RESPONSIBLE, SAFE AND INCLUSIVE AI FOR SUSTAINABLE DEVELOPMENT IN HEALTH IN SOUTHEAST ASIA.

FINAL REPORT

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This document and its contents have been prepared and are intended solely as information for Foreign, Commonwealth, and Development Office, Government of UK.

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List of abbreviations

AI – Artificial Intelligence

ASEAN – Association of Southeast Asian Nations

EHR – Electronic Health Records

FCDO – Foreign, Commonwealth & Development Office

HTA – Health Technology Assessment

ICT – Information and Communications Technology

LLM – Large Language Model

MoH – Ministry of Health

OECD – Organisation for Economic Co-operation and Development

R&D – Research & Development

SaMD – Software as a Medical Device

SDGs – Sustainable Development Goals

UK – United Kingdom

NICE – National Institute for Health and Care Excellence

MHRA – Medicines and Healthcare Products Regulatory Agency

CDEI – Centre for Data Ethics and Innovation

HDR UK – Health Data Research UK

AeHIN – Asia eHealth Information Network

EHDS – European Health Data Space Regulation

GDHP – Global Digital Health Partnership

FHIR – Fast Healthcare Interoperability Resources

DQMI – Data Quality Maturity Index

WHO – World Health Organization

EXECUTIVE SUMMARY

Artificial Intelligence (AI) can transform healthcare and improve patient outcomes. The Foreign, Commonwealth, and Development Office (FCDO), Government of the United Kingdom (UK), seeks to support responsible, safe and inclusive AI for health development in the Association of Southeast Asian Nations (ASEAN) following ASEAN's recognition of AI's potential and in line with the UK's AI for Development (AI4D) programme.

This study, commissioned by FCDO, aims to guide responsible, safe and inclusive AI development in ASEAN through:

1. Scope existing AI-related applications, policies, and partnerships in Indonesia, Philippines, Malaysia, Cambodia, Vietnam, Thailand, Lao PDR, Timor-Leste, and Myanmar.
2. Identify low-hanging policy options and enabling actions in the nine member states.
3. Outline actionable research questions to promote responsible, safe, and inclusive AI in the ASEAN region.
4. Identify collaboration opportunities to progress an enabling environment for AI.

This report presents country assessments and a gap analysis for AI in the nine member states. The study's methodology involved a desk review to map the AI policy, initiatives and collaboration networks' landscape in ASEAN, following the Broadband Commission for Sustainable Development's Roadmap to AI Maturity in health. As its foundational pillars, the roadmap takes six areas for AI maturity in health—People and Workforce, Data and Technology, Governance and Regulatory, Design and Processes, Partnerships and Stakeholders, and Business Models. These six pillars of the framework were present across the product lifecycle of AI for health. Stakeholder interviews with regional experts were conducted to supplement the desk review.

There is a strong commitment to advancing AI in health across the region. However, systemic challenges such as the rural-urban divide, health workforce shortages, and digital disparities persist in all member states. The report identified six areas critical to AI maturity in health, each with unique challenges and opportunities. In **People and Workforce**, challenges include a shortage of AI-skilled healthcare professionals, digital literacy gaps, and talent retention issues. There are opportunities to integrate AI into education, upskill workers, and promote gender inclusivity in tech. Policy actions involve establishing training programs, incentivising retention, and improving digital literacy. **Data and Technology** face hurdles such as low internet penetration, non-interoperable systems, and biased AI models due to unrepresentative datasets. Policy recommendations focus on improving data infrastructure, promoting collaboration, and creating AI innovation hubs. **Governance and Regulatory** challenges include the absence of AI-specific health strategies, undefined regulatory pathways, and unclear reimbursement models, with opportunities to develop unified frameworks, streamline approval processes, and ensure ethical AI use. Policy actions include issuing interim guidelines, mandating clinical evaluations, and establishing post-market surveillance. **Design and Processes** are hindered by a lack of human-centred design and limited end-user involvement. Policy measures involve engaging end-users and setting evidence standards. **Partnerships and Stakeholders** grapple with fragmented governance, conflicting public-private priorities, and limited regional collaboration. Policy actions can focus on building strategic alliances, incentivising private-sector involvement, and enhancing regional cooperation. Finally, **Business Models** face challenges such as unclear reimbursement and financial constraints. Policy actions include providing tax rebates, establishing procurement frameworks for AI in health, and ensuring financial sustainability.

The document identifies key research themes and questions to strategically guide investment and spur innovation in AI for healthcare, addressing critical gaps and opportunities in the field. A central focus is scaling AI training programs to bridge the significant talent gap, exploring how

educational institutions, governments, and private sectors can collaborate to upskill professionals and integrate AI into national curricula. Another pressing question revolves around improving data interoperability and mitigating bias in AI models, emphasising the need for robust, representative datasets and advanced data-sharing frameworks to ensure fairness and accuracy in AI-driven healthcare solutions. Additionally, the document highlights the importance of integrating AI into clinical workflows and investigating best practices for designing human-centred AI tools that enhance efficiency without disrupting existing processes. Finally, the role of public-private partnerships is explored, examining how collaboration between governments, tech companies, and healthcare providers can accelerate AI adoption, foster innovation, and ensure inclusion and sustainable implementation. These research themes collectively aim to shed light on the most pressing challenges and unlock investment opportunities.

Case studies from Vietnam, Thailand, and Timor-Leste illustrate how AI-driven healthcare solutions address gaps in diagnostics, clinical decision support, and workflow efficiency. However, challenges remain in ensuring equitable adoption, regulatory harmonisation, and validation across diverse populations. Scaling these solutions requires investment in digital infrastructure and transparent AI governance frameworks to ensure safety, inclusivity, and trust. Ensuring responsible scaling requires robust regulatory frameworks, inclusive training datasets, and ethical AI deployment to mitigate bias and ensure fairness. Additionally, integrating these solutions with existing healthcare infrastructures while prioritising data security and patient trust will be crucial. The findings and recommendations presented in the document underscore AI's potential to transform healthcare in ASEAN. However, realising this potential requires addressing systemic challenges and implementing targeted policies.

INTRODUCTION

Artificial intelligence (AI) has transformative potential across various sectors that can drive efficiency, innovation, and growth. AI can play a crucial role in accelerating progress on Sustainable Development Goals (SDGs), particularly in healthcare, where it can help overcome system gaps ranging from accessibility to inequality [1]. AI can bridge disparities in healthcare access, treatment, and outcomes for women and other underserved populations by enabling innovative solutions, improved risk assessment, and better care planning [2-4].

The Association of Southeast Asian Nations (ASEAN) has recognised the significance of AI in tackling common challenges and opportunities in health, environment, agriculture, and education. On June 7th, 2024, the ASEAN Ministerial Meeting on Science, Technology, and Innovation (AMMSTI-20) in Siem Reap, Cambodia [5] discussed AI's potential to support equitable development, culminating in a statement acknowledging the "significant transformative potential of Artificial Intelligence (AI) as a key driver of technological advancement and innovation" [6]. ASEAN has also launched the ASEAN Guide on AI Governance and Ethics to guide the effective governance of AI in the region.

The United Kingdom (UK) is committed to supporting responsible innovation in AI – unleashing the full potential of new technologies while keeping people safe and secure. The UK's national AI strategy recognises AI's power to increase resilience, productivity, growth, and innovation while prioritising data protection and regulatory frameworks to address algorithmic biases and discrimination [7]. The UK's recent International Development White Paper highlighted that "both the opportunities and the risks created by AI are amplified in low and middle-income country contexts," while the Digital Development Strategy stresses that AI benefits are not automatically evenly distributed globally.

In November 2023, the UK hosted the first global AI Safety Summit (AISS), where the AI for Development (AI4D) programme supporting responsible AI was announced [8]. In June 2024, the G7 Leaders' Summit announced a £20m expansion of the AI4D programme into Asia, including support for the ASEAN region.

Within this context, the Foreign, Commonwealth, and Development Office (FCDO) has commissioned studies to map the status, trends, opportunities, and challenges of realising responsible, safe, and inclusive AI for sustainable development across South-East Asia, focusing on health [9].

This study aims to:

1. Scope existing AI-related applications, policies, and partnerships in Indonesia, Philippines, Malaysia, Cambodia, Vietnam, Thailand, Lao PDR, Timor-Leste, and Myanmar.
2. Identify low-hanging policy options and enabling actions in the nine member states.
3. Outline actionable research questions to promote responsible, safe, and inclusive AI in the ASEAN region.
4. Identify collaboration opportunities to progress an enabling environment for AI.

METHODOLOGY

This study used an analytical framework to define and assess 'responsible, ' 'safe, ' and 'inclusive' AI within the healthcare context in Southeast Asia. Our methodology primarily involves desk-based research and key informant interviews.

DEFINING RESPONSIBLE, SAFE, AND INCLUSIVE AI

We adapted definitions from the International Organization for Standardisation's "Building a responsible AI: How to manage the AI ethics debate" and IBM's "What is responsible AI?" [10-13] to establish mutually exclusive and comprehensive working definitions:

- Responsible AI: Systems designed, developed, and implemented with a strong ethical framework, promoting patient well-being, privacy, and autonomy while improving health outcomes. Responsible AI systems are cost-effective, improve care workflows, and ensure end-users are well-informed of the benefits and risks.
- Safe AI: Systems that mitigate risks regarding patient privacy (such as misuse of personal data), prevent adverse outcomes (such as wrong diagnoses or treatment recommendations), and avoid broader harm to society or the environment.
- Inclusive AI: Systems accessible to all, regardless of gender, disability, socioeconomic status, geography, religious or ethnic background, or education level. These systems should not exacerbate existing inequalities and must address biases based on various demographic factors while incorporating diverse and representative data inputs from the population served.

SCOPING APPROACH

We mapped AI applications, policies, and partnerships across nine ODA-eligible ASEAN member states (Indonesia, Philippines, Malaysia, Cambodia, Vietnam, Thailand, Lao PDR, Timor-Leste, and Myanmar) through:

1. Review of publicly available policy documents and strategies related to AI, digital health, and health technologies
2. Analysis of scientific and grey literature on AI implementations in healthcare
3. Examination of government-led initiatives and public-private partnerships
4. Consultation of global resources, including the OECD's National AI Policies and Strategies repository, Oxford's Government AI Readiness Index, and the Asia Society Policy Institute report on AI [14-16]
5. Key informant interviews with relevant stakeholders in the region to validate findings and fill information gaps

AI APPLICATIONS IN HEALTHCARE

This study considered AI applications for health based on the definition of the Organisation for Economic Co-operation and Development (OECD) and the consensus guideline for trustworthy and deployable artificial intelligence in healthcare [17, 18].

- Diagnostics and Predictive Analytics: Image analysis, condition diagnosis, progression monitoring, and personalised medicine applications
- Clinical Decision Support: Tools offering evidence-based recommendations and alerts
- Patient Monitoring and Management: Systems tracking health metrics and managing long-term conditions

- Therapeutics and Intervention: AI-assisted surgical systems, therapeutic chatbots, and virtual health assistants
- Operational and Administrative Support: Workflow optimisation, scheduling, billing, and fraud detection
- Research and Development: Drug discovery and public health interventions
- Community-based Interventions: Health education and promotion tools

ANALYTICAL FRAMEWORK

We utilised the Broadband Commission for Sustainable Development's Roadmap to AI Maturity as our guiding framework. We mapped out the six pillars of the framework across the product lifecycle of AI for health (Figure 1).

The framework consists of six key pillars (vertical axis):

1. Governance and regulatory: Legal and regulatory frameworks governing AI development and use
2. People and Workforce: Human capital and skills necessary for AI implementation
3. Data and Technology: Infrastructure and resources enabling AI development
4. Design and Processes: Methodologies and procedures for creating and validating AI systems
5. Partnership and Stakeholders: Collaboration ecosystems supporting AI development and implementation
6. Business models: Financial mechanisms and incentive structures

Each pillar is assessed across three lifecycle phases (horizontal axis):

1. Design And Development: Initial creation of AI solutions, including data collection and algorithm development
2. Evaluation: Assessment and validation of AI systems before widespread implementation
3. Implementation And Scaling: Deployment, adoption, and expansion of AI solutions in healthcare settings

We identify specific elements contributing to responsible, safe, and inclusive AI for each intersection of pillar and lifecycle phase (see Figure 1). This framework aligns with global ethical principles outlined in the Montreal Declaration for Responsible AI (Well-being, Autonomy, Justice, Privacy, Knowledge, Democracy, and Responsibility) [1, 19].

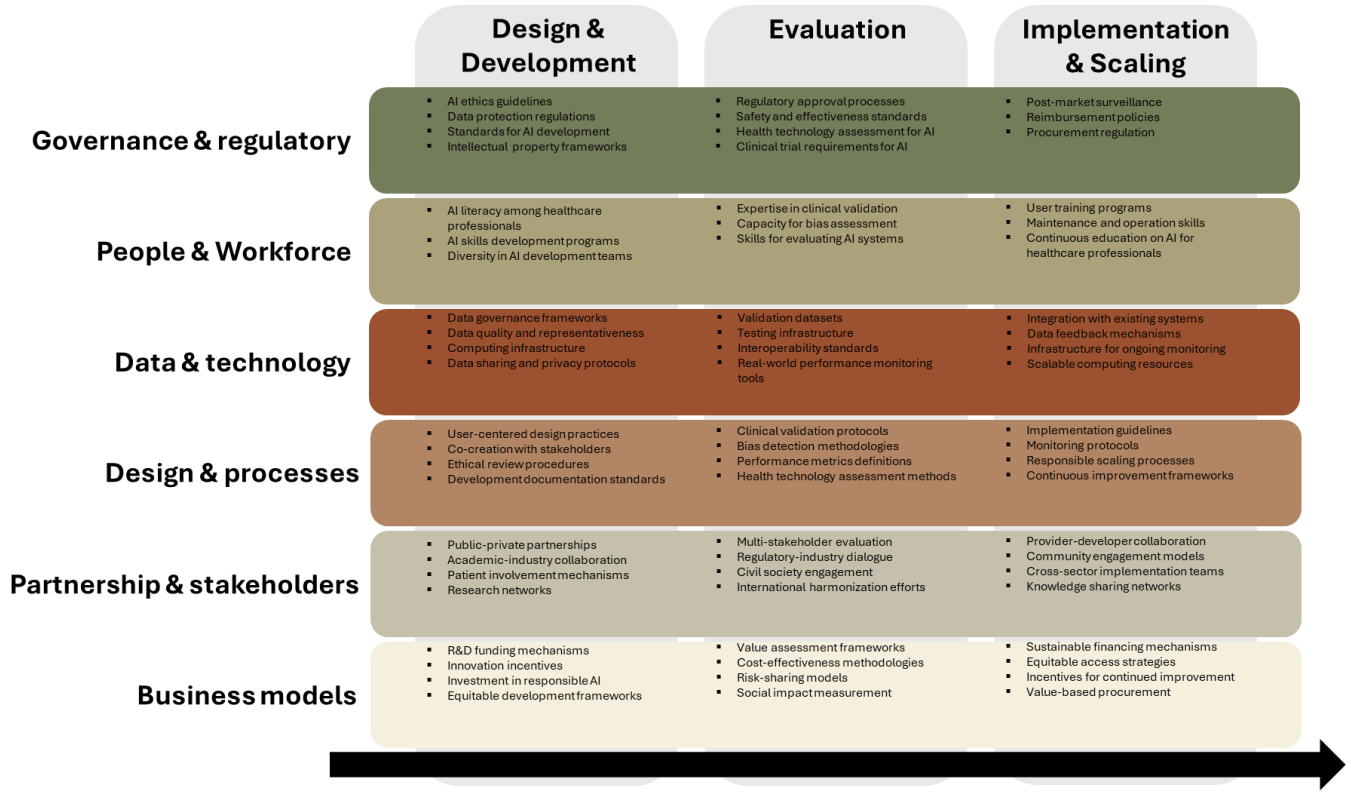

Figure 1 Framework for assessing responsible, safe and inclusive AI in health[12].

[1] **Health Technology Assessment (HTA)** is a systematic process used to evaluate the clinical, economic, and social impact of health technologies, such as medicines, medical devices, and AI-driven healthcare solutions. It helps policymakers and healthcare providers make informed decisions about which technologies should be adopted, ensuring they are effective, safe, and provide value for money. HTA is crucial for responsible and inclusive AI in health, as it assesses whether AI tools improve patient outcomes without reinforcing biases or widening health disparities. It also plays a key role in Universal Health Coverage (UHC) by guiding equitable access to essential healthcare services while ensuring sustainability in health financing. By prioritising cost-effectiveness and fairness, HTA ensures that AI-driven innovations are integrated into healthcare systems in a way that benefits all populations, including marginalised groups.

[2] **Reimbursement Frameworks** determine how healthcare providers are compensated for using AI, ensuring that the costs associated with implementing and maintaining AI systems are covered, while **Procurement Frameworks** guide the acquisition and purchasing of AI technologies, ensuring they meet safety, efficacy, and ethical standards. Both these frameworks are crucial in ensuring the financial sustainability of AI solutions (by covering the costs of implementation, maintenance, and upgrades) and quality assurance by selecting AI tools that meet high safety, effectiveness, and ethical standards.

AN OVERVIEW OF ARTIFICIAL INTELLIGENCE IN ASEAN

CAMBODIA

Cambodia is ranked 133rd out of 193 countries in the Government AI Readiness Index, reflecting significant gaps in governmental vision for implementing AI, data protection, cybersecurity governance, and overall maturity in technology industries [15]. A recent report from the Ministry of Industry, Science, Technology and Innovation reached similar conclusions [20].

