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Navigating the Landscape of Digital Health

A Country Report: Indonesia

THE ACCESS AND DELIVERY PARTNERSHIP

HITAP
Health Intervention and Technology Assessment Program

Contents

Table of Figures

Abbreviations

AI	Artificial Intelligence
API	Application Programming Interface
BPJS	Badan Penyelenggara Jaminan Sosial
BRIN	National Research and Innovation Agency
DHT	Digital health technology
DRG	Diagnostic Related Group
DTO	Digital Transformation Office
EHR	Electronic Health Record
EIT	Electronic Information and Transactions
FHIR	Fast Healthcare Interoperability Resources
GDP	Gross Domestic Product
GMP	Good Manufacturing Practices
HHS	Household Health Supplies
HIS	Health Information System
HOTS	Higher Order Thinking Skills
HTA	Health Technology Assessment
HTAC	Health Technology Assessment Committee
ICT	Information, Communication and Technology
IDI	Indonesian Medical Association
HIS	Indonesia health services
IMD	Institute for Management Development
IVD	In vitro Diagnostics
JKN	National Insurance Program
MCIT	Ministry of Communications and Information Technology
MIABIS	Minimum Information about Biobank Data Sharing
MOH	Ministry of Health
MOHA	Ministry of Home Affairs

NGO	Non-Governmental Organization
NICE	National Institute for Health and Care Excellence
PKRT	Perbekalan Kesehatan Rumah Tangga
PNPK	National Guidelines for Medical Practice
PPK	Clinical Practice Guidelines
REST	Representational State Transfer Architectural Style
SNI	National Standardisation
SWOT	Strengths, Weaknesses, Opportunities and Threats
TNP2K	National Team for the Acceleration of Poverty Reduction
UHC	Universal Health Coverage
UK	United Kingdom
UNDP	United Nations Development Programme
WHO	World Health Organisation

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Executive Summary

Digital health technology (DHT) offers the potential to expand universal health coverage (UHC) by answering healthcare needs through a wide range of technology applications for instance artificial intelligence, big data, and machine learning. The adoption of DHT is not a new concept although the significance was widely accelerated during the pandemic of COVID-19. Indonesia has been moving towards digital transformation since 2019, as part of the current government's vision of prospering society through digitalisation in 2025.

Telemedicine has been selected by the government since 2018 to address the traditional challenges in healthcare as in the Presidential Regulation of the Republic of Indonesia No.82/2018 Regarding Health Insurance. Both private and government-based telemedicine has been growing ever since in the country.

The Ministry of Health Indonesia (MoHI), through the Decree No. 46/2017, defines e-health as the utilisation of information and communication technology to improve health quality service, efficiency, and effectiveness. These include health management information systems, electronic medical records, surveillance systems, health knowledge management, telemedicine, mobile health, consumer health informatics, e-learning in health sciences, and medical research. Yet, if DHT is considered a medical device, the definition and registration will be referring to the Decree of 62/2017 such as medical devices, in-vitro diagnostics, and household health supplies.

The guideline for digital transformation has been laid out in the Blueprint of Digital Transformation Strategy 2024 launched by the MoHI. The main strategy in this blueprint is not to create another application but rather restructure the system through health data integration, develop a comprehensive citizen information system, and a new design of health business architecture. Data architecture is supported by Fast Healthcare Interoperability Resources (FHIR) and OpenEHR systems and protected by a consent base.

The Digital Transformation Office (DTO) of MoHI coordinates the overall governance system and is supported by other working groups including Badan Penyelenggara Jaminan Sosial (BPJS). Each unit has a different function in every phase of technology development. Only in the planning, product/service research, piloting, and implementation phases are all units working together. The structure currently does not include the Ministry of Communications and Information Technology (MCIT).

As the government begins to boost health technology services in Indonesia, the market has become more established and is increasing the demand. The Indonesian digital economy, revenue, and internet penetration are promising for DHT adoption in the country. In addition, the digital literacy curriculum and programmes established by the MCIT can narrow the digital literacy gap between the population and the workforce.

The rapid utilisation of DHT also has implications for inclusion in the national insurance program (JKN). There has not been a reimbursement mechanism for DHT but there have been trials for telemedicine, which is based on capitation. Critics have identified issues in relation to the adoption and feasibility of telemedicine to users (patients and health workers) and its

equity. An opportunity for the realisation is seen yet requires multi-sector consultations based on the Indonesian landscape’s strengths, weaknesses, opportunities, and threat analysis. The analysis of Indonesia's digital health ecosystem in this report presents valuable lessons for other countries.

1. Indonesian digital health ecosystem

1.1 Overview of the digital health ecosystem in Indonesia

Digital health technology (DHT) offers the potential to expand universal health coverage (UHC) by answering healthcare needs through a wide range of technology applications, for instance, artificial intelligence, big data, and machine learning. Success requires key drivers in legal, logistical, and infrastructural factors that vary among countries (Kong 2019). The adoption of DHT is not a new concept in Southeast Asia, even though its development was widely accelerated during the pandemic of COVID-19 (Sit 2021).

Indonesia has been moving towards digital transformation since 2019, subject to the current government's vision of a prosperous society through digitalisation by 2025 (Ministry of National Development Planning 2007). This ambition was accelerated during the COVID-19 pandemic, particularly since telemedicine as a kind of DHT product provided a lot of advantages to COVID-19 and non-COVID-19 patients. However, the digitalisation journey is still challenging due to its low digital competitiveness, based on the results of a survey conducted by the Institute for Management Development (IMD) which placed Indonesia in the 56th rank out of 63 countries. Ever since, digital transformation in governance has become a priority (Deloitte 2021).

The pandemic has also highlighted the importance of public-private partnerships to implement DHT to address traditional healthcare challenges in Indonesia, such as the shortage of physical health infrastructure in the population number (1 person per 100,000 of hospital number), inadequate healthcare workforce, and large geographical barrier (6,000 inhabited islands) (MTