and Observation (PEDRO) Center, and hydrometeorological and early warning stations network PhilSensors – serves as a cornerstone for high-impact research initiatives conducted by government agencies, academic institutions, and research organizations across the nation in fields of space technology, advanced wireless networks, artificial intelligence, smart cities, robotics, and other emerging technologies such as blockchain technology and quantum computing.

In pursuing sustainable development and eradicating poverty, Science, Technology, and Innovation (STI) play pivotal roles in crafting practical solutions to our most critical challenges. DOST-ASTI is at the forefront of

driving R&D initiatives to harness the transformative potential of artificial intelligence (AI) for the Philippines. This Policy Brief outlines DOST's concerted efforts to leverage S&T Innovation, particularly AI, to reinforce the 2030 Agenda and eradicate poverty amidst multiple crises.

Outline of Empirical Facts and Issues

The Advanced Science and Technology Institute (DOST-ASTI) actively engages in various AI-related projects and collaborations to boost AI technology utilization across different sectors. Their initiatives include developing AI-based agriculture, healthcare, urban planning, and disaster management solutions. Here is the list of challenges in ASTI's AI solutions.

1. **Funding and Resource Allocation.** Securing sufficient funding and resources for AI research, development, and deployment, especially for long-term projects.
2. **Technical Challenges.** Overcoming technical challenges such as data bias, model interpretability, and algorithmic transparency.
3. **Enhancing Local AI Talent.** Partnering with academic institutions and the industry to upskill students and professionals in AI.
4. **Data Privacy and Security.** Ensuring the integrity, confidentiality, and availability of data used in AI applications, particularly when handling sensitive personal information.
5. **Spread of Misinformation and Disinformation.** This stifles innovation by eroding public trust, distorting decision-making, reducing collaboration, harming reputations, diverting resources, and affecting public support for new technologies and initiatives.
6. **Public Awareness and Acceptance.** Increasing the general public's awareness and understanding of AI technologies to foster acceptance and mitigate fears related to job displacement and ethical concerns.

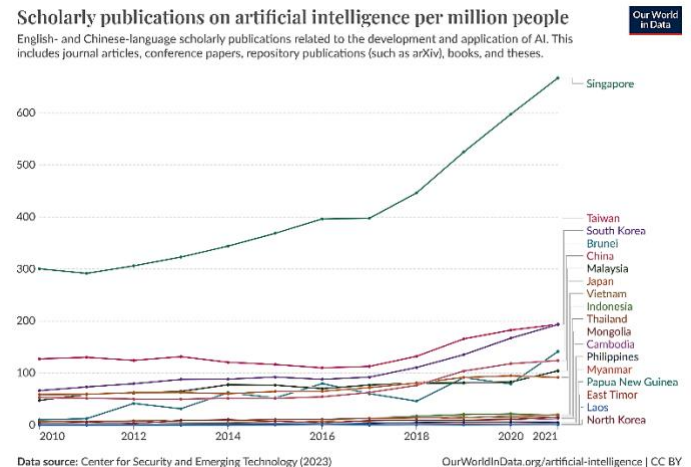
7. **International Competitiveness.** Keeping pace with global AI developments and maintaining the Philippines' competitive edge in the rapidly evolving AI landscape.
8. **Scalability and Maintenance.** Ensuring AI systems are scalable and maintainable as they grow in complexity and are deployed across various sectors.
9. **Intellectual Property and Legal Issues.** Addressing legal challenges related to intellectual property rights, liability, and compliance with international and local AI regulations.
10. **Ethical and Societal Impact.** Managing AI's broader ethical and societal implications, including its impact on employment, equity, and social norms.
11. **Interoperability and Standardization.** Developing and implementing standards for AI systems to work seamlessly across different platforms and sectors.
12. **Integration with Existing Systems.** Seamlessly integrating AI technologies with existing infrastructure and legacy systems in various sectors.

The urgency lies in leveraging AI and emerging technologies to address national challenges effectively, promoting innovation, and maintaining competitiveness in the global landscape. These efforts are part of the broader AI and ICT Roadmap DOST (Philippine Council for Industry, Energy and Emerging Technology Research and Development, 2021) and involve significant collaborations with local universities and international partners.

The AI Research Gap

The Center for Security and Emerging Technologies (2023) highlights a global surge in AI publications, indicative of heightened interest and investment in AI research worldwide, as shown in Figure 1. However, this surge also reveals a widening research gap, emphasizing the need for strategic investments and collaborative efforts to bridge disparities in AI development and ensure equitable access to technological advancements. As AI continues to shape various sectors and industries, addressing this research gap becomes imperative to harnessing the full potential of AI for societal benefit and sustainable development.

Figure 1. Scholarly publications on artificial intelligence per million people



Data source: Center for Security and Emerging Technology (2023)

The high costs associated with AI R&D pose a significant challenge, necessitating strategic investments to effectively bridge this gap and harness AI's potential. However, amidst these challenges lie immense opportunities for collaboration and innovation, with the Philippines positioned favorably for technological growth and strategic AI adoption.

Strategic Approach to Boosting R&D in Artificial Intelligence

DOST-ASTI adopts a multifaceted strategy to leverage AI for national development, aimed at maximizing the impact of this cutting-edge technology across various sectors:

1. **R&D Initiatives in AI and Emerging Technologies.** DOST-ASTI actively engages in AI R&D across various domains such as agriculture, disaster risk reduction and management, and building sustainable and smart communities. DOST-ASTI aims to foster innovation and develop AI solutions tailored to address pressing societal challenges faced by the Philippines.
2. **Strategic Partnerships.** Collaboration with government agencies, academic institutions, and industry stakeholders is integral to DOST-ASTI's approach. DOST-ASTI facilitates knowledge exchange, capacity building, and collaborative research efforts. Moreover, international collaboration enables DOST-ASTI to stay abreast of best practices and standards, enhancing the quality and relevance of local R&D endeavors.
3. **Democratizing Access.** Recognizing the importance of inclusivity in AI development, DOST-ASTI

endeavors to democratize access to AI technologies. By leveraging economies of scale and adopting a model reusability framework, DOST-ASTI strives to make cutting-edge AI technology accessible to researchers, policymakers, and entrepreneurs. This open approach promotes innovation and accelerates the adoption of AI solutions across different sectors.

4. **Modernizing S&T Infrastructure.** DOST-ASTI recognizes the critical role of modernized science and technology infrastructure in driving AI adoption and fostering innovation. By focusing resources on R&D programs that deliver significant impact, DOST-ASTI ensures that its S&T infrastructure remains at the forefront of technological advancement. This commitment to modernization enables

DOST-ASTI to effectively support high-impact research initiatives and propel AI development in the Philippines, thereby contributing to the nation's socio-economic growth and resilience.

DOST-ASTI's R&D Initiatives in Artificial Intelligence

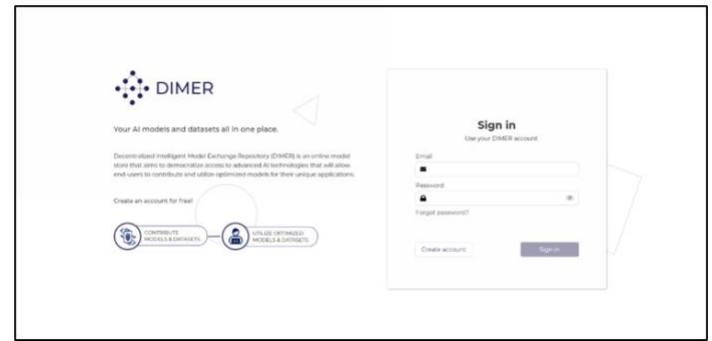
Two major AI projects (ASTI-ALaM and iTANONG) in DOST-ASTI will be discussed, and how they will impact national AI applications will be addressed.

ASTI-Automated Labeling Machine (ASTI-ALaM)

This initiative aims to develop AI models accessible through an online repository, empowering users to leverage AI technology for various applications. ASTI-ALaM democratizes access to advanced AI models by optimizing workflows and enhancing AI capabilities, fostering innovation across sectors (ASTI, n.d.-a).

Dedicated AI Engineers and Researchers focus on developing impactful AI-based solutions that utilize remote sensing and computer vision. The developed machine learning and artificial neural network-based models will be made accessible through an online model store as shown in Fig. 2, Decentralized Intelligent Model Exchange Repository (DIMER), empowering end-users to reuse the AI models and leverage cutting-edge AI technology in their specific areas of interest.

Figure 2. DIMER model store interface



The ASTI-ALaM Project aims to:

- **DEVELOP** an optimized workflow for creating machine learning and artificial neural network-based models with broad application domains.
- **OPTIMIZE** the use of the country's archived remote sensing data and existing compute infrastructure to train precise deep learning models.
- **ENHANCE** the capabilities of AI scientists, engineers, and researchers in developing AI solutions.
- **COLLABORATE** with government agencies, local government units, private organizations, and other stakeholders, providing them with AI-based solutions.

iTANONG, A Natural Language Interface to Databases for Filipinos

Figure 3. iTANONG search engine



Revolutionizing access to information, the iTANONG Project aims to transform how Filipinos access and interact with information, especially for those who find technical language challenging (ASTI, n.d.-b). The project developed a natural language interface to databases, as shown in Figure 3, that allows end users to access and generate insights from stored information using simple Filipino, English, or Taglish queries.