GOVERNANCE AND REGULATORY

Cambodia lacks a national AI strategy or a dedicated AI strategy for health [20]. The Cambodia Digital Economy and Society Policy Framework 2021-2035 outlines a broad vision for digital adoption across sectors, including health, with intentions to expand AI use for data analysis and governance [21]. However, this framework does not provide specific ethical guidelines for AI development in healthcare or address data protection comprehensively.

The Ministry of Health (MoH) regulates software as medical devices through the Department of Drugs and Food, which is aligned with the ASEAN Medical Device Directive [22]. Prakas[3] no. 1258 classifies medical devices according to four risk levels but lacks specific provisions for AI [23]. Notably, the current regulatory framework does not require local validation of AI systems, raising concerns about their safety and effectiveness in the Cambodian context. Cambodia has no dedicated Health Technology Assessment (HTA) agency, limiting systematic evaluation of AI technologies [24].

The Ministry of Post and Telecommunications (MPTC) has proposed draft laws for cybersecurity and personal data protection, but these have not been implemented, leaving personal health data vulnerable [25]. The MoH makes centralised reimbursement decisions for medical equipment, including AI technologies, but procurement regulations lack specific provisions for AI systems. There are no established post-market surveillance mechanisms for AI medical devices, representing a significant gap in ensuring their continued safety and effectiveness. Cambodia's mixed health systems of public and private hospitals are commonly understaffed, which makes implementing future PDPA and cyber security laws challenging because healthcare facilities lack or have limited legal departments [26].

These regulatory gaps hinder responsible AI development and use, potentially compromising patient safety and privacy, particularly for vulnerable populations.

PEOPLE AND WORKFORCE

Multiple tertiary institutions, including the Royal University of Phnom Penh and Cambodia Academy of Digital Technology, offer computer science degrees, but no specialised programs exist for healthcare AI. Despite government subsidies, tertiary education remains inaccessible for

[3] Prakas is a Cambodian term which means official proclamation. It is a ministerial or inter-ministerial decision signed by the relevant Minister(s).

many Cambodians, especially those from rural areas, limiting the diversity of potential AI developers [27].

Cambodia faces a significant healthcare workforce shortage, with only 1.4 health workers per 1,000 people, well below the WHO standard of 4.45 for achieving health-related SDGs [28]. This shortage is more pronounced in rural areas. There has been no systematic assessment of digital health or AI literacy among healthcare workers, though the National Institutes of Public Health has identified this as a priority [29]. AI and digital health literacy are not currently part of Cambodian medical education.

There appears to be limited expertise in clinical validation and bias assessment for AI systems, with no specialised training programs for evaluating or implementing AI solutions in healthcare. The shortage of healthcare workers and potential limited digital literacy present significant barriers to responsible AI implementation, particularly regarding adequate supervision and appropriate use.

The lack of a diverse, AI-literate healthcare workforce may result in AI systems that don't adequately address the needs of Cambodia's diverse population, particularly rural and underserved communities, raising concerns about inclusive AI implementation.

DATA AND TECHNOLOGY

Cambodia has a centralised Health Management Information System (HMIS) captures diagnosis, demographic, and location data [30]. However, this system doesn't incorporate imaging data, and the available data may not be granular enough for developing advanced AI models. Many primary healthcare centres lack internet access or reliable electricity, and these centres submit paper reports that are later digitised [30].

The limited availability of comprehensive, representative datasets creates challenges for properly developing and evaluating AI systems in the Cambodian context. There is little evidence of established interoperability standards for health data systems, testing infrastructure, or validation datasets specifically curated for AI development and evaluation.

Infrastructure limitations, particularly in rural areas, complicate integration with existing systems. The digital divide between urban and rural healthcare facilities may exacerbate healthcare disparities if AI solutions are deployed predominantly in well-resourced urban settings, raising significant concerns about inclusive and equitable AI implementation.

DESIGN AND PROCESSES

There is no evidence of patient involvement in AI design processes or established ethical review procedures specific to AI development in healthcare. The absence of user-centred design practices may result in AI solutions that don't effectively address local healthcare needs or cultural contexts.

The country lacks established clinical validation protocols and bias detection methodologies specific to AI in healthcare. Without these processes, AI systems deployed in Cambodia may perpetuate or amplify existing biases, particularly affecting marginalised populations.

There is no evidence of established implementation guidelines, monitoring protocols, or continuous improvement frameworks for AI in healthcare. The lack of responsible design and implementation processes raises concerns about AI systems' safety, effectiveness, and inclusivity in the Cambodian healthcare context.

BUSINESS MODELS

There is no information on existing homegrown AI businesses in Cambodia's healthcare system. Limited data availability presents a significant barrier to AI business development in the healthcare sector.

The law on investment provides tax incentives for both foreign and Cambodian nationals [31]. Qualified investment projects eligible for tax incentives include investments in high-tech industries and health as priority areas, encompassing medical AI [31]. However, venture capital in Cambodia is still in its early stages, limiting funding for AI innovation [32].

There is no evidence of established value assessment frameworks, cost-effectiveness methodologies, or social impact measurement specifically for AI in healthcare. Similarly, sustainable financing mechanisms, equitable access strategies, and value-based procurement approaches for AI appear underdeveloped.

The limited business ecosystem for AI in healthcare may hinder developing and scaling locally appropriate, affordable AI solutions that could address Cambodia's specific healthcare challenges.

PARTNERSHIPS AND STAKEHOLDERS

Appendix 1 provides a summary of stakeholders and partnerships. Cambodia's AI ecosystem includes multiple government ministries with defined roles: the Ministry of Health regulates healthcare AI and determines reimbursement; the Ministry of Industry, Science, Technology and Innovation leads AI strategy; the Ministry of Post and Telecommunications oversees data governance; and the Ministry of Education provides funding for AI education.

Academic institutions such as the Royal University of Phnom Penh and the University of Puthisastra offer relevant computer science or medicine programs, though interdisciplinary integration appears limited. The Smart Axiata Digital Innovation Fund represents a potential funding source for digital innovation.

International partners, including WHO, the World Bank, UNESCO, and the Asian Development Bank, support healthcare initiatives and policy development. Several hospitals have adopted digital healthcare initiatives, and startups like ArrowDot utilise AI for business applications.

Despite this stakeholder diversity, formal collaboration mechanisms specifically for healthcare AI are underdeveloped. The lack of patient involvement and community engagement raises concerns about the inclusivity and relevance of AI solutions, particularly for underserved populations.

Examples of implementation initiatives include:

1. **Cambodia-China AI Collaboration for diabetes diagnosis accuracy through AI**
   Cambodia and China initiated a pilot project focusing on AI-assisted diabetes diagnosis. This collaboration involves the Cambodia-China **Friendship Preah Kossamak Hospital** and the **Guizhou Provincial Health Commission** [33] The Ministry of Industry, Science, Technology And Innovation (MISTI) and the Ministry of Health support the project.
2. **Centre for AI Innovation (CEAI) Launch**
   Cambodia's Centre for AI Innovation (CEAI), in partnership with Singapore, promotes inclusivity in AI education and application. CEAI aims to ensure that a significant portion of Cambodia's population gains access to AI knowledge, with applications spanning healthcare and other sectors (20).

INDONESIA

Indonesia is well-positioned to benefit from AI due to its large market size and high adoption rate, ranking 42nd globally in the 2023 Government AI Readiness Index [15]. Indonesia is the first Southeast Asian nation to complete UNESCO's AI Readiness Assessment — a tool designed to evaluate a country's capacity to ethically design, develop, and use artificial intelligence (AI) [34]

GOVERNANCE AND REGULATORY

Indonesia's 2020-2045 Artificial Intelligence National Strategy (Stranas KA) was developed through cross-sector consultations to enhance AI competitiveness [16]. The regulatory landscape includes the 2022 Personal Data Protection Law [35, 36], the 2019 One Data Policy for streamlining data sharing across public agencies, and a voluntary Circular Letter on AI Ethics (2023). An AI and Cybersecurity Research Centre, launched in 2022, is expected to draft Presidential AI Regulations by 2025 [37, 38]

The Ministry of Health's 2024 Regulatory Sandbox for Digital Health Innovation provides a controlled environment for testing healthcare innovations [39]. During its G20 presidency, Indonesia promoted a global AI platform for pandemic surveillance, supporting a unified global health architecture [40].

Indonesia classifies AI under Software as a Medical Device (SaMD) based on intended purpose and risk level. While the Indonesian Health Technology and Assessment Committee (InaHTAC) serves as the HTA nodal agency, there is no legal mandate for HTA implementation in healthcare decision-making [24]. Key barriers include private sector interference in HTA outputs, lack of expertise, and absence of standard procedures [41].

Despite a comprehensive National AI Strategy emphasising responsible, safe, and inclusive AI, implementation remains unclear, and governance frameworks are still evolving. The lack of standardised HTA processes and reimbursement frameworks presents barriers to safe and effective AI adoption in healthcare [41, 42].

PEOPLE AND WORKFORCE

Indonesia has achieved gender parity in education at the national level, with higher female enrolment in tertiary education (47% compared to 42% for males) [43, 44]. However, challenges persist at the subnational level, with economic conditions, geographical remoteness, and other factors affecting marginalised groups.

The country is integrating AI into training programs through initiatives like AI TEACH for Indonesia and IBM SkillsBuild [45, 46]. Organisations like Plan Indonesia and Markoding focus on providing AI skills to women and underprivileged youth [46].

In healthcare, Indonesia faces a critical workforce shortage, particularly in rural areas [47], due to limited training capacity, geographical challenges, and resource constraints [47, 48]. The government has launched initiatives like the Hospital-based Specialist Doctor Education Program (PPDSBRS) to address these shortages [47].This program aims to decentralise specialist training and increase the number of qualified specialists more quickly.

While AI-powered tools could enhance service quality and accessibility, information on healthcare-specific AI training programs is limited. Gender equality is not deeply addressed in AI development, and no known measures are in place to promote gender equality in AI design and use [49].

DATA AND TECHNOLOGY

Indonesia faces challenges with data biases, security, and public trust. Models often trained on high-income country data require adaptation with local datasets from platforms like Halodoc [50]. Past data breaches in the health sector have raised concerns about medical data privacy [51].

According to stakeholders, Indonesia has a low uptake of electronic medical records and limited data interoperability. Data is often kept in individual servers rather than integrated into national systems. This includes low uptake of electronic medical records and low data interoperability—data is kept in separate servers and not incorporated into the national data. Ensuring compliance with ethical standards, strengthening cybersecurity measures, and fostering greater public confidence in AI-driven healthcare solutions will be crucial for sustained progress.

The enforcement of data privacy laws and ethical guidelines is still evolving [52], with ongoing efforts to improve cybersecurity and data protection. The 2023 Health Bill has raised additional concerns related to health data security [53]. While efforts to use diverse datasets continue, challenges remain in representing indigenous languages and diverse demographics [52, 54].

DESIGN AND PROCESSES

Information on AI design and clinical workflows in Indonesia is limited. Whether patients and end-users are included in the design process is unaccounted for, despite its importance for developing inclusive AI tools. Restricted access to quality local datasets creates barriers to designing safe and inclusive AI solutions.

Co-design processes involving end-users are in the early stages, with some initiatives focusing on patient involvement. Accessibility in AI interfaces is being addressed, but more work is needed to accommodate different literacy levels and disabilities [52].

BUSINESS MODELS

Indonesia's investment framework includes Law No. 25 of 2007 on Capital Investment [55], , which regulates both domestic and foreign investments [56]. While intellectual property laws cover trademarks, patents, and copyrights, challenges with piracy and counterfeiting create disincentives for investment [42, 43, 57].

The National AI Strategy guides AI investment in health, but IP rights associated with AI/ML are not yet regulated [14, 42]. The Personal Data Protection Law applies extraterritorially, indicating legal consequences even for data processing outside Indonesia. Reimbursement models remain uncommon in Indonesia [42].

Including marginalised groups in AI policy dialogues is improving, with efforts to involve diverse stakeholders. Tax incentives for responsible AI practices are being considered but are not yet widespread [52]. Further clarity is needed on enhancing the scalability of AI solutions beyond the pilot phase.

PARTNERSHIPS AND STAKEHOLDERS

Appendix 1 lists key stakeholders and partnerships in Indonesia. Indonesia has developed a diverse ecosystem supporting AI in healthcare. Key government entities include the Ministry of Health (overseeing healthcare AI services and reimbursement), the Ministry of Communication and Digital Affairs (formulating digital transformation regulations), the National Research and Innovation Agency (coordinating research), and the National Cyber and Crypto Agency (ensuring cybersecurity).

Academic institutions provide complementary expertise. Universities like the University of Indonesia and Gadjah Mada University offer computer science and medical programs, while others specialise in either discipline.

The funding landscape includes international organisations like the Global Fund and venture capital firms such as East Ventures, which support technology startups. Development partners include the UNDP, WHO, ADB, and USTDA, along with private sector partners like Microsoft, which provides AI skills development.

Healthcare providers, including Siloam Hospitals Group, have adopted digital initiatives, while emerging AI businesses like Nexmedis (health information systems), Prixa (medical image analysis), and Rey (AI-driven health insurance) are creating innovative solutions.

KORIKA, established under the National AI Strategy, is a collaboration centre for stakeholders [58]. Despite this ecosystem, coordination mechanisms specifically for healthcare AI remain underdeveloped, particularly regarding patient involvement and representation of marginalised communities.

Examples of implementation initiatives include:

1. **Assessing Indonesia's AI Readiness: UNESCO and Kominfo's Insights on Digital Transformation**
   KOMINFO has collaborated with UNESCO on an AI Readiness Assessment, tracking progress toward ethical AI governance. The assessment engaged over 500 participants across five regions, evaluating the AI landscape in legal, socio-cultural, economic, educational, and infrastructural dimensions. Key findings include concerns about labour displacement, low public awareness of AI's potential biases, and underfunded AI research. The recommendations suggest creating a National Agency for Artificial Intelligence, implementing ethical AI regulations, and promoting equal access to AI education and resources [59].
2. **Indonesia's Ministry of Health and Google Cloud Collaboration**
   The Indonesian Ministry of Health expanded its collaboration with Google Cloud to support the development of healthcare-specific generative AI innovations. This partnership aims to improve healthcare access, experiences, and outcomes by providing a secure environment to test and tailor AI solutions to Indonesia's healthcare sector [60].

LAO PDR

Currently, Lao PDR is ranked 136th in the 2023 Government AI Readiness Index [15], indicating its early stage in AI development.

GOVERNANCE AND REGULATORY

Lao PDR has not established a dedicated national AI strategy but has taken foundational steps toward digitisation [61]. The Ministry of Technology and Communications has outlined 5-, 10-, and 20-year digitisation plans emphasising digital transformation, though explicit references to AI in healthcare remain limited [62]. The Digital Health Strategy 2023–2027 sets objectives for improving health information systems and governance, creating potential entry points for AI integration, but AI-specific strategies and guidelines are absent [63].

AI in Lao PDR is regulated as Software as a Medical Device (SaMD), governed by recently updated medical device regulations aligned with ASEAN standards. There is no established HTA framework or clear reimbursement guidelines for AI solutions, resulting in fragmented and ad-hoc decision-making processes [24, 64].

Data protection frameworks exist through the Law on Electronic Data Protection and the Law on Prevention and Combating Cyber Crime [65, 66], but these need reinforcement for effective implementation. Transparent regulatory standards and accountable governance mechanisms remain underdeveloped, hindering responsible AI adoption in healthcare.

PEOPLE AND WORKFORCE

Capacity-building efforts for AI in health are emerging but limited. Lao PDR has engaged in international partnerships with institutions from China and Korea to foster AI competencies, yet clear integration into national health education curricula is lacking [67, 68]. The University of Health Sciences (UHS) in Vientiane, central to health professional training, has not yet included systematic AI education in its programs, highlighting significant gaps in local expertise.

Initiatives to improve gender diversity and inclusivity in digital training exist, guided by the UNDP Gender Equality Strategy 2022–2026 [69]. However, these efforts remain generalised without specific strategies for increasing diversity within the healthcare AI workforce, underscoring a critical need for targeted interventions to ensure inclusive AI development [69, 70].

DATA AND TECHNOLOGY

Lao PDR's data infrastructure requires significant improvements to enable AI integration. Health information digitisation has been initiated through platforms like District Health Information Software 2 (DHIS2), improving data management since 2015, yet coverage remains inconsistent, particularly in rural regions [71].

Lao PDR's digitisation lags behind most Southeast Asian countries due to limited access to high-quality data, shortage of government expertise, and weak technological infrastructure [72-74]. Digitalisation barriers in Laotian healthcare include low staff training, resistance to digital systems, and resource constraints [75].

The country's heavy reliance on single-source hardware raises concerns about data privacy and security, underscoring the need for stronger data protection regulations before and alongside further AI initiatives[72].Robust investments in digital infrastructure and enhanced regulatory oversight are essential to mitigate risks and promote secure, equitable AI deployment in healthcare.

DESIGN AND PROCESSES

There are no specific laws on patient and end-user involvement in the AI development lifecycle, as the AI regulatory landscape is still evolving with a focus on ethical AI use and data privacy. The

Digital Health Strategy emphasises the importance of involving stakeholders in designing and implementing AI systems, but implementation is challenging to monitor [63].

There is a lack of clarity on processes involving patients or healthcare providers in the design phase of AI tools. While accessibility in AI interfaces is being addressed, more clarity is needed on accommodating different literacy levels and disabilities to ensure inclusivity and safety [61].

BUSINESS MODELS

Lao PDR's primary investment framework is the Law on Investment Promotion (2016), which aims to create a favourable investment climate [76]. The Law on Intellectual Property (2017) governs IP rights and aligns with international standards, but weak enforcement and limited capacity for IP protection remain challenges [77, 78].

No laws specifically target AI investment in healthcare. The inclusion of marginalised groups in AI policy dialogues and efforts to include diverse stakeholders are unclear. There is a lack of collaboration with patient advocacy groups and no clear budget or tax incentives for responsible AI practices.

PARTNERSHIPS AND STAKEHOLDERS

Appendix 1 lists key stakeholders, partnerships and implementation initiatives if AI in healthcare in Lao PDR. Lao PDR has a limited but developing stakeholder ecosystem for AI in healthcare. Two key government entities lead relevant initiatives: the Ministry of Health, which is responsible for healthcare governance and policy development, and the Ministry of Technology and Communications, which leads the country's digital transformation and oversees infrastructure development.

Several academic institutions offer computer science programs, including the National University of Laos, Souphanouvong University, and Lao-Korean College, while the University of Health Sciences provides medical education. However, there appears to be limited integration of AI training in healthcare curricula.

The funding landscape is minimal, with LTS Ventures representing one of the few venture capital firms in the country. It focuses primarily on fintech and software development for SMEs rather than healthcare AI.

Development partners like Asia Catalyst work with community-based organisations to promote health rights and improve healthcare access, though specific AI-focused initiatives are not evident. Medi Laos International Hospital has adopted digital healthcare initiatives in the healthcare sector, potentially creating opportunities for AI implementation.
Examples of implementation initiatives include:

1. **Laos-China Collaboration on AI and Big Data Development**
   The Research Institute for Smart Technology under the Lao Ministry of Technology and Communications has signed a Memorandum of Understanding with Chongqing College of Electronic Engineering in China. This partnership focuses on providing technical training and education programs to develop human resources in AI and Big Data, aiming to enhance research and infrastructure in sectors such as public health [67].
2. **Guangxi Zhuang Autonomous Region and Lao PDR AI Collaboration**
   The Guangxi Zhuang Autonomous Region of China has partnered with Lao PDR to establish the China-Laos AI Innovation Cooperation Centre. This collaboration aims to systematically enhance Laos' foundational AI capabilities, empowering the growth of various industries [79].

MALAYSIA

Malaysia is ranked 23rd globally in the 2023 government AI readiness index [15].

GOVERNANCE AND REGULATORY

Malaysia has established the National Artificial Intelligence Roadmap 2021-2025 (AI-RMAP) with structured initiatives to build safe and secure AI [80]. The Malaysia Digital Economy Blueprint (MyDIGITAL) emphasises inclusivity, ethics, and trust, focusing on building a digitally inclusive society and creating a secure digital environment [81].

The Malaysian Medical Authority (MDA) regulates medical devices and classifies AI as Software as a Medical Device (SaMD) under the Malaysian Medical Device Act 2012. AI follows a risk-based classification aligned with international guidelines, ranging from Class A (low risk) to Class D (very high risk) [82]. Stringent performance, validation, and post-market surveillance requirements apply to AI tools.

While there is no legal mandate for HTA implementation in healthcare decision-making [24], the Malaysian Health Technology Assessment Section (MaHTAS) conducts assessments to inform reimbursement and pricing decisions, though there is no explicit mention for SaMDs [83, 84]. Ethical use and transparency are of focus, with proposed AI labelling standards and explainability measures reinforcing the need for strong regulations [85]. The lack of timely HTA and reimbursement frameworks for AI tools can delay access to innovations, increase out-of-pocket costs, and widen health inequities [86, 87].

PEOPLE AND WORKFORCE

The AI Talent Roadmap for Malaysia (2024-2030) and the Malaysia-Artificial Intelligence Consortium (MAIC) aim to boost collaboration and capacity-building [88]. Malaysia has achieved gender parity in higher education, with higher female enrolment in tertiary education (approximately 50% vs. 42% for males) [89].

Several initiatives target inclusive AI training, such as the MCMC-Microsoft AI TEACH Program focused on the B40 group, women, and persons with disabilities, and the Microsoft Bersama Malaysia Initiative, which has upskilled over 1.53 million people in digital technologies, including AI [90, 91].

Despite these efforts, healthcare workforce shortages and hospital overcrowding remain unaddressed, raising concerns about AI's impact on systemic healthcare issues [92]. Cross-skilling, a critical shortage of digital talent, and a lack of progressive policies are major barriers to promoting inclusive growth and preventing workforce polarisation [93].

DATA AND TECHNOLOGY

Malaysia's National Artificial Intelligence Roadmap 2021-2025 (AI-RMAP) and Digital Economy Blueprint (MyDIGITAL) focus on improving digital infrastructure and creating a safe and secure digital environment [80, 81]. However, data privacy remains a key concern, with public trust fragile due to unclear safeguards [94, 95]

Ethical concerns related to patient autonomy, privacy, and AI robustness need addressing to ensure trustworthy AI adoption [96]. AI implementation tends to favour well-equipped urban centres, potentially widening disparities with rural areas [97].

Limited focus on health-related AI systems raises concerns about privacy, data sharing, patient safety, and equitable data representation [93, 100]. Challenges including informed consent, biases in training data, and AI's "black box" decision-making threaten patient autonomy and care continuity [98, 99].

DESIGN AND PROCESSES

Malaysia's National Guidelines on AI Governance and Ethics, introduced by the Ministry of Science, Technology, and Innovation (MOSTI), emphasise involving patients and end-users in the AI development lifecycle [100, 101]. These guidelines outline ethical principles, including fairness, privacy, security, and transparency for responsible AI development.

However, surveillance mechanisms for implementing fairness and transparency principles across AI tools in healthcare remain unclear. Robust monitoring and evaluation ensure AI tools are responsible, safe, and inclusive for their intended users.

BUSINESS MODELS

Malaysia's investment framework is established through the Promotion of Investments Act 1986, which offers various incentives to attract domestic and foreign investments and is overseen by the Malaysian Investment Development Authority [102, 103].

Intellectual property protection is governed by the Intellectual Property Corporation of Malaysia Act 2002, which is aligned with international standards, including the TRIPS Agreement [104, 105]. This Act provides a robust framework for protecting and enforcing IP rights.

While Malaysia's investment laws and IP framework provide a solid foundation for attracting investments that can lead to sustainable business models, information on initiatives to include marginalised groups in AI policy dialogues and tax incentives for responsible AI practices is lacking.

PARTNERSHIPS AND STAKEHOLDERS

Appendix 1 lists key stakeholders in Malaysia. Malaysia's AI ecosystem is supported by a structured government framework where four key ministries coordinate efforts: Health (regulating healthcare AI), Digital (overseeing transformation and the National AI Office), Science and Technology (managing the AI Roadmap), and Higher Education (developing AI talent).

Academic institutions like the University of Malaya and Universiti Kebangsaan Malaysia provide computer science and medical expertise, while specialised universities focus on either discipline. The funding landscape includes Khazanah Nasional (sovereign wealth fund), Cradle Fund (government-backed early-stage investor), and NEXEA (venture capital firm).

Examples of implementation initiatives include:

1. **Sunway Medical Centre and Annalise.ai Partnership**

Sunway Medical Centre (SMC) has partnered with Annalise.ai to integrate AI-driven medical imaging solutions into its healthcare services. The collaboration focuses on deploying Annalise Enterprise, an AI-powered chest X-ray (CXR) technology capable of detecting up to 124 radiological findings within seconds. This implementation aims to assist radiologists and clinicians by improving diagnostic accuracy and efficiency in patient care [106].

2. **AWS and Malaysia's Ministry of Higher Education Collaboration**

Amazon Web Services (AWS) has partnered with the Malaysian Ministry of Higher Education's Department of Polytechnic and Community College Education (JPPKK) to drive AI adoption in education. The initiative includes AI and machine learning (ML) training programs for students across Malaysia's polytechnics and community colleges [107].

MYANMAR

Myanmar's AI landscape is in its infancy, ranking 149th in the 2023 Government AI Readiness Index [15]. The country's exploration of AI remains undeveloped, with significant challenges exacerbated by ongoing geopolitical instability.

GOVERNANCE AND REGULATORY

Myanmar lacks a dedicated AI policy. The Myanmar e-Governance Master Plan 2030 is the only document reflecting AI-related initiatives, outlining short-term goals for ICT frameworks and long-term objectives for infrastructure and digital governance [108]. Broader digital policies like the Myanmar Digital Economy Roadmap 2018-2025 do not address AI [109, 110].

There is no evidence of a regulatory framework for AI and no HTA mandate [24]. While the country is reportedly drafting a National AI Strategy and Policy to address ethical dilemmas and data privacy issues, it currently lacks specific ethical AI standards, posing risks for responsible AI use [111].

PEOPLE AND WORKFORCE

In Myanmar, enrolment rates from pre-primary to tertiary education show a slight gender disparity, with rates slightly higher for females as of 2018 [112, 113]. There is a lack of information on targeted efforts for skilling and upskilling the health workforce in AI, especially for women, though initiatives like the Women's Peace Network focus on supporting women's rights more broadly [114, 115].

Integrating AI in health across educational curricula appears non-existent, limiting the development of essential expertise for responsible, safe, or inclusive AI implementation.

DATA AND TECHNOLOGY

AI adoption in healthcare is virtually non-existent beyond isolated initiatives supported by development partners. The ongoing conflict has disrupted digital health advancements, further widening the urban-rural divide [116-118]. Myanmar faces critical gaps in ICT infrastructure and is among the least developed in Southeast Asia [119], with significant challenges in expanding internet, mobile, and telephone services, particularly in rural areas [120].

The country lacks comprehensive data protection laws, leaving personal data vulnerable to misuse [121]. This absence of robust data protection and privacy regulations hampers the development of a coherent digital governance framework [122] and leaves marginalised populations particularly vulnerable.

DESIGN AND PROCESSES

Specific examples of end-user involvement in AI development in Myanmar are scarce as AI development is still nascent. The challenging political situation and limited technological infrastructure create significant barriers to implementing user-centred design approaches for AI solutions.

BUSINESS MODELS

Myanmar's investment laws, including the Myanmar Investment Law and the Companies Law, theoretically provide a framework for investment and intellectual property protection [123]. However, the 2021 coup has created an unfavourable investment climate, with major foreign companies suspending operations and exiting investments [124]. The current environment does not provide responsible and safe conditions for investing in and scaling healthcare AI interventions, significantly limiting business model development and sustainability.

Appendix 1 lists key stakeholders in Myanmar. Myanmar's AI ecosystem in healthcare is severely limited, with minimal coordination among stakeholders. Government oversight is divided between the Ministry of Health, which is responsible for healthcare administration and medical education, and the Digital Economy Development Committee (DEDC), which focuses on broader digital economy development.

The academic landscape includes computer science programs at institutions like the University of Computer Studies in Yangon and Mandalay. Medical education is provided through several University of Medicine campuses across the country. However, there appears to be little integration between these disciplines to support AI development in healthcare.

The funding environment is particularly challenging, with no active venture capital firms specifically investing in AI or technology startups identified. This significant gap severely limits innovation and development in healthcare AI.

Among development partners, PATH stands out for its work equipping healthcare providers with AI tools to enhance diagnostic accuracy and treatment, including the implementation of qXR for tuberculosis detection in partnership with the Myanmar Medical Association [125].

A few healthcare institutions have adopted digital initiatives, including Pun Hlaing Hospitals, Yangon Children's Hospital, and the Pinlon Group of Hospitals. VinBrain's collaboration with Myanmar's Golden Zanekka Public Company has introduced DrAid™, an AI-powered diagnostic tool, in some leading hospitals [126].

These isolated initiatives operate in a fragmented environment with limited coordination, policy support, or sustainable funding mechanisms, reflecting Myanmar's early exploratory stage in healthcare AI development.

Examples of implementation initiatives include:

1. **PATH and Myanmar Medical Association's AI-Driven TB Detection**
   In partnership with the Myanmar Medical Association, PATH has implemented an AI tool called qXR to enhance tuberculosis (TB) detection. This initiative equips private X-ray facilities with AI technology capable of rapidly analysing chest X-rays, thereby accelerating diagnosis and improving treatment adherence [125].
2. **VinBrain and Golden Zanekka Public Company's Deployment of DrAid™**
   VinBrain collaborated with Myanmar's Golden Zanekka Public Company to integrate DrAid™, an AI-powered diagnostic tool, into leading hospitals in Myanmar. DrAid™ assists medical professionals in interpreting X-ray images to identify lung, heart, and bone diseases, aiming to enhance diagnostic accuracy and patient care [126].

THE PHILIPPINES

The Philippines is ranked 65th globally as per the 2023 government AI readiness index [15].

GOVERNANCE AND REGULATORY

The Philippines Development Plan 2023-2028 promotes AI as a social and economic transformation driver [127]. The National AI Strategy Roadmap (2021) identified five key barriers to AI adoption, leading to a 2024 update and legislative developments, including Bill No. 7396, which proposes an Artificial Intelligence Development Authority [128-130].

The Food and Drug Administration classifies AI-based applications as Software as Medical Device under Administrative Order No. 2018-0002, following risk-based classification from Class A (low risk) to Class D (high risk) [131]. Unlike other ASEAN members, the Philippines has a legislative mandate for HTA implementation, with the Department of Health's HTA Unit serving as the nodal agency [24]. Administrative Order 2020-0041 provides a reimbursement framework that includes SaMDs, though more clarity is needed [132].

The Philippines has foundations for responsible AI through data protection legislation. The National ICT Planning, Policy, and Standards Bureau collaborates with the International Telecommunication Union to promote ethical AI policymaking through initiatives like the AI Dialogue: Gender-Based AI Policy [133].

PEOPLE AND WORKFORCE

The Philippines shows strong gender parity in tertiary education, with higher female enrolment [134]. The Digital Workforce Competitiveness Act (RA 11930) prioritises digital transformation in education for the Fourth Industrial Revolution [135]. Several universities have integrated AI programs, including the University of the Philippines Diliman, offering PhD and Master's programs in AI [136].

IBM partnered with the Department of Education in 2021 to strengthen tech skills in the Senior High School curriculum [137], though information on healthcare-specific AI training is scarce. The University of the Philippines promotes responsible AI use following "Principles for Responsible and Trustworthy AI"[152].

The government is committed to addressing gender divides by providing women with equal access to emerging technologies through online training in AI and data science [153]. While many local women's organisations focus on gender equality and empowerment [138], organisations specifically addressing AI inclusivity across health systems are limited.

DATA AND TECHNOLOGY

The National Privacy Commission's Circular No. 22-04 mandates transparency in data processing and decision-making systems [139]. The 2012 Data Privacy Act and the 1997 Intellectual Property Code provide regulatory foundations but require updates for AI-specific challenges [140, 141]. The Philippines is one of two ASEAN countries participating in the Cross-Border Privacy Rules system [142].

While lacking a dedicated health AI strategy, the Department of Health and Philippine Health Insurance Corporation (PhilHealth) are working to integrate medical data for efficient service delivery. The PhilHealth Strategic Plan 2021-2023 outlines health data management improvements [143] and Joint Administrative Order 2021-002 mandates national health data standards for interoperability [144].

DESIGN AND PROCESSES

Limited information exists on frameworks for including patients, end-users, and vulnerable populations in the design and workflow of AI tools in healthcare, representing a significant gap in ensuring inclusive AI development.

BUSINESS MODELS

The Philippines has established investment laws, including the Foreign Investments Act (1991), Public Service Act Amendatory Law (RA 11659), and Corporate Recovery and Tax Incentives for Enterprises Law [145, 146]. Intellectual property is governed by the Intellectual Property Code (RA 8293) [146].

While no laws specifically regulate AI in healthcare, the Philippine Innovation Act (RA 11293) provides a general framework [135]. AI adoption in healthcare remains fragmented, with innovations primarily led by the private sector amid financing and technical constraints [74, 147]. The Philippine Startup Development Program under the Innovative Startup Act (R.A. 11337) encourages entrepreneurship, though public-private partnerships need strengthening to accelerate AI adoption [148, 149].

PARTNERSHIPS AND STAKEHOLDERS

Appendix 1 lists key stakeholders in the Philippines. The Philippines has a diverse ecosystem supporting AI in healthcare. The government framework includes several departments with complementary roles: the Department of Health oversees health policies and reimbursement for AI-integrated services; the Department of Science and Technology supports AI-driven healthcare projects through funding and policy development; the Department of Information and Communications Technology manages the national ICT agenda; and the Department of Trade and Industry leads the National AI Roadmap.

Academic institutions provide both technical and healthcare expertise. Universities like the University of the Philippines Manila and the University of Santo Tomas offer programs in both computer science and medicine, while others specialise in either discipline. This educational foundation supports the development of interdisciplinary talent needed for healthcare AI.

The funding landscape includes QBO Innovation Hub, which supports tech startups through funding, mentorship, and networking opportunities. International development partners like the Asian Development Bank and World Bank provide additional resources for health system strengthening.

Several healthcare institutions, including St. Luke's Medical Center and The Medical City, have adopted digital initiatives. Emerging AI businesses in healthcare include MedHyve (digital procurement), Instalimb (3D-printed prosthetics using machine learning), Advanced Abilities (preventive care and early detection), and TQHQ (AI-based hospital management).

Examples of implementation initiatives include:

1. **DOST-PCHRD's AI-Driven Health Innovations**
   The Department of Science and Technology – Philippine Council for Health Research and Development (DOST-PCHRD) has actively supported AI-driven health projects. Notable initiatives include the Artificial Intelligence Nutrition Assistant (AINA), an automated food recognition and dietary assessment mobile application, and the UTAK AI project, which utilises AI-assisted imaging techniques for brain tumour detection and analysis. These projects aim to enhance healthcare delivery and make medical services more accessible, especially in underserved areas [150].
2. **Union Bank and GLS Partner with Government for AI Research Centre**
   Union Bank of the Philippines and Global Learning Solutions (GLS) have joined forces with the Philippine government to establish an AI research centre to drive innovation and digital transformation. The initiative, led by the Department of Trade and Industry (DTI), seeks to

develop AI-driven solutions for various industries, enhancing competitiveness and efficiency [151].