The iTANONG Project specifically aims to:

- Build a natural language querying engine (NLQE) that can interface with any database or flat-file

tables to elicit information and insights for business value and actionable decisions.

- Carry out and enable state-of-the-art research in machine learning, deep learning, data science, natural language processing, and artificial intelligence and consequently institute research laboratories in these areas.
- Conduct capacity building for researchers and technology adopters in deep learning, software engineering, and natural language processing.
- Push the widespread adoption of the technology generated from this research, starting from DOST-ASTI and consequently in the whole DOST and other government agencies.
- Commercialize the products and technologies that will be generated from the research.

State-of-the-art Natural Language Processing (NLP) technology facilitates seamless information retrieval, empowering stakeholders across government, business, academia, and industries.

Policy recommendations

With the above compelling needs, the following policies are recommended.

- **Investment to upgrade DOST-ASTI facilities.** As the national R&D institution for ICT and electronics, DOST-ASTI is still leasing an office space with a 35-year-old building infrastructure.
- **Investment in AI Infrastructure and Human Resources.** Robust infrastructure and capacity-building investments are imperative to bolster AI readiness and adoption.
- **Strengthening Regulatory Frameworks.** Creating an enabling environment for AI innovation requires formulating adaptive regulatory frameworks and fostering responsible AI development.
- **Promoting Collaboration and Knowledge Sharing.** Encouraging partnerships between government, academia, and industry stakeholders fosters a collaborative ecosystem conducive to innovation and sustainable development.
- **Prioritizing Ethical Considerations.** Ethical guidelines must underpin AI initiatives, ensuring fairness, transparency, and accountability in AI development and deployment.
- **Enhancing Public Awareness and Education.** Developing comprehensive educational programs and public awareness campaigns about AI's benefits and risks can help demystify the technology for the general populace and foster an informed society.

- **Fostering R&D and Innovation Ecosystems.** Governments should support AI research and development (R&D) by providing funding, resources, and incentives for innovation, particularly in sectors critical to sustainable development.
- **Building International Cooperation.** Engaging in international partnerships and collaborations can provide opportunities for knowledge exchange, technical assistance, and best practices in AI development and ethical standards.
- **Ensuring Data Privacy and Security.** Implementing stringent data protection measures and privacy laws will secure personal and sensitive information and build public trust in AI systems.
- **Developing AI Talent Pipelines.** Establishing programs to train and nurture AI professionals, including scholarships, internships, and apprenticeships, can help address the skills gap in the AI workforce.
- **Encouraging AI for Social Good.** Initiatives that leverage AI for addressing social challenges, such as healthcare, education, and disaster response, should be prioritized to ensure that technology contributes positively to society.
- **Integrating AI with Sustainable Development Goals.** Align AI strategies and projects with the United Nations Sustainable Development Goals to ensure that AI advancements contribute to global efforts for sustainable and equitable growth.
- **Monitoring and Evaluation Frameworks.** Implementing robust monitoring and evaluation frameworks to continuously assess the impact of AI policies and projects, ensuring they meet intended objectives and can be adjusted as needed.

Policy conclusions

Among 18 East Asian countries, the Philippines secured the 10th spot in Government AI Readiness, according to the Oxford Insights and International Development Research Centre (2023). This signifies that the Philippines is primed for technological growth and strategic AI adoption in the public sector.

Government investment in the country's AI infrastructure and human resources and strengthening regulatory frameworks to create an environment conducive to AI innovation and adoption could propel our nation forward in embracing the transformative power of AI. As the Philippines strives to enhance our government's AI readiness, DOST-ASTI envisions a future where AI will be integral to our public sector,

promoting inclusivity and enhanced citizen participation.

As the country navigates through the complexities of the 2030 Agenda and confronts unprecedented crises, the effective utilization of AI and other cutting-edge technologies emerges as a linchpin for achieving sustainable development and eradicating poverty. DOST's unwavering commitment to innovation and collaboration exemplifies the transformative potential of S&T Innovation in driving positive change and propelling the Philippines toward a future where AI catalyzes inclusive growth and prosperity.

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