THAILAND

Thailand is ranked 37th globally in the 2023 Government AI Readiness Index [15].

GOVERNANCE AND REGULATORY

Thailand has established key regulatory frameworks with the National AI Ethics Guidelines 2020 [152] and the National AI Strategy and Action Plan 2022-2027 [153]. Two significant initiatives in development include the Draft Royal Decree on Business Operations that Use AI Systems, which takes a risk-based approach inspired by the EU AI Act [154], and the Draft AI Innovation Promotion and Support Act, which seeks to establish an AI sandbox [155].

Healthcare is a priority in Thailand's AI strategy, with the first phase (2022-2023) focusing on AI-driven health solutions [156, 157]. The "AI for Social Good Project" (2021-2023) explored AI's role in overcoming healthcare challenges [158], while the healthcare sector shapes AI regulations through initiatives like the AI Governance Clinic [159].

The Thai Food and Drug Administration has issued specific guidance for Software as Medical Device (SaMD), including AI applications [160, 161]. Notably, the Thai FDA mandates that human clinicians review all medical device AI processes, ensuring AI never becomes fully autonomous. Thailand has specific provisions for Health Technology Assessment through the Health Intervention and Technology Assessment Program (HITAP) [24] and provides universal health coverage with reimbursement policies covering AI and SaMDs [162].

While Thailand's National AI Strategy emphasises responsible, safe, and inclusive AI, implementation challenges exist. Critics note a lack of public involvement in developing AI regulations, with ethical guidelines showing bias toward commercialisation over safety [163]. Additionally, Thailand's 4.0 strategy may insufficiently address inequality issues [164].

PEOPLE AND WORKFORCE

Thailand shows gender disparity in higher education enrolment, with more men than women [165]. Public-private partnerships are promoting AI education, with the National AI Committee aiming to train 13,000 individuals annually through the Digital Government Development Agency and Thailand Artificial Intelligence Research Institute [166-168].

Universities, including Chulalongkorn, King Mongkut's Institute of Technology, and Mahidol, offer AI training programs. Mahidol University's Faculty of Medicine at Siriraj Hospital collaborates with AI startups to develop healthcare products [169, 170].

While organisations like the UN and local NGOs work to empower women and girls [171, 172], specific efforts to reduce gender disparities in healthcare AI remain unclear.

DATA AND TECHNOLOGY

Thailand has established the Personal Data Protection Act 2019, facilitating cross-border data transfers [173] and aims to strengthen digital infrastructure by 2027. However, technological and human capacity constraints hinder AI scalability [174], including inconsistent data structures, paper-based records in rural areas, and limited awareness of data-sharing benefits.

The National AI Strategy emphasises safe AI principles, compliance with data privacy regulations, and cybersecurity measures [175]. However, the Cybersecurity Act 2019, which allows questioning without court orders for anticipated threats, raises concerns about government access to private data [176].

DESIGN AND PROCESSES

We could not find evidence of end-user involvement in designing, evaluating, or implementing AI solutions for healthcare.

BUSINESS MODELS

Thailand is emerging as a health tech innovation hub in ASEAN [177], with AI venture capital investment growing exponentially from below 20 million USD in 2020 to over 250 million [178]. The country offers a favourable environment for foreign investors through the Foreign Business Act and Board of Investment incentives [179, 180], though challenges like bureaucracy and political instability create occasional uncertainty [181].

Intellectual property protection is overseen by the Department of Intellectual Property, with key laws including the Trademark Act, Patent Act, and Copyright Act [182, 183]. Despite these frameworks, enforcement can be inconsistent, and navigating the IP landscape may require local expertise [184].

While existing frameworks provide mechanisms for ensuring scalable business models, AI may exacerbate the urban-rural divide without intentional inclusivity efforts, highlighting the need for increased attention to equity across the AI lifecycle.

PARTNERSHIPS AND STAKEHOLDERS

Appendix 1 outlines key stakeholders. Thailand has a robust ecosystem supporting AI in healthcare, with three key ministries leading government initiatives: Public Health, Digital Economy and Society, and Higher Education, Science, Research and Innovation.

Academic institutions like Mahidol and Chulalongkorn Universities offer programs in computer science and medicine, while venture capital firms such as SCB 10X and Krungsri Finnovate fund AI startups.

Key initiatives include the "AI for Social Good" project, a collaboration between universities, international organisations, and tech companies [169], and TrueBusiness and Intel's partnership leveraging 5G and AI technologies to modernize healthcare [190].

Several innovative healthcare AI startups are emerging, including Agnos Health (patient management systems), Cariva (personalised healthcare), and WizTech Health (preventive solutions).

Examples of implementation initiatives include:

1. AI for Social Good: Strengthening Data Governance and AI Innovation in Thailand

“AI for Social Good” project investigating barriers and enablers to healthcare AI in Thailand: a collaboration between the Association of Pacific Rim Universities, the United Nations Economic and Social Commission for Asia and the Pacific, Google and the Office of National Higher Education Science Research and Innovation Policy Council. The initiative focused on improving AI governance and data-sharing frameworks to enhance healthcare and poverty alleviation efforts. It also identified key barriers such as inconsistent data architecture, manual data processing, and legal uncertainties, emphasising the need for standardised data-sharing guidelines and regulatory sandboxes [158].

2. TrueBusiness and Intel's AI Partnership

TrueBusiness, a subsidiary of True Corporation, partnered with Intel to modernize Thailand's healthcare system. This collaboration leverages True's 5G network and Intel's AI technologies to introduce seven smart healthcare solutions to enhance diagnostics, treatment, rehabilitation, and patient data management. Key innovations include AI-powered telemedicine services, real-time patient monitoring, and advanced data analytics [185].

TIMOR-LESTE

Timor-Leste is currently ranked 137th globally in the 2023 Government AI Readiness Index, reflecting its early stage of digitisation and AI adoption. The country's "Timor Digital 2032" plan, released in 2023, primarily focuses on digitisation and equity without specific references to AI but establishes foundations for future AI integration [186].

GOVERNANCE AND REGULATORY

Timor-Leste lacks a dedicated national AI strategy or an AI strategy for health. While the Timor Digital 2032 plan identifies health as one of five strategic digital pillars aiming to connect all government health facilities to an Information and Communications Technology (ICT) network, it does not explicitly address AI governance [186]. .

The establishment of Agência da Tecnologia Informação e Comunicação (TIC Timor) as the responsible agency for digitisation and government Information Technology demonstrates a structural commitment to digital governance [187]. However, the country has no comprehensive data protection legislation, specific laws governing AI development, or a clear regulatory framework for health technologies, creating significant gaps for responsible AI implementation.

The Ministry of Health (MoH) demonstrates pragmatic oversight, evidenced by their careful review and approval of tools like MediBot (an AI clinical chatbot) based on alignment with national clinical guidelines rather than through formal regulatory processes [188]. While practical for early pilots, this approach highlights the need for more structured regulatory systems as AI adoption increases.

The absence of robust data protection regulations and AI-specific ethical guidelines raises serious concerns about patient privacy and data security. Without clear governance frameworks, there are limited mechanisms to ensure AI systems meet safety standards, obtain proper consent for data use, or protect vulnerable populations. This regulatory vacuum could lead to unsafe or exploitative AI implementations if not addressed proactively as adoption increases.

PEOPLE AND WORKFORCE

Timor-Leste faces a significant healthcare workforce shortage, with density of health professionals below WHO standards despite efforts to expand capacity through international partnerships (adding approximately 700 Cuban-trained doctors by 2013) [189]. This workforce deficit is partially being addressed through AI tools designed to act as "co-pilots" for clinicians [190].

Several initiatives are building digital capacity. NGO-led programs provide digital literacy training for healthcare professionals [191], while the UN-backed Digital Skills Academy focuses on training youth with a special emphasis on women and girls [192]. The Leste AI Hub, partnering with companies like Google and IBM, trains young Timorese in machine learning and natural language processing [193].

The gender gap in technical education challenges ensuring diverse AI development. Without deliberate efforts to include women and people from rural areas in AI training programs, the resulting systems may reflect biased perspectives or fail to address the entire population's needs. The shortage of AI specialists also raises questions about responsible implementation—there may not be enough trained professionals to supervise AI systems in clinical settings properly, potentially compromising patient safety.

DATA AND TECHNOLOGY

As of early 2023, only about 50% of the population were internet users, and the country's internet speed ranked among the slowest globally [194]Connectivity is especially limited in rural areas. Urban centres like Dili have mobile 4G, while rural villages might have only patchy 2G/3G coverage.

Timor-Leste has implemented DHIS2 to collect case-based data. However, this data is not granular enough to implement or train AI models [195]. Data for AI algorithms are sparse or not readily usable. Current AI health projects adapt to this reality by leveraging localised data sources rather than requiring big datasets. For example, MediBot's knowledge base is built from Timor-Leste's clinical guidelines and protocols, which the MoH approved [188].

The introduction of AI-enabled portable X-ray machines for tuberculosis screening demonstrates a successful approach to adopting appropriate technology for low-resource settings, bringing advanced diagnostics to remote areas without requiring a hospital infrastructure [196].

The digital divide presents serious inclusivity challenges, as AI health solutions might primarily benefit urban populations with better connectivity, potentially widening existing healthcare disparities. Additionally, the lack of comprehensive, representative health datasets raises concerns about algorithmic bias—AI models might not perform equally well for all demographic groups if trained on limited or non-diverse data. Without established data governance frameworks, there are also significant concerns about data privacy, security, and appropriate consent procedures for collecting and using sensitive health information.

DESIGN AND PROCESSES

Timor-Leste's approach to designing AI solutions for health has been notably user-centric and context-specific. Given resource constraints, design efforts focus on simplicity, localisation, and integration into existing workflows. MediBot exemplifies this approach, operating through WhatsApp and Telegram—platforms already used daily by health workers—ensuring minimal disruption and a familiar interface [190]. The content is in the local Tetum language and tailored to Timor-Leste's primary care context, addressing cultural and language barriers.

BUSINESS MODELS

Timor-Leste's Private Investment Law regulates domestic and foreign private investment [197]. This law does not explicitly list health or AI as a priority area. Timor-Leste does not have formal IP legislation, which disincentives investment.

AI in healthcare initiatives in Timor-Leste have primarily been funded by donors, grants, and partnerships rather than commercial revenue. The government's health budget is limited (health expenditure is under $100 per capita per year) [198], so innovation often depends on external support.

For example, the WHO and donor-funded programs provided digital X-ray units and AI software to facilitate AI-powered TB screening [196]. Similarly, EquiTech developed the MediBot project with support from an MIT Solve award and in-kind collaboration with an NGO [190].

Long-term sustainability remains a concern. If donor funding diminishes, AI services could become limited to those who can afford to pay, potentially exacerbating healthcare inequities. The lack of established value assessment frameworks specifically for AI in healthcare makes it difficult to systematically evaluate whether these technologies deliver equitable benefits across diverse populations.

PARTNERSHIPS AND STAKEHOLDERS

Appendix 1 provides a summary of stakeholders and partnerships in Timor-Leste. The country has a limited but developing stakeholder ecosystem for AI in healthcare. The Ministry of Health (MoH) leads health policy design, implementation, and evaluation, working actively with international agencies to introduce innovations such as AI-driven TB screening in collaboration with WHO [277].

The National University of Timor-Leste (UNTL) offers computer science and medicine programs, though specialised AI in healthcare curricula remain underdeveloped. The funding landscape is minimal, with no active venture capital firms specifically investing in AI or healthcare technology startups identified in the country.

Development partners play a crucial role, including WHO (supporting essential health service implementation), UNICEF (collaborating on health and nutrition initiatives), East Meets West/Thrive Networks (focusing on medical infrastructure and healthcare professional training), and Maluk Timor (training and empowering local healthcare professionals).

No major hospitals in Timor-Leste have yet adopted AI-driven or large-scale digital health transformation initiatives, and no notable homegrown AI businesses in healthcare were identified. This stakeholder gap reflects both the early stage of AI development and inclusivity challenges, as the lack of local commercial entities may limit the development of contextually appropriate AI solutions that address the specific needs of Timorese populations.

Examples of implementation initiatives include:

1. **EquiTech Medibot**

Equitech, a Singapore-based technology innovator, developed Medibot, an AI-powered clinical decision chatbot. It is built to support healthcare providers by offering immediate, region-specific, and guideline-driven medical recommendations. EquiTech collaborated closely with **Maluk Timor**, a local NGO, to ensure MediBot's effective deployment [190].

VIETNAM

Vietnam ranks 51st on the 2024 AI Government Readiness Index [15], demonstrating significant progress in AI adoption while facing ongoing governance, cybersecurity, and infrastructure development challenges.

GOVERNANCE AND REGULATORY

Vietnam has established a coordinated governance structure where multiple ministries share responsibility for regulating AI. The Ministry of Health oversees medical device regulation and reimbursement, while the Ministry of Information and Communications drives national ICT policy, including the draft Digital Technology Industry Law with AI provisions. The Ministry of Science and Technology develops AI regulation, including data protection standards and the national AI strategy.

The 2021 National Strategy on RAndD and Application of Artificial Intelligence set five strategic directions for AI development with concrete targets for 2030. The Ministry of Health is a target ministry, highlighting healthcare's priority status [199]. Government action plans such as Decision No. 749/QĐ-TTg position healthcare as central to digital transformation initiatives [200].The MoH has rolled out health-specific digital strategies – for example, Decision 5349/QĐ-BYT (2019) approved a national Electronic Health Records (EHR) implementation plan, and Decision 4888/QĐ-BYT (2019) set a roadmap for applying “smart” health IT by 2025 [201]. There is no national strategy for AI in healthcare.

Vietnam has enacted the Personal Data Protection Decree [202], with a more comprehensive Personal Data Protection Law expected in May 2025 [203]. AI technology is regulated as a medical device under Decree NO. 98/2021, which employs a risk-based classification system [204]. The Health Strategy and Policy Institute can perform health technology assessments for AI products and provide reimbursement recommendations [24].

The draft National Standard on Artificial Intelligence and Big Data includes quality assurance standards and a risk-based approach to regulation, demonstrating commitment to safety and bias mitigation. However, Vietnam lacks a dedicated strategy specifically for AI in healthcare, and reimbursement mechanisms remain underdeveloped [205]. The absence of healthcare-specific AI guidelines creates uncertainty around implementation and evaluation standards. Hospitals generally lack IT departments capable of auditing algorithms or monitoring performance over time—creating significant safety risks if AI systems drift or malfunction undetected. These regulatory gaps could affect patient safety and equitable access to AI benefits.

PEOPLE AND WORKFORCE

Vietnam faces significant healthcare workforce challenges that impact responsible AI implementation. With only 2.8 health workers per 1,000 people [28]—below the WHO-recommended threshold, the system was already strained before the complexity of AI adoption was added. Digital health and AI literacy remain limited; a survey of over 1,100 Vietnamese medical and pharmacy students found that 92% did not understand AI in healthcare [206], highlighting a critical knowledge gap among future professionals. Despite this, medical students highlighted their interest in integrating AI into fields like radiology and medical genetics [206]. Some Vietnamese universities have started responding to this need. For example, RMIT University Vietnam (a private Australian university in Ho Chi Minh City) has involved students in building AI-powered healthcare apps [207]. VinUniversity, backed by VinGroup, established a Smart Health Center focusing on digital health research and training [208]. However, AI and informatics training is not yet standard in public medical schools like Hanoi Medical University or Ho Chi Minh University of Medicine and Pharmacy.

The country is working to address these challenges through initiatives like the National Innovation Center's goal to train 5,000-7,000 AI engineers by 2030 [209]. Universities like RMIT

Vietnam and VinUniversity have established programs focusing on digital health research. However, AI and informatics training is not yet a standard in public medical schools such as Hanoi Medical University or Ho Chi Minh University of Medicine and Pharmacy.

Persistent disparities in educational access, particularly for ethnic minorities and people from rural areas, mean that AI developers may not represent Vietnam's diverse population. This lack of diverse representation in the AI workforce could lead to systems that don't adequately address the needs of all Vietnamese citizens. The shortage of trained professionals also presents safety concerns, as inadequate supervision of AI systems could compromise patient outcomes and undermine trust in these technologies. Without deliberate efforts to expand access to AI education and ensure diversity in the technology workforce [210], Vietnam risks developing AI systems that primarily serve privileged populations.

DATA AND TECHNOLOGY

Vietnam's health information systems are evolving, with strengths to leverage and gaps to address. Traditionally fragmented across paper records and incompatible software [211], the healthcare data landscape is slowly integrating through initiatives like the nationwide Electronic Health Records implementation [209]. Major hospitals have adopted Hospital Information Systems and Picture Archiving and Communication Systems, creating potential data resources for AI development. The Ministry of Information and Communication's draft National Standard on Artificial Intelligence and Big Data includes standards on Quality Assurance for AI and a risk-based approach to AI regulation [212]. This reflects safety and bias mitigation principles, suggesting a national commitment toward responsible AI.

Many major hospitals have adopted Hospital Information Systems (HIS) at the facility level for managing patient records, billing, and laboratory results. Some larger hospitals use Picture Archiving and Communication Systems (PACS) for radiology images [213]. The volume of digitised health data for AI is increasing, though quality and consistency remain issues. For example, if EHR adoption becomes universal, AI developers could potentially access large datasets of de-identified patient information for model training. A notable example is the work by VinBigData's Big Data Research Institute, which developed VinDr, an AI system for medical image analysis. In building VinDr, the researchers curated and labelled large imaging datasets – including thousands of chest X-rays, mammograms, CT scans, and ultrasound images from Vietnamese hospitals. These datasets are available through an open-access repository (lab.vindr.ai), allowing the healthcare community to access locally relevant training data. This initiative improves algorithm performance for Vietnam's population and addresses a critical challenge in responsible AI—the need for representative training data.

However, significant challenges remain in ensuring safe and inclusive AI deployment. Data quality and consistency vary widely, particularly between urban and rural facilities, threatening to amplify existing healthcare disparities if AI systems are trained primarily on data from well-resourced settings. The lack of explicit guidelines on patient consent for AI applications raises privacy and ethical concerns, especially as data collection accelerates. Furthermore, the design and implementation of health AI solutions have typically been driven by technologists with minimal patient involvement, limiting the inclusivity of resulting systems and potentially creating solutions that don't address actual user needs or cultural contexts.

DESIGN AND PROCESSES

We could not find evidence of end-user involvement in designing, evaluating, or implementing AI solutions for healthcare.

BUSINESS MODELS

One prominent player is VinBrain, a subsidiary of Vingroup. VinBrain has developed DrAid, a suite of AI pathology and radiology solutions to support early disease detection nationwide [209]. Gene Solutions is a Ho Chi Minh City-based company that's become a leader in genetic testing in Southeast Asia [209]A South Korean company, AITRICS, recently received Vietnam's MoH approval for its AI software, which predicts patient deterioration (e.g., detecting early warning signs of sepsis in ICUs).

The business model in Vietnam often involves partnerships with the public sector. Many AI health startups pilot their products in public hospitals to build credibility and clinical evidence, even if their eventual model is to sell to private clinics or export abroad. For instance, VinBrain's DrAid was trialled in large public hospitals [208].

Vietnam's investment climate for health tech and AI has been increasingly favourable. According to a DealStreetAsia report, health-tech startups in Southeast Asia raised around $580 million in 2023, and Vietnam ranked third in the region, after Singapore and Indonesia, in attracting investments [209].

PARTNERSHIPS AND STAKEHOLDERS

Appendix 1 lists key stakeholders in Vietnam. Vietnam has developed a coordinated ecosystem for healthcare AI with clear ministerial divisions: The Ministry of Health oversees digital health policies and implementation, the Ministry of Science and Technology drives AI strategy execution, and the Ministry of Information and Communications develops AI legal frameworks and ethics guidelines.

The academic landscape includes numerous institutions offering computer science and medicine programs, including Vietnam National University and Hanoi University of Science and Technology. However, integration between these disciplines, specifically for healthcare AI, remains limited.

The funding environment has strengthened, and venture capital firms like Do Ventures, VinaCapital Ventures, and Access Ventures are supporting early-stage technology startups. International partners provide crucial support. UNDP offers policy guidance for AI integration, NVIDIA Corporation has established government partnerships for AI research infrastructure, and organizations like WHO and PATH contribute to strengthening the health system.

Several major healthcare institutions, including Cho Ray Hospital, University Medical Center Ho Chi Minh City, and FV Hospital, have adopted digital initiatives, creating potential implementation sites for AI solutions. The emerging business landscape features companies like VinBrain (developer of DrAid for diagnostic radiology), Deepcare (AI-based teleconsultation), and N2TP (clinical decision support software).

Examples of implementation initiatives include:

1. **Tam Anh Research Institute and University of Oxford Collaboration**

The Tam Anh Research Institute (TAMRI) has entered a partnership with the University of Oxford to advance medical research and training in Vietnam. This collaboration focuses on integrating AI into healthcare systems, particularly in addressing challenges in tropical medicine. By combining Oxford's research expertise with TAMRI's local insights, the partnership aims to develop innovative diagnostic tools and treatment protocols [214].

2. **VinBrain and Microsoft Partnership**

VinBrain, a subsidiary of Vingroup, has established a formal collaboration with Microsoft to enhance AI applications in healthcare. This partnership focuses on data sharing, cross-product validation, and research and development. VinBrain leverages its AI-powered platform, DrAid, which assists in detecting various disease indicators, while Microsoft provides support through its

Azure cloud services and advanced computer vision models. This collaboration aims to improve diagnostic accuracy and streamline healthcare workflows in Vietnam [215].

SUMMARY OF KEY CHALLENGES IN ASEAN

The countries included in this report demonstrate a strong commitment to advancing AI in health. Promoting safe, responsible, and inclusive AI requires integrating these principles throughout the development cycle. Our literature review and stakeholder interviews identified significant regional opportunities alongside critical gaps. This section summarises key findings relevant across ASEAN member states.

GOVERNANCE AND REGULATORY

- **Lack of healthcare-specific AI strategies:** While most countries have national AI strategies, none have developed specific AI strategies for health, creating uncertainty about implementation in healthcare contexts.
- **Implementation barriers:** Many countries have established data protection acts and governance frameworks. However, healthcare institutions often lack the legal capacity and expertise to implement them effectively, particularly in resource-constrained settings.
- **Regulatory gaps:** Countries increasingly adopt the ASEAN Medical Device directive, which classifies software as a medical device across risk levels. However, no countries have developed specific AI guidance for regulations despite evidence that AI performance can vary based on ethnicity and geography, creating safety concerns for diverse populations [216, 217].
- **Absence of LLM guidelines:** Regulatory guidelines for large language models (LLMs) in healthcare, such as ChatGPT or Claude, are absent across the region, raising potential patient safety risks when these technologies are used without appropriate guardrails [218].
- **Limited HTA implementation:** Only the Philippines has a HTA mandate for AI. HTA represents a key opportunity to assess whether AI for healthcare is safe and inclusive, as equity considerations are often a core component of these frameworks [219].
- **Emerging post-market surveillance:** While an increasing number of countries are adopting post-market surveillance for AI in healthcare, which is crucial given the risk of adverse events after implementation, systematic approaches remain underdeveloped.

PEOPLE AND WORKFORCE

- **Educational gaps:** No country has integrated AI curricula into pre- or in-service education for healthcare professionals, despite digital literacy and AI knowledge being essential for enabling tomorrow's health workforce to use these technologies effectively.
- **Resource shortages:** Many ASEAN countries face significant shortages of healthcare human resources, impeding providers' ability to adopt AI applications that require initial training and familiarisation, especially in rural and underserved areas.
- **Access inequities:** While computer science curricula are increasingly available, high costs exclude marginalised groups, including women and people from rural areas, from meaningfully participating in AI development, limiting diverse perspectives in solution creation.
- **Talent retention issues:** Many Southeast Asian countries struggle to retain AI talent, particularly Indonesia, Vietnam, and Thailand, where trained professionals often migrate to higher-wage countries, creating a persistent skills gap.
- **Gender representation challenges:** While women's representation in AI is growing across ASEAN, there is limited evidence of concentrated efforts to train and include women specifically in health-related AI initiatives, despite promising programs like UN-backed AI-powered chatbots for women entrepreneurs in the Philippines and women's health platforms in Thailand [220].

DATA AND TECHNOLOGY

- **Security vulnerabilities:** The absence of robust data protection frameworks and security measures specific to health AI raises serious concerns about potential breaches of confidential patient information, undermining trust in these systems.
- **Infrastructure limitations:** Many countries (Cambodia, Lao PDR, Myanmar, Timor-Leste, and Vietnam) have limited technological infrastructure, low internet penetration, and fragmented data systems, hindering AI integration in healthcare, particularly in rural regions.
- **Dependency on foreign technologies:** AI models in most member states (except Thailand, Indonesia, and Vietnam) often rely on foreign-developed technologies, leading to biases and reduced transparency in training data. Stakeholders emphasised that these imported models frequently fail to account for local socio-demographic variations, raising concerns about equitable healthcare delivery and cultural appropriateness.

DESIGN AND PROCESSES

- **Workflow integration gaps:** No ASEAN member state has comprehensively mapped AI integration within health workflows, creating significant implementation barriers. The lack of structured processes for aligning AI solutions with end-user needs (clinicians, patients, and healthcare workers) impedes usability, trust, and effectiveness.
- **Bias and equity risks:** Insufficient human involvement in AI deployment can exacerbate biases, limiting equitable access and reinforcing disparities, particularly regarding gender and social inclusion. Industry AI sandboxes often exclude academia and patient representatives, reinforcing scepticism about AI as a "black box" system.

BUSINESS MODELS

- **Diverse investment frameworks but limited AI focus:** While countries like Malaysia, Indonesia, and the Philippines have established investment frameworks (such as Malaysia's Promotion of Investments Act, Indonesia's Law No. 25 on Capital Investment, and the Philippines' Foreign Investments Act), few have provisions specifically targeting healthcare AI investment.
- **Intellectual property protection gaps:** Most countries have intellectual property laws aligned with international standards, but enforcement varies significantly. Vietnam, Cambodia, and Indonesia face challenges, particularly with IP protection, creating disincentives for AI innovation and investment.
- **Reimbursement uncertainty:** Specific reimbursement mechanisms for AI in healthcare are largely absent across all surveyed countries. Thailand stands out with Universal Health Coverage (UHC), which includes some AI and SaMD reimbursement, while Vietnam and the Philippines have initiated but not fully implemented direct reimbursement frameworks for AI.
- **Uneven sandbox development:** Thailand, Indonesia, and Malaysia have begun developing regulatory sandboxes for testing AI innovations, while other countries lack these controlled environments entirely. Indonesia's 2024 Regulatory Sandbox for Digital Health Innovation represents a promising model.
- **Venture capital concentration:** Healthcare AI funding is heavily concentrated in more developed economies (Malaysia, Thailand, and Indonesia), while countries like Cambodia, Lao PDR, Myanmar, and Timor-Leste have minimal venture capital ecosystems specifically supporting AI in healthcare.
- **Public-private partnership imbalance:** Stakeholders across multiple countries reported that AI adoption in healthcare is primarily driven by private investments rather than

coordinated public-private initiatives, creating equitable implementation and sustainability challenges.

POLICY RECOMMENDATIONS FOR RESPONSIBLE, SAFE, AND INCLUSIVE AI IN HEALTH

Based on the gaps identified across ASEAN member states, we propose actionable policy recommendations that balance immediate impact with the strategic development of AI capabilities in health.

1. Interim Health AI Guidelines through Ministerial Directives

Gaps addressed: Lack of specific regulations for AI in health; weak data protection frameworks.
Institutional implementation: Ministry of Health will be in each country, coordinating with digital/ICT and science/technology ministries.
Existing regulatory frameworks are in development phases across ASEAN and can be refined to include guidelines specific to health AI without requiring comprehensive legislative changes. Health ministries can issue interim guidelines through ministerial directives that:

- Adopt a risk-based classification system for health AI applications, ranging from Level 0 (no automation) to Level 5 (completely autonomous) as suggested in the existing framework [221]
- Require transparency in AI-generated outputs with mandatory labelling
- Mandate clinical evaluation reports proportionate to risk levels
- Establish minimum data protection standards specific to health data
- Implement the two-dimensional framework [222] to systematically classify AI systems as incomprehensible, interpretable, or understandable

These guidelines should align with international best practices, such as the WHO's "Ethics and Governance of Artificial Intelligence for Health: Guidance on Large Multi-Modal Models" [223], while adapting to local contexts. By mandating clear labelling of AI-generated outputs, enhanced consent protocols, and appropriate intellectual property protections, countries can strengthen trust and bridge obstacles to effective human-AI collaboration.
Existing Implementation model: Singapore's Health Sciences Authority (HSA) "Regulatory Guidelines for Software Medical Devices" provides a practical template that other ASEAN countries can adapt to their contexts [224]. Unlike creating entirely new regulatory bodies, this approach leverages existing ministerial authority to establish interim guidelines while more comprehensive frameworks develop.
How the UK can help: The UK's Medicines and Healthcare Products Regulatory Agency (MHRA) and the National Institute for Health and Care Excellence (NICE) have extensive experience developing healthcare AI governance frameworks. The UK's Centre for Data Ethics and Innovation (CDEI) and the Alan Turing Institute have worked extensively on AI risk classification and explainability. The UK can:

1. Establish a regulatory exchange program where SE Asian policymakers receive structured training on risk-based classification, clinical validation, and AI transparency best practices.
2. Co-develop a Health AI Risk Classification Toolkit, tailored to ASEAN's needs, which provides ready-to-use templates for SE Asian health ministries to classify AI systems based on automation levels and interpretability.
3. Establish a UK-ASEAN Health AI Policy Dialogue, bringing together policymakers, researchers, and industry leaders to align on regulatory approaches.
4. Offer secondments or short-term regulatory fellowships instead of direct funding, allowing ASEAN health regulators to shadow UK experts and adapt regulatory models suitable for their local contexts.

2. AI Testbeds in Existing Healthcare Facilities

Gaps addressed: Limited technical infrastructure, disparities in digitisation, and inequitable AI adoption.

Institutional implementation: District-level health departments working with national digital health agencies.

Rather than waiting for comprehensive infrastructure upgrades, member states can transform select existing healthcare facilities into AI testbeds. As District hospitals and health centres in underserved areas can serve as one-stop centres by:

- Equipping them with cloud-based AI diagnostic support tools and assisted telemedicine
- Leveraging alternative connectivity solutions where needed, including satellite internet options like Starlink, which has already begun deployment in countries like Timor-Leste [225]
- Utilising off-grid solutions such as those developed by Blackfrog Technologies to ensure continuous operation in areas with unreliable power [226]
- Creating demonstration sites that double as digital literacy hubs with trained facilitators
- Implementing AI Decision Support Tools with embedded training capabilities to enhance workforce skills

These centres would promote trust among local communities through familiar settings while providing practical environments for testing AI applications. The approach builds on existing government digitisation efforts through public-private partnerships without requiring massive new infrastructure.

Existing Implementation Model: Vietnam's implementation of VinBrain's DrAid in public hospitals shows how AI pilots can use existing infrastructure while building clinical evidence [227].

How the UK can help:

1. The UK is home to leading AI health tech companies such as DeepMind Health (Google UK), BenevolentAI, and Ultromics. These companies specialise in AI-driven diagnostics for radiology, cardiology, and oncology. These firms can pilot AI solutions in ASEAN testbed sites, supporting early disease detection in rural and underserved areas.
2. UK-based institutions like the NHS AI Lab can provide frameworks for evaluating AI diagnostic tools, ensuring that testbed deployments align with global best practices.
3. The UK can facilitate partnerships between ASEAN governments and UK satellite internet providers (e.g., OneWeb, a British satellite internet company competing with Starlink) to enhance internet access in rural health centres [228].

3. Healthcare AI Skills Acceleration Program

Gaps addressed: Lack of trained healthcare workforce; limited AI literacy.

Institutional implementation: Medical and nursing education councils can partner with technology ministries and industry.

The existing healthcare workforce can be trained and upskilled by developing structured capacity-building approaches. As noted in the original recommendations, specific budgets should be allocated within national 'AI in health' strategies for:

- Creation of modular AI literacy micro-credentials for practising clinicians
- Development of online learning platforms tailored explicitly to health workers
- Integration of basic AI concepts into existing continuing education requirements
- Establishment of mentorship networks between technology and healthcare sectors
- The incorporation of AI modules in nursing and medical curricula. These modules should familiarise health workforce members with the use of AI and how it works, including its benefits and limitations.

This approach addresses immediate needs through upskilling programs and long-term workforce development through curricular changes. By collaborating with industry experts, academia, and public-private partnerships, workforce training can be accelerated without requiring extensive new government expenditures.

Implementation model: Malaysia's AI Talent Development Initiative and the MCMC-Microsoft AI TEACH Program, with their focus on underrepresented groups, demonstrate how structured skills

programs can be implemented through partnerships rather than solely through government-led programs [45].

How UK can help:

1. The NHS AI Lab and UK's Health Education England can develop AI training modules for district-level healthcare workers in ASEAN, ensuring on-site AI upskilling in testbed facilities.
2. The UK's General Medical Council and Royal College of Nursing can work with ASEAN institutions to embed AI training into medical and nursing school curricula, ensuring long-term workforce readiness.
3. UK-based health AI professionals can participate in a mentorship exchange program with ASEAN clinicians, providing hands-on guidance in AI adoption. The NHS Clinical Entrepreneur Program can be adapted for ASEAN, supporting AI-driven healthcare innovations by connecting ASEAN clinicians with UK AI experts [229].
4. The UK can help ASEAN establish an AI-powered knowledge-sharing network in ASEAN based on federated learning, ensuring cross-border collaboration while preserving data privacy. Drawing from the European Health Data Space Regulation (EHDS) and Global Digital Health Partnership (GDHP), the UK can support interoperability frameworks, allowing ASEAN countries to securely exchange AI-driven health insights [230, 231].

4. Data Quality and Interoperability Standards

Gap addressed: Fragmented health information systems; data quality issues; lack of representative datasets.

Institutional implementation: National health information departments working with standards bodies.

The lack of quality, interoperable health data represents a fundamental barrier to responsible AI development. Building on existing digitisation efforts, countries can:

- Adopt minimum health data interoperability standards based on international frameworks (e.g., Fast Healthcare Interoperability Resources (FHIR) [232])
- Implement data quality assessment tools for existing health datasets
- Create incentives for healthcare facilities to improve data documentation
- Establish clear protocols for de-identification of health data for AI training

These actions would help address many AI systems' "black box" nature. By improving data quality and interoperability, countries can create environments where AI development can proceed with appropriate safeguards.

Implementation model: Singapore's National Electronic Health Record (NEHR) data standards provide a reference point [233]. Vietnam's VinDr open dataset initiative demonstrates how standardised, locally relevant training data can be developed through collaborative approaches between academic institutions and healthcare providers [234].

How the UK can help:

1. The UK's NHS Digital and the Centre for Improving Data Collaboration can provide technical guidance on implementing FHIR and other global health data standards across ASEAN [235].
2. UK research institutions (e.g., Alan Turing Institute, Open Data Institute) can work with ASEAN universities to develop open, standardised AI training datasets using models like Vietnam's VinDr initiative. The UK's HDR UK (Health Data Research UK) federated learning model can be adapted for ASEAN, enabling AI training on diverse patient datasets while maintaining data privacy [236].
3. NHS England's Data Quality Maturity Index (DQMI) framework can be adapted for ASEAN to assess and improve health data quality in hospitals and clinics. UK experts can provide training for ASEAN health data officers on data validation, cleansing, and bias mitigation techniques [237].

4. Regulatory Sandboxes for Health AI Innovation

Gaps addressed: Lack of validation processes, barriers to safe experimentation, and uncertain regulatory pathways.

Institutional implementation: Collaborative framework between health and technology regulators with defined operational guidelines.

Regulatory uncertainty often impedes innovation while simultaneously failing to protect the public. Establishing controlled environments for testing AI health innovations can address both concerns:

- Create straightforward entry and exit criteria for sandbox participation
- Develop simplified but rigorous testing protocols based on risk levels
- Include patient and clinician representatives in sandbox governance
- Provide regulatory guidance throughout the development process

These sandboxes would serve as spaces where developers can test innovations with real-world data and receive regulatory feedback before full-scale deployment. The frameworks should outline users' needs, benefits, risks, socioeconomic impacts, data quality information, and potential biases or inaccuracies.

Implementation model: Indonesia's 2024 Regulatory Sandbox for Digital Health Innovation demonstrates how sandboxes can operate within existing regulatory structures while providing space for innovation [39]. Thailand's AI Governance Clinic, which involves healthcare sector participation, provides another regional example of collaborative approaches to regulation [238, 239].

How the UK can help:

1. The 'AI Airlock'—NHS's AI Lab's Regulatory Sandbox model can be adapted for ASEAN, helping countries develop clear entry/exit criteria, risk-based validation processes, and compliance frameworks for AI-driven healthcare [240].
2. The UK's MHRA can assist ASEAN regulators in creating privacy-preserving sandbox environments that balance innovation with patient safety.
3. UK expertise in real-world validation of AI medical devices (e.g., through the NICE Evidence Standards Framework for Digital Health Technologies) can help ASEAN refine testing protocols for AI-driven diagnostics and treatment recommendations [241].

5. ASEAN Regional Health Technology Assessment Framework for AI

Gaps addressed: Limited HTA implementation, inconsistent evaluation standards, and inequitable access to AI health technologies.

Institutional implementation: The ASEAN Secretariat collaborates with national HTA agencies and is coordinated through the ASEAN Health Cluster**.**

Only the Philippines currently has an HTA mandate for AI, creating inconsistencies in how AI technologies are evaluated across the region. An ASEAN-wide framework would:

- Establish core principles for evaluating health AI technologies with explicit inclusion of safety, effectiveness, and equity considerations
- Develop standardised methodologies for assessing AI technologies that account for their unique characteristics (continuous learning, context-specificity)
- Create specific protocols for evaluating algorithmic bias and ensuring representative testing across diverse populations
- Implement mechanisms for sharing evaluation data across member states to prevent duplication of efforts
- Guide appropriate reimbursement models based on demonstrated value

This regional framework would allow countries to maintain sovereignty over approval decisions while benefiting from shared methodologies and evidence. It would particularly benefit member states with less developed HTA capabilities, enabling them to make informed decisions about AI technologies without building extensive infrastructure from scratch.

Implementation model: The ASEAN Medical Device Directive provides a precedent for regional harmonisation while respecting national regulatory authority [22]. The framework could build on regional cooperation mechanisms like the ASEAN Medical Device Committee, with technical support from more established HTA agencies such as Thailand's Health Intervention and Technology Assessment Program (HITAP) and the Philippine HTA Unit.

How the UK can help:

1. The UK's expertise in health technology assessment (HTA) and evidence-based AI evaluation can support ASEAN in developing AI-specific HTA guidelines drawing from the NICE standards for AI and digital health and The NHS AI Lab's evidence framework, which defines the real-world validation process for AI-driven medical tools [242].
2. The existing Asia eHealth Information Network (AeHIN) is a regional collaborative network and a valuable platform for accelerating AI adoption in healthcare, strengthening health information systems and promoting the use of ICTs to improve health outcomes in South and Southeast Asia. It focuses on capacity building, health data governance, digital health advocacy, and interoperability. The UK can partner with AeHIN to expand its scope to include AI governance, evaluation, and policy development, provide technical assistance in AI capacity-building programs, and support ASEAN in adopting AeHIN's "Mind the GAPS" (Governance, Architecture, Program Management, and Standards) framework for AI oversight [243].

KEY RESEARCH THEMES AND QUESTIONS

Building on our mapping of AI readiness across ASEAN member states, the identified gaps in the summary section, and our policy recommendations, we propose the following strategic research themes and questions. These are designed to guide investment and promote innovation in responsible, safe, and inclusive AI for healthcare across the region.

1. People and Workforce Development
Research theme: Scaling AI training programs to bridge the talent gap in healthcare AI.
Key questions:

- How can healthcare-specific AI training be effectively integrated into existing medical and nursing curricula without overburdening already stretched educational systems?
- What are the most effective models for upskilling practicing healthcare professionals with varying levels of digital literacy?
- How can countries develop retention strategies to prevent AI talent migration from Indonesia, Vietnam, and Thailand to higher-wage economies?
- What interventions are most effective in promoting gender diversity in healthcare AI development, and how can these be tailored to cultural contexts across ASEAN?
- How can digital literacy initiatives be designed to reach underserved communities, particularly in rural areas with limited connectivity?

2. Data Quality and Interoperability
Research theme: Improving data quality, interoperability, and representativeness to ensure safe and inclusive AI models.
Key questions:

- What are the minimum data standards required across ASEAN to enable responsible AI development while respecting varying levels of digital maturity?
- How can countries with fragmented health information systems effectively aggregate data for AI training while ensuring privacy and security?
- What approaches are most effective in identifying and mitigating bias in training datasets for healthcare AI across ASEAN's diverse populations?
- How can synthetic data generation techniques be leveraged to address data scarcity while ensuring clinical validity?
- What governance frameworks best balance data access for innovation with privacy protection in Southeast Asia?

3. Governance and Regulatory Frameworks
Research theme: Developing fit-for-purpose regulatory approaches for healthcare AI that ensure safety while enabling innovation.
Key questions:

- What regional regulatory models are most effective for different levels of AI maturity across ASEAN member states?
- How can post-market surveillance be implemented efficiently, particularly in resource-constrained settings?
- What standardised approaches to clinical validation are most appropriate for different categories of healthcare AI applications?
- How can reimbursement frameworks be designed to incentivize AI solutions that address priority health needs while ensuring equity?
- What are the most effective liability and accountability frameworks for AI in healthcare that appropriately distribute responsibility between developers, healthcare institutions, and clinicians?

4. Clinical Integration and Workflow Design
Research theme: Integrating AI into clinical workflows to enhance rather than disrupt healthcare delivery.
Key questions:

- How can human-centred design principles be applied to develop AI tools that fit seamlessly into existing clinical workflows?
- What implementation strategies are most effective for overcoming resistance to AI adoption among healthcare professionals?
- How should decision-making authority be balanced between AI systems and healthcare professionals across different use cases?
- What metrics are most appropriate for evaluating the real-world impact of AI on healthcare quality, efficiency, and equity?
- How can AI tools be designed to function effectively in low-resource settings with connectivity challenges?

5. Sustainable Business Models
Research theme: Developing financially sustainable approaches to scale AI innovations beyond pilot projects.
Key questions:

- What procurement models best incentivize responsible AI development while ensuring affordability for public health systems?
- How can public-private partnerships be structured to align commercial interests with public health priorities?
- What value assessment frameworks are most appropriate for different categories of healthcare AI applications?
- How can countries develop domestic AI innovation ecosystems that reduce dependency on foreign-developed technologies?
- What financial incentives most effectively direct AI development toward underserved populations and neglected health conditions?

CASE STUDIES

CASE STUDY I: DrAID™, VIETNAM

Medical Imaging and Health Data Management

Context: DrAid™ is an AI-powered diagnostic tool that enhances medical imaging and data-driven healthcare solutions. It facilitates comprehensive chest X-ray screening (CXR), CT Liver Cancer Diagnosis and Treatment (DAndT), and MRI Rectal Cancer DAndT. These applications aid in early disease detection and assist oncologists in developing precise treatment plans. Additionally, DrAid™ provides data solutions for predicting hospital trends, such as patient overflow, and acts as a co-pilot for medical professionals, optimising workflow efficiency.

Summary: VinBrain's DrAid™ represents a breakthrough in AI-driven medical imaging, offering rapid and accurate disease screening capabilities. It is Southeast Asia's first AI-powered X-ray diagnostic tool to receive FDA approval in 2022, affirming its adherence to stringent quality and safety standards [244]. The tool can identify 21 lung, heart, and bone abnormalities within 15 seconds with an impressive average accuracy of 91.2%. By significantly reducing initial screening time by 80-85% and improving diagnostic precision by up to 25%, DrAid™ is transforming healthcare efficiency [245]. The platform continuously refines its diagnostic accuracy by leveraging a vast dataset of 2.3 million images, including 400,000 labelled images [246]. DrAid™ is currently employed by nearly 2,000 doctors across over 100 hospitals in Vietnam, including major institutions such as Hospital 108 and the University Hospital of Medicine and Pharmacy in Ho Chi Minh City [247].

AI Approach: Predictive and discriminative AI approach, leveraging machine learning techniques.

AI Model: Convolutional neural network (CNN).

Model Maturity: DrAid™ has reached a high level of maturity, as evidenced by its regulatory approvals and widespread adoption. The FDA approval in 2022 underscores its compliance with rigorous medical standards [244]. Following this milestone, the model has been integrated into over 100 hospitals in Vietnam, demonstrating strong clinical validation [247]. However, information regarding its performance across diverse populations and its adaptability to different imaging equipment is limited.

Responsible, Safe, and Inclusive Assessment: VinBrain prioritises responsible AI development through compliance with international regulations and data security measures [248]. DrAid™ aligns with ISO 13485:2016 and ISO 9001:2015 quality management standards, ensuring safety and efficacy [249]. It also adheres to HIPAA regulations, safeguarding patient data with Microsoft Azure's advanced encryption and authentication protocols [245, 249]. The platform follows HL7 FHIR standards for seamless and accurate data exchange between healthcare systems [249]. VinBrain collaborated with Stanford University to standardise labelling processes, promoting inclusive and representative AI training data [250]. While this initiative contributes to demographic inclusivity, explicit details on targeted efforts for gender diversity and underserved populations remain unclear.

CASE STUDY II: PERCEPTRA, THAILAND

AI-Powered Medical Imaging: Transforming Diagnostics in Thailand

Context: Perceptra's journey began as a research project in collaboration with Siriraj Hospital in 2019 [251]. Since then, it has evolved into a leading AI-driven medical imaging provider in Thailand. The company's flagship product, Inspectra CXR, played a crucial role during the COVID-19 pandemic, scanning over 400,000 cases in 2021 and assisting more than 600 radiologists in efficiently allocating limited medical resources [252]. In 2023, Inspectra CXR V3 became the first Thai AI-powered chest X-ray solution to receive Thai FDA approval, followed by HSA approval in 2024 [253, 254]. Looking ahead, Inspectra CXR V4 aims to achieve nationwide deployment as part of Thailand's national healthcare package. Perceptra's solutions are now implemented in 90+ hospitals across Thailand. The company continues to expand its AI portfolio with the introduction of Inspectra EYE (developed in collaboration with Google Health, launched in 2024) [255], Inspectra MMG (mammography AI, launched in six pilot sites in 2024 in partnership with Siriraj Hospital) [256], and Inspectra CTB (brain CT AI, expected to launch in 2025).

Summary: Perceptra's AI solutions are designed to enhance diagnostic accuracy, streamline hospital workflows, and improve patient outcomes. Inspectra CXR provides real-time AI-powered chest X-ray analysis, detecting up to eight abnormalities with high precision. Trained on 2.1 million global images and further refined using 900,000 Thai images, it seamlessly integrates into existing hospital systems. Building on this success, Inspectra MMG delivers AI-assisted mammography interpretation. Developed in collaboration with over 20 breast imaging specialists, the system excels in detecting key breast abnormalities, including calcifications, nodules/masses, architectural distortions, and axillary adenopathy. Its deep learning models are trained on dense breast data with comprehensive lesion labels, ensuring high sensitivity and accuracy.

AI Approach: Deep learning and computer vision techniques for image analysis. Cloud-based AI solutions for seamless integration with hospital systems.

AI Model: Convolutional neural networks (CNNs).

Model Maturity: Perceptra's AI solutions have reached a significant level of maturity, with regulatory approvals and widespread hospital adoption. The success of Inspectra CXR V3 and Inspectra MMG demonstrates clinical validation and acceptance. However, Inspectra CXR V4 is still in progress towards national healthcare package inclusion. Additionally, Inspectra CTB, slated for a 2025 launch, will further expand Perceptra's AI-driven diagnostics.

Responsible, Safe, and Inclusive Assessment: Perceptra prioritises responsible AI deployment by ensuring regulatory compliance, data security, and bias mitigation. Its AI models are trained on extensive Thai-specific datasets to improve localisation and fairness [252, 256]. The Inspectra suite is fully integrated with hospital IT infrastructures, providing secure, scalable, and privacy-compliant solutions. However, continued efforts in peer review validation, user training, and AI explainability will further strengthen trust and adoption among healthcare professionals.

CASE STUDY III: MEDIBOT, TIMOR LESTE

AI-Driven Clinical Decision Support Chatbot in Timor-Leste

Context: The quality of primary care in Timor-Leste is constrained by limited clinical training, especially in remote areas where physicians lack access to clinical supervision and professional development. Although clinical guidelines exist, they are often in English rather than Tetun, difficult to access both physically and digitally, and not well-integrated into medical practice. Medibot is the first AI-driven clinical decision support chatbot in Timor-Leste, providing primary care providers with an AI-powered co-pilot for diagnosis and treatment [257].

Summary: Medibot addresses critical gaps in primary healthcare delivery by offering AI-powered clinical decision support tailored to Timor-Leste's healthcare system. Trained on nationally approved clinical guidelines, Medibot ensures that its recommendations are contextually relevant, considering local disease patterns, available treatments, and healthcare infrastructure. By integrating with widely used platforms like WhatsApp and Telegram, Medibot reduces adoption barriers and enhances accessibility for healthcare providers. Additionally, the platform incorporates AI reliability mechanisms, including self-critique, role assignment, and an upcoming peer-review process, where expert doctors will review AI-generated responses against Ministry of Health guidelines. The chatbot is currently being piloted with several NGOs in Timor-Leste, collectively housing 300 doctors and health workers. While national regulatory frameworks for AI in healthcare are still developing, Medibot aims to work with regulatory bodies to co-create policies that can serve as a foundation for future AI applications in low-and-middle-income countries (LMICs).

AI Approach: Probabilistic AI approach, leveraging machine learning models.

AI Model: Transformer-based AI model, similar to large language models (LLMs).

Model Maturity: Medibot is in the pilot phase, currently deployed within several NGOs that employ around 300 healthcare professionals. Efforts are underway to scale its reach to Timor-Leste's network of 1,200 doctors and 7,000 health workers. The platform has received approval for testing within these NGOs, and discussions are ongoing with regulatory bodies for broader national adoption. Given the nascent nature of AI regulations in LMICs, Medibot is a pioneering use case for shaping future regional AI policies.

Responsible, Safe, and Inclusive Assessment: Medibot is built with a strong emphasis on inclusivity, safety, and responsible AI deployment. The chatbot ensures that its recommendations align with local healthcare standards by training on nationally approved medical guidelines. Integration with WhatsApp and Telegram enhances accessibility, particularly in remote areas with limited digital infrastructure. Robust mechanisms, including AI self-critique, role assignment, and planned peer review, improve the reliability of recommendations while fostering trust among healthcare providers. Additionally, healthcare professionals receive training on AI prompting, risk mitigation, and professional responsibility, further strengthening digital literacy.

CASE STUDY IV: DOCDOC, PHILIPPINES

AI-Powered Doctor Discovery and Healthcare Navigation

Context: DocDoc is a healthcare platform designed to enhance patient access to quality medical care by leveraging artificial intelligence and a dedicated medical concierge service. The platform addresses the challenge of matching patients with the right healthcare specialists based on data-driven insights. Operating across eight Asian countries, including Singapore, the Philippines, Indonesia, Hong Kong, Malaysia, Thailand, South Korea, and Japan, DocDoc connects insured patients with specialists while facilitating seamless cashless transactions with insurance firms [258]. With a vast network of over 23,000 contracted doctors across 65 specialties, DocDoc ensures patients receive personalised and informed recommendations tailored to their specific medical needs [259].

Summary: DocDoc combines AI-driven analytics with expert human oversight to improve healthcare transparency and accessibility. The platform's proprietary HOPE (Heuristic for Outcome, Price, and Experience) engine integrates multiple data sources to assess individual physician expertise and match them with unique patient needs [259]. Through its patient-centric model, DocDoc minimizes out-of-pocket expenses, eliminates unnecessary paperwork, and streamlines interactions between patients, doctors, and insurance providers [260]. By maintaining a strong emphasis on quality, the platform ensures that its recommended doctors are carefully selected based on thorough investigations into their expertise and medical track record. As an industry leader in AI-powered doctor discovery, DocDoc aims to redefine healthcare decision-making by offering safe, transparent, and fair access to medical services.

AI Approach: Probabilistic AI approach, using predictive analytics.

AI Model: Natural language processing (NLP).

Model Maturity: DocDoc’s AI-driven system has reached an advanced stage of maturity. It has been implemented across eight Asian countries and serves a large network of healthcare providers. The platform has undergone rigorous validation through its deployment in real-world healthcare settings.

Responsible, Safe, and Inclusive Assessment: DocDoc prioritises transparency in data usage and protection, ensuring that patient information is handled securely and ethically. The platform follows best practices for privacy compliance, though specific regulatory certifications or adherence to global healthcare data standards are not explicitly mentioned. Regarding inclusivity, DocDoc’s AI-driven approach is designed to mitigate biases and provide equitable healthcare access to patients of all backgrounds. The platform aims to reduce disparities and improve healthcare outcomes for underserved populations by leveraging diverse data points. Future enhancements, such as increased regulatory engagement and further bias-mitigation strategies, would strengthen its commitment to ethical AI practices and inclusive healthcare delivery.

CASE STUDY V: 5G HOSPITAL, THAILAND

Siriraj Hospital: ASEAN's First 5G Smart Hospital

Context: Siriraj Hospital, Thailand's oldest and one of its most prestigious medical institutions, is undergoing a major transformation to become ASEAN's first 5G-powered smart hospital. By integrating 5G technology, artificial intelligence (AI), and cloud computing, the hospital aims to enhance medical services, improve patient care, and increase operational efficiency. This initiative represents a significant step towards modernizing healthcare infrastructure in the region, setting a precedent for other hospitals to follow.

Summary: The implementation of 5G smart hospital technology at Siriraj Hospital is revolutionising multiple aspects of healthcare delivery. The initiative includes smart emergency medical services, where 5G-equipped ambulances transmit real-time patient data and high-resolution videos to doctors, enabling immediate remote guidance. AI-powered inventory management predicts and optimises medical supply needs, reducing waste and operational costs. AI-driven pathological diagnosis systems enhance accuracy and efficiency, while real-time patient tracking and automated alerts improve emergency room monitoring [261, 262]. The long-term vision is to expand these advancements beyond Siriraj Hospital, bringing AI and 5G-enabled healthcare solutions to hospitals across Thailand, particularly in rural areas.

AI Approach: Predictive and probabilistic AI models.

AI Model: Convolutional neural networks (CNNs) for image-based diagnostics in pathology, Deep learning algorithms for predictive analytics in inventory management and patient monitoring.

Model Maturity: The smart hospital initiative is in an advanced deployment phase, with key components such as 5G-enabled ambulances and AI-driven inventory management already in use. The expansion plans indicate a roadmap toward scaling these technologies nationwide. However, further validation and regulatory approvals may be needed to ensure uniform implementation across different hospital environments, particularly in rural healthcare settings where infrastructure challenges exist.

Responsible, Safe, and Inclusive Assessment: Siriraj Hospital prioritises responsible AI deployment by integrating cloud security measures and encryption to protect patient data. Real-time monitoring enhances patient safety, reducing risks associated with delayed medical intervention. Efforts are also being made to extend AI-powered healthcare solutions to rural hospitals, ensuring equitable access to advanced medical technology. However, details on inclusivity measures, such as AI bias mitigation or multilingual accessibility, are not explicitly mentioned, highlighting an area for further development.

CASE STUDY VI: VeriSee DR, Acer medical, INDONESIA

AI-Powered Diabetic Retinopathy Screening

Context: VeriSee DR is an AI-assisted diagnostic software from Taiwan, designed to identify high-risk diabetic retinopathy (DR) patients with high accuracy and efficiency. It has received regulatory approval by the Indonesian MOH. Its deep learning model has been trained on images labelled by retina specialists and validated in a pivotal clinical trial against a rigorous clinical reference standard. By leveraging AI techniques, VeriSee DR delivers screening accuracy comparable to professional ophthalmologists, achieving a 93% accuracy rate in referral recommendations [263].

Summary: VeriSee DR enhances diabetic retinopathy detection by analysing retinal images and providing immediate referral recommendations to ophthalmologists. It applies advanced deep learning models to retinal images, enabling real-time detection of DR indicators. The system's neural network architecture is trained on extensive datasets of expert-labelled retinal images The AI model is optimised for high sensitivity (95%) and specificity (90%) [264, 265]. The AI-generated referral recommendations are cross-referenced with lesion detection results to minimise false positives and false negatives, improving diagnostic confidence. It's key features include broad camera compatibility (supports multiple retinal camera brands, including Topcon, Canon, Crystalvue, Nikon, and MiiS), offline functionality (can be operated without an internet connection, ensuring accessibility in remote and resource-limited settings), lesion detection & location mapping: (identifies the four primary DR lesions—microaneurysms, haemorrhages, soft exudates, and hard exudates—and pinpoints their locations), and efficient processing (produces referral recommendations within 30 seconds of image upload) [263].

AI Approach: Deep learning techniques.

AI Model: Convolutional neural networks (CNNs).

Model Maturity: VeriSee DR is a clinically validated AI solution with proven real-world applications. Its high performance and regulatory approval in Taiwan demonstrate its readiness for widespread adoption whilst being already approved and officially launched in five Southeast Asia countries including Thailand, Indonesia, Philippines, Vietnam, and India [266]. Future developments may focus on further expanding camera compatibility, enhancing AI explainability, and integrating with broader healthcare IT ecosystems.

Responsible, Safe, and Inclusive Assessment: VeriSee DR prioritises patient safety, accuracy, and inclusivity. By supporting offline functionality, it ensures accessibility for healthcare providers in low-connectivity regions. Its clinical validation and rigorous testing promote reliability, while multi-camera compatibility broadens its usability across different medical facilities. To further strengthen trust, continued efforts in peer-reviewed validation, physician training, and explainability of AI recommendations will enhance the software's safe integration into clinical practice.

CONCLUSIONS

The landscape of AI in healthcare across ASEAN reveals both tremendous potential and significant challenges. While the region demonstrates a strong commitment to technological advancement, realising responsible, safe, and inclusive AI in healthcare requires a multifaceted, collaborative approach.

This study highlights AI's transformative potential in ASEAN healthcare. Projections suggest AI could add $1 trillion to the Southeast Asian GDP by 2030, with promise in addressing critical healthcare challenges. However, the current implementation is driven more by specific institutional needs than by a comprehensive, systematic strategy.

We identified critical challenges across the nine member states. Regulatory frameworks remain underdeveloped, with most countries lacking healthcare-specific AI strategies that could provide clear guidance and ensure patient safety. Significant workforce limitations, characterised by a critical shortage of AI-skilled healthcare professionals and limited digital literacy, impede meaningful AI integration, particularly in rural and underserved areas. Infrastructure constraints persist, with substantial disparities in digital infrastructure, data interoperability, internet connectivity, and technological readiness. Perhaps most concerningly, AI solutions often fail to represent diverse populations, potentially exacerbating healthcare inequities adequately.

This report's findings and recommendations align with the ASEAN Responsible AI Roadmap (2025-2030), which provides a strategic blueprint for responsible AI development and deployment across the region [267]. The roadmap’s cross-cutting pillars—Skills & Capacity Building, Fairness & Inclusion, Governance & Participation, and Integration & Cooperation—directly address many of the challenges identified in our analysis. For instance, our recommendation to establish AI testbeds in existing healthcare facilities complements the roadmap’s objective of advancing digital infrastructure and connectivity for AI.

Despite these challenges, the report identified opportunities for advancement. The ASEAN eHealth Information Network and emerging regional initiatives provide promising knowledge-sharing platforms and collaborative development. Countries like Vietnam, Thailand, and Indonesia are developing localised AI solutions demonstrating the potential for context-specific healthcare innovations. An emerging ecosystem of partnerships between governments, academic institutions, and private sector entities is creating foundational frameworks for responsible AI development for health.

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APPENDIX

CAMBODIA

INSTITUTIONS	ROLE
Government	
Ministry of Health (MoH)	Oversees public health policies and collaborates on AI-driven health initiatives. Regulation of AI and Reimbursement policies in healthcare.
Ministry of Industry, Science, Technology and Innovation (MISTI)	Leads the national AI strategy and regulation across all sectors. Develops AI governance frameworks, ethical guidelines, and compliance policies. Ensures responsible AI adoption aligned with international AI ethics standards.
Ministry of Post and Telecommunications (MPTC)	Regulates data governance, cybersecurity, and digital transformation policies that impact AI adoption. Ensures AI-driven health and government digital solutions align with national ICT policies.
Ministry of Education, Youth, and Sports (MoEYS)	Provides funding and resources for AI education and research, supporting universities and institutions in developing AI capabilities.
Academia	
Royal University of Phnom Penh (RUPP) ,Cambodia Academy of Digital Technology , American University of Phnom Penh, And Institute of Technology, Cambodia	Offers programs in Computer science.
University of Puthisastra (UP)	Offers programs in medicine.
International University (Cambodia) And University of Health Sciences, Cambodia	Offers programs in Computer science and medicine.
Funding organisations	
Smart Axiata Digital Innovation Fund (SADIF)	Venture capital fund that invests in Cambodian-based, high-growth digital companies.
Development partners	
World Health Organization (WHO)	Collaborates with Cambodia's Ministry of Health to bolster health systems and addressing public health challenges.
World Bank	supporting Cambodia's healthcare transformation through projects like the Health Equity and Quality Improvement Project (H-EQIP).

UNESCO	Supports Cambodia's AI ethics readiness and AI policy development.
Asian Development Bank (ADB)	Contributes to various initiatives aimed at enhancing healthcare services and infrastructure.
Asia Catalyst	collaborates with local organizations to enhance healthcare access and rights for marginalised populations.
The Asia Foundation	Assists Cambodian ministries and organizations in AI policy development.
Healthcare	
Cambodia-China Friendship Preah Kossamak Hospital, Cambodia's Central Hospital , And Calmette Hospital	Adopted digital healthcare initiatives.
Potential business	
ArrowDot	Cambodian startup that utilises AI functions to automate data analysis and business development processes.

Implementation initiatives

1. AI-supported diagnosis of eye and cardiovascular disease in some healthcare settings in Cambodia [20].
2. Study of an AI decision support system to guide antibiotic prescribing for a children's hospital [268]. Results indicated that the random forest algorithm provided the best predictive performance for antibiotic susceptibility, improving the targeting of empiric therapy and potentially reducing antimicrobial resistance.

INDONESIA	
INSTITUTIONS	**ROLE**
Government	
Ministry of Health (Kementerian Kesehatan)	Responsible for the development of National Health Policies. Oversees the development of healthcare services using AI and healthcare reimbursement policies.
KORIKA (Kolaborasi Riset dan Inovasi Industri Kecerdasan Artifisial)	An organisation established to orchestrate AI initiatives across government, industry, academia, and the community.
Ministry of Education, Culture, Research, and Technology	Instrumental in formulating and implementing Indonesia's National AI Strategy 2020-2045. Responsible to bolster AI research and innovation, develop AI research centres.
Ministry of Communication and Digital Affairs (Kementerian Komunikasi dan Digital)	Responsible for formulating policies and regulations to promote digital transformation and the integration of AI technologies. Oversees the development of digital infrastructure and ensures the ethical implementation of AI.
National Research and Innovation Agency (Badan Riset dan Inovasi Nasional - BRIN)	Coordinates national research and innovation efforts. It integrates various research organizations to streamline and enhance research initiatives.
National Cyber and Crypto Agency (Badan Siber dan Sandi Negara - BSSN)	Responsible for cybersecurity and cryptography, ensuring the security of digital infrastructures.
Academia	
University of Indonesia (Universitas Indonesia - UI), Gadjah Mada University (Universitas Gadjah Mada - UGM)	Offers programs in Computer science and medicine.
Bandung Institute of Technology (Institut Teknologi Bandung - ITB), Bina Nusantara University (BINUS), Telkom University, Sepuluh Nopember Institute of Technology (Institut Teknologi Sepuluh Nopember - ITS), Gunadarma University	Offers programs in Computer science.
Airlangga University (Universitas Airlangga - UNAIR), Padjadjaran University (Universitas Padjadjaran - UNPAD), Hasanuddin University (Universitas Hasanuddin - UNHAS)	Offers programs in medicine.
Funding organisations	
East Ventures	Supports tech founders and disruptors across Indonesia.
Alpha JWC Ventures	specialises in early to growth-stage investments, focusing on enterprise and consumer-related companies.
Development partners	

United Nations Development Programme (UNDP)	Focuses on improving the accessibility and quality of healthcare services in Indonesia, emphasising universal health coverage.
World Health Organization (WHO)	Provides technical guidance and support to Indonesia's Ministry of Health, aiding in the development and implementation of health programs.
Asian Development Bank (ADB)	Provides support in improving the prevention, detection, and treatment of communicable and noncommunicable diseases in Indonesia.
United States Trade and Development Agency (USTDA)	Assisting Indonesia in developing smart city innovations for its new capital city.
Microsoft	Aid in AI-related upskilling in Indonesia.
Economic Research Institute for ASEAN and East Asia (ERIA)	Partnered with the Ministry of Health to enhance national health policy and capacity, aiming to improve healthcare delivery and policy implementation.
Healthcare	
Siloam Hospitals Group, Mayapada Healthcare Group, Universitas Gadjah Mada (UGM) Academic Hospital, Metropolitan Medical Centre (MMC), Primaya Hospital Group	Adopted digital healthcare initiatives.
Potential business	
Nexmedis	Nexmedis is a health information system provider that assists healthcare facilities in optimising operations through AI-driven solutions.
Prixa	Prixa is a health-tech startup utilising AI-powered algorithms to analyse medical images and assist doctors in diagnosing diseases.
Rey	App and cloud-based life and health insurance platform offering solutions for critical illness insurance, lab test coverage, medical coverage, and more.

Implementation initiatives

1. The National Research and Innovation Agency (BRIN) is working on a data infrastructure for biological and genetic resources, including uses for population health research in Indonesia [269].
2. The Institut Teknologi Bandung (ITB) and Bukalapak Collaborative Artificial Intelligence and Cloud Laboratory to advance AI research. [270].
3. Special Economic Zones established to boost investment in tech ventures like data centres [271].
4. KORIKA and OpenAI are collaborating to develop an AI system that “aligns with the Indonesian nation’s values” [272].
5. NVIDIA and the Ministry of Education, Culture, Research and Technology signed an MoU to develop AI talent – including education over 20,000 students in AI skills [273].
6. The national open data portal launched in 2014 – over 90,000 publicly-available dataset across diverse areas [274].

7. Siloam Hospitals and Philips are collaborating to boost AI in healthcare through capacity-building and technical solutions [275].
8. MoH – Harrison.ai collaboration to leverage AI in radiology and other health services [276].

LAO PDR	
INSTITUTIONS	**ROLE**
Government	
Ministry of Health (MOH)	The Ministry of Health is responsible for the governance and guidance of healthcare in Laos, including AI policy development, healthcare delivery, and public health initiatives.
Ministry of Technology and Communications (MTC)	the MTC leads the country's digital transformation, overseeing the development of government infrastructure, national digitisation standards, and government software frameworks.
Academia	
National University of Laos (NUOL), Souphanouvong University, Lao-Korean College (LKC)	Offers programs in computer science.
University of Health Sciences (UHS)	Offers programs in medicine.
Funding organisations	
LTS Ventures	Based in Vientiane, LTS Ventures is a venture capital firm that invests in fintech, business, and software development for SMEs in Laos.
Development partners	
Asia Catalyst	Partners with community-based organizations to promote health rights and improve access to healthcare services.
Healthcare	
Medi Laos International Hospital	Adopted digital healthcare initiatives.

Implementation initiatives

1. AI-supported diagnosis of eye and cardiovascular disease in some healthcare settings in Cambodia [20].
2. Partnership between Hayat Technologies (provider of AI solutions) and healthcare professionals in Vientiane, Laos: Forecasting dengue outbreaks and integrating data into AI.rbo system [269].
3. The RAD-AID Friendship system for radiology has been implemented in one children's hospital in Lao PDR. This upgraded digital infrastructure can be integrated with AI, laying the foundation for phased AI implementation as Lao refines its regulatory frameworks [277].
4. Medi Laos International Hospital is set to implement an AI-enabled online queuing system in its Emergency Department, supported by a $1.5 million grant from SCALE AI [278].

MALAYSIA	
INSTITUTIONS	**ROLE**
Government	
Ministry of Health (MOH)	Oversees public health policies and collaborates on AI-driven health initiatives. Regulates AI applications in healthcare, including diagnostic tools and digital health systems.
Ministry of Digital	Oversees the national digital transformation and AI agenda, including infrastructure development, cybersecurity, and the digital economy. Leads the National AI Office (NAIO) to drive AI policy, governance, and ethical AI adoption across sectors.
Ministry of Science, Technology, and Innovation (MOSTI)	Develops AI research, innovation, and governance frameworks to ensure responsible AI adoption. Oversees the National AI Roadmap 2021-2025 and National Guidelines on AI Governance and Ethics to promote ethical AI use in Malaysia.
Ministry of Higher Education (MOHE)	Ensures the development of AI talent and workforce readiness by integrating AI education into universities and technical institutions.
Academia	
University of Malaya (UM), Universiti Kebangsaan Malaysia (UKM), Universiti Sains Malaysia (USM), Universiti Putra Malaysia (UPM)	Offers programs in Computer science and medicine.
Universiti Teknologi Malaysia (UTM), Multimedia University (MMU), Asia Pacific University of Technology and Innovation (APU)	Offers programs in computer science.
International Medical University (IMU), Newcastle University Medicine Malaysia (NUMed), RCSI And UCD Malaysia Campus (RUMC)	Offers programs in medicine.
Funding organisations	
Khazanah Nasional	Malaysia's sovereign wealth fund. Invest in high-growth startups via VC funds.
Cradle Fund	Government-backed early-stage fund that provides seed grants and investment to nascent companies.
NEXEA	Local venture capital and accelerator firm that mentors early-stage Malaysian startups.
Development partners	
United Nations Development Programme (UNDP)	Supports building inclusive AI ecosystems for sustainable development.
Healthcare	

Pantai Hospital Kuala Lumpur, Sunway Medical Centre, Gleneagles Hospital Kuala Lumpur, Hospital Kuala Lumpur (HKL), Prince Court Medical Centre, National Heart Institute (Institut Jantung Negara, IJN)	Adopted digital healthcare initiatives.
Potential business	
Hayat Technologies	Health-tech startup specialising in AI epidemiology and public health analytics.
Naluri	Digital health startup that blends AI with human coaching to tackle chronic disease and mental health.
DF Automation and Robotics	Robotics startup building autonomous guided vehicles powered by AI.

Implementation initiatives

1. Transformation of Technology Park Malaysia into a National AI Park (MRANTI Park) aimed at bringing researchers, creators and innovators together for Research, Development, Commercialization and Innovation [279].
2. Setting up of Universiti Teknologi Malaysia's (UTM) Faculty of Artificial Intelligence (FAI) and MY AI NEXUS programme aimed at bringing renowned AI experts, academic institutions, industry leaders, governmental bodies and stakeholders together [88].
3. AI-powered diagnosis of diabetic retinopathy – the Diabetic Retinopathy Inference with Multi Artificial Neural Network Technology Automation (DR. MATA) [280].
4. “AI untuk Rakyat”, a self-learning online program aimed at enhanced awareness and public understanding of AI [281].
5. Malaysian health-data warehouse (MyHDW) – a national healthcare information gathering and reporting system – is aimed at data interoperability using a common medical data framework. It includes a patient treatment information system (SMRP) and patient registry information system (PRIS) [282].
6. CelcomDigi and AmBank have partnered to offer AI-driven digital healthcare solutions to Malaysian medical providers [283].
7. Purdue University has established AI and data science education partnerships with Malaysian universities, including Universiti Tunku Abdul Rahman (UTAR) and Universiti Tenaga Nasional (UNITEN) [284].
8. Ramsay Sime Darby Health Care (RSDH) has entered a collaboration with Annalise.ai to deploy AI-powered diagnostic tools across its hospitals [285].

MYANMAR	
INSTITUTIONS	**ROLE**
Government	
Ministry of Health	Responsible for administering health affairs and healthcare, including all medical schools.
Ministry of Transport & Communications	Responsible for regulating the transport and communication sectors.
Ministry of Science and Technology	Responsible for multisectoral AI innovation policy in Myanmar.
Digital Economy Development Committee (DEDC)	Focuses on developing and supporting the nation's digital economy through initiatives like infrastructure development, skill enhancement, and fostering innovation.
Academia	
University of Computer Studies, Yangon (UCSY), University of Computer Studies, Mandalay (UCSM), Yangon Technological University (YTU)	Offers programs in computer science.
University of Medicine 1, Yangon, University of Medicine 2, Yangon, University of Medicine, Mandalay, University of Medicine, Magway , University of Medicine, Taunggyi	Offers programs in medicine.
Development partners	
PATH	Working in Myanmar to equip healthcare providers with AI tools to enhance diagnostic accuracy and treatment.
Healthcare	
Pun Hlaing Hospitals, Yangon Children's Hospital (YCH), Pinlon Group of Hospitals	Adopted digital healthcare initiatives.

Implementation initiatives

1. AI for security-related purposes: the “Safe Cities” programme for face recognition in urban settings, supported by Chinese technology company Huawei [286].
2. EyRIS partnered with Advance Innovation to introduce AI-driven retinal screening solutions in Myanmar [287].

PHILIPPINES	
INSTITUTIONS	**ROLE**
Government	
Department of Health (DOH)	Oversees public health policies and collaborates on AI-driven health initiatives. Develops reimbursement policies for AI-integrated healthcare services.
Department of Science and Technology (DOST)	Leads national science and technology initiatives. Supports AI-driven healthcare projects through funding and policy development.
Department of Information and Communications Technology (DICT)	Responsible for planning, developing, and promoting the national ICT development agenda.
Department of Trade and Industry (DTI)	Oversees AI policy development and economic integration. Leads the National AI Roadmap and supports AI adoption in businesses through initiatives.
Academia	
University of the Philippines Manila, University of Santo Tomas (UST)	Offers programs in Computer science and medicine.
De La Salle University (DLSU), Ateneo de Manila University (ADMU), Mapúa University	Offers programs in computer science.
Pamantasan ng Lungsod ng Maynila (PLM) College of Medicine, University of the Philippines College of Medicine, Cebu Institute of Medicine	Offers programs in medicine.
Funding organisations	
QBO Innovation Hub	Supports tech startups, through funding, mentorship, and networking opportunities.
Development partners	
Asian Development Bank (ADB)	Helps to implement reforms and ensure access to high-quality, accessible, and responsive healthcare services.
World Bank	Provides funding, global knowledge, and partnerships to support healthcare.
Healthcare	
St. Luke's Medical Center, The Medical City (TMC), Bataan St. Joseph Hospital and Medical Center (BSJHMC), Manila Doctors Hospital, Makati Life Medical Center	Adopted digital healthcare initiatives.
Potential businesses	
MedHyve	Startup focusing on digital procurement, aiming to simplify medical procurement processes using AI.

Instalimb	uses 3D-CAD, 3D printing, and machine learning technology to create 3D printed prosthetics and orthotics.
Advanced Abilities	Platform offering medical solutions for preventive and early detection.
TQHQ	Provider of cloud and AI-based hospital and laboratory management SaaS solution for the healthcare sector.

Implementation initiatives

1. AI Pinas Research and Development (RAndD) Conference and Workshop 2023, the first AI RAndD conference in the country hosted by the Department of Science and Technology and the University of the Philippines Mindanao [288]
2. National Health Data Repository (NHDR) - The DoH and PhilHealth are pioneering the Philippines' first integrated medical data architecture. The date of completion of the project is unknown [147, 289].
3. AI is being used to detect early liver cancer in CT scans in the CANDLE Study (National Health Institute) [290].
4. An AI-based screening tool for COVID-Pneumonia using chest x-rays in hospitals [291].
5. Dengue prediction model using Long Short-Term Memory (LSTM) at the University of the Philippines [292].
6. Use of computer aided detection/artificial intelligence (CAD/AI) in chest X-ray screening for tuberculosis under the national TB control program.
7. The Medical City (TMC), a prominent hospital chain in the Philippines, has partnered with Lunit, an AI company specialising in medical imaging [293].
8. Qure.ai has partnered with AstraZeneca, Aventus Medical, and Intellicare to advance early risk detection of lung nodules by employing AI-assisted chest X-rays [294].

THAILAND	
INSTITUTIONS	**ROLE**
Government	
Ministry of Public Health (MOPH)	Responsible for formulating AI-related health policies, the development of digital health infrastructure and promoting collaboration between tech companies and healthcare institutes.
Ministry of Digital Economy and Society (MDES)	Responsible for developing AI infrastructure, promoting ethical AI practices, and fostering a skilled digital workforce. The Ministry is also Ministry is aiming to establish a new national artificial intelligence (AI) committee to accelerate the national AI strategy in the second phase.
Ministry of Higher Education, Science, Research, and Innovation (MHESI)	Oversees the development of AI-powered education platforms, fostering AI governance, and supporting research in AI-related fields.
The National Science and Technology Development Agency (NSTDA) affiliated to the Ministry of Higher Education, Science, Research and Innovation	Conduct research and development (R&D) that drives national economic and social progress. Initiatives include collaboration with National Health Security Office (NHSO), developing Pathumma LLM, an AI technology tailored to understand Thai linguistic and cultural contexts, supporting applications such as chatbots and speech-to-text transcription in healthcare settings.
Academia	
Mahidol University, Chulalongkorn University, Chiang Mai University, Khon Kaen University, Prince of Songkla University, Thammasat University, Kasetsart University	Offers programs in Computer science and medicine.
Asian Institute of Technology	Offers programs in computer science.
Funding organisations	
SCB 10X, Krungsri Finnovate, AddVentures by SCG, Beacon VC	Invest in and support AI startups through financial backing, mentorship, and strategic resources.
Development partners	
World Health Organization (WHO)	Collaborates with the Royal Thai Government and other organizations to improve health systems and achieve national health targets.
United Nations Development Programme (UNDP)	Partners with the Royal Thai Government, legislative and judicial branches, and civil society to address development challenges and promote the Sustainable Development Goals.
U.S. Agency for International Development (USAID)	Supports Thailand's healthcare efforts, often in collaboration with the CDC.

U.S. Trade and Development Agency (USTDA)	Supporting Thailand's healthcare sector by exploring partnerships and opportunities to bring high-tech U.S. solutions to Thailand's medical facilities.
Healthcare	
Bumrungrad International Hospital, Siriraj Piyamaharajkarun Hospital, Samitivej Sukhumvit Hospital, Bangkok Hospital, Samutprakan Hospital	Adopted digital healthcare initiatives.
Potential business	
Agnos Health	Startup providing AI technologies that underpin patient registration and management systems, enhancing operational efficiency in hospitals.
Cariva	Specialises in delivering artificial intelligence (AI)-enabled personalized healthcare and precision medicine solutions.
Joey Doctor	AI-based patient engagement tool for healthcare professionals.
Invitrace	Focuses on integrating AI with digital biomarkers to enhance health innovations.
WizTech Health	Focuses on integrating medical expertise with AI to provide personalized preventive health solutions.

Implementation initiatives

1. A national diabetic retinopathy screening programme uses a deep learning algorithm in 9 primary care clinics and demonstrated similar detection rates to retina specialists in community-based settings [295].
2. The Thailand AI Research Institute's "AI for Everyone" initiative makes AI solutions available for SMEs through off-the-shelf, easily integrated AI models [16].
3. The "Smart Health Solutions" project in Khon Kaen City uses blockchain, IoT and data analytics for preventive health and ambulance services. It is a collaboration among local healthcare providers, academia and local government [296].
4. Siriraj Hospital's "Smart Hospital" project was chosen as a model for 5G technology by the National 5G Committee. The hospital uses blockchain technology and AI to support smart ambulance solutions, emergency room patient monitoring and decentralised personal health records [297].
5. AI Governance Clinic (AISG) gathers over 33 partners in Healthcare, Finance and Government sectors to improve good governance and guide the implementation of AI Guidelines in medicine [159].
6. The Medical AI Data Sharing Consortium and Platform is a collaboration between the National Electronics and Computer Technology Center (NECTEC), Medical Services Department, hospitals and universities to establish an open medical data management platform. This aims to promote AI research for disease diagnosis and public health [157].
7. The Conference on the Ethics of Science and Technology and Sustainable Development was hosted in Thailand in 2019, including public meetings of the International Bioethics Committee and the World Commission on the Ethics of Science Knowledge and Technology [298].

8. The Faculty of Medicine at Khon Kaen University (MDKKU) joined forces with AstraZeneca and the Digital Economy Promotion Agency (DEPA) to utilise AI for the early detection of heart failure and lung cancer [299].
9. Bangkok Dusit Medical Services (BDMS) and King Mongkut's Institute of Technology Ladkrabang (KMITL) have collaborated with Spark Beyond to transition from reactive to preventive healthcare using AI analytics[300].
10. Researchers at Thammasat University, in collaboration with the Department of Medical Services, developed "AI Chest 4 All," an AI-based tool designed to improve access to healthcare and assist in disease diagnosis across Thailand [301].
11. Bangkok Hospital Headquarters partnered with Agnos Health to implement an AI-driven Smart Patient Management system [302].
12. Bangkok Medical Software Co,Ltd (BMS) along with Looloo Health developed "PresScribe," an AI-powered service designed to transform healthcare delivery in Thailand [303].
13. Siriraj Piyamaharajkarun Hospital (SiPH) in Thailand partnered with IBM to enhance its Pathology Information System using advanced computational technologies and AI [304].

TIMOR-LESTE	
INSTITUTIONS	**ROLE**
Government	
Ministry of Health (MoH)	Responsible for designing, implementing, coordinating, and evaluating health policies.
Ministry of Information and Telecommunications	Focusing primarily on the integration of ICT in Critical Sectors, including e-Government, Education, **Health**, Agriculture, and the Economy.
Ministry of Higher Education, Science and Culture	Responsible for science policy and education policy for AI
Academia	
National University of Timor-Leste (UNTL)	Offers programs in Computer science and medicine.
Development partners	
World Health Organization (WHO)	Supports Timor-Leste's health sector by implementing essential health service packages.
UNICEF	Collaborates with WHO and other organizations on various health and nutrition initiatives.
East Meets West (Thrive Networks)	Focuses on improving medical infrastructure and training healthcare professionals.
Maluk Timor	Focuses on training and empowering local healthcare professionals in Timor-Leste.

Implementation initiatives

1. In 2022, Delft Imaging provided two portable X-ray systems and CAD4TB AI software for Tuberculosis detection [305, 306].

VIETNAM	
INSTITUTIONS	**ROLE**
Government	
Ministry of Health (MOH)	Responsible for formulating and implementing policies and guidelines related to digital health. It collaborates with other state agencies, research institutions, and medical universities to implement digital health initiatives.
Ministry of Science and Technology (MOST)	Responsible for the research, development, and application of AI technologies. It acts as the focal point for implementing national AI strategies, organizing their execution.
Ministry of Information and Communications (MIC)	Involved in developing legal frameworks for AI, addressing challenges such as AI ethics, and promoting responsible AI development.
Academia	
Vietnam National University, Ho Chi Minh City, Duy Tan University, Hanoi University of Science and Technology, Vietnam National University, Ho Chi Minh City University of Technology, Can Tho University, Hanoi University, VNU University of Science, Ho Chi Minh City University of Science, University of Economics Ho Chi Minh City	Offers programs in Computer science and medicine.
Funding organisations	
Do Ventures, VinaCapital Ventures, Access Ventures, Golden Gate Ventures	Invest in technology and AI startups, particularly in early-stage and growth-stage companies.
Development partners	
United Nations Development Programme (UNDP)	Provides strategic policy recommendations and supports the integration of AI to improve public administration and service delivery.

Vietnamese German Center for Medical Research (VG-CARE)	The centre focuses on clinical research, particularly in tropical and infectious diseases, aiming to improve diagnostics and targeted therapies.
United States Agency for International Development (USAID)	Supports various health initiatives in Vietnam and healthcare infrastructure development.
NVIDIA Corporation	It is establishing an AI Research and Development Center and an AI Data Center in Vietnam in partnership with the Vietnamese government.
World Health Organization (WHO)	Supports the government on strengthening the health systems
PATH	Collaborating with local leaders and communities to develop sustainable healthcare solutions.
Vietnam Civil Society Partnership Platform on AIDS (VCSPA)	Network of organizations dedicated to improving health services for people living with HIV in Vietnam.
Friends of Hue Foundation (FHF)	non-profit organization providing education and healthcare services to children and rural communities in Vietnam.
Healthcare	
Cho Ray Hospital (Ho Chi Minh City), Phu Tho General Hospital, FV Hospital, City International Hospital, University Medical Center Ho Chi Minh City (UMC), Ho Chi Minh City Hospital for Tropical Diseases, Binh Dan Hospital	Adopted digital healthcare initiatives.
Potential business	
DrAid	Provides a comprehensive AI platform for diagnostic radiology.
Deepcare	Offers an AI-based teleconsultation platform that enables users to connect with certified healthcare professionals for remote consultations.
VinBrain	Focuses on developing AI solutions for healthcare.
N2TP	Provides a clinical decision support software that supports medical facilities.

Implementation initiatives

1. The International Research Centre for Artificial Intelligence at the Hanoi University of Science and Technology was established to enhance research and international collaborations on AI [307].

2. RMIT And Ericsson AI Lab established at Royal Melbourne Institute of Technology (RMIT) University Hanoi [308].
3. The annual “Vietnam Artificial Intelligence Day” (AI4VN) has been sponsored by the Ministry of Science and Technology since 2018. The event gathers cross-sector stakeholders to discuss innovation and sustainability in AI [309].
4. Aus4Innovation: 11 million USD development assistance program, partnering local and Australian institutions for AI technical assistance and capacity-building for the Ministry of Science and Technology [310].
5. The Vietnam AI Grand Challenge brings together developers to find AI solutions across industries, including health [311].
6. The MedArmor AI Hospital is planned to be built in Vietnam with assistance from Australian partners, running primarily on virtual technologies and AI to analyse patient data [312].
7. VitalCare – Korean-built AI technology to predict death, cardiac arrest and ICU transfers in hospitals, was approved in Vietnam in November 2024 [313].
8. VinBrain has expanded its reach by partnering with Medlatec, one of Vietnam's largest private healthcare systems. This collaboration involves deploying VinBrain's AI solution, DrAid, across Medlatec's extensive network of hospitals and clinics [314].
9. To bolster AI capabilities in healthcare, NVIDIA has acquired VinBrain, integrating its expertise into NVIDIA's broader AI initiatives [315].
10. The Core8 Group, in collaboration with MedArmor, has announced plans to establish Vietnam's first AI x ESG Hospital [312].

ASEAN

1. The World Health Organization (WHO), in collaboration with the Economic Research Institute for ASEAN and East Asia (ERIA), has undertaken initiatives to improve access to quality diagnostic testing in ASEAN countries [316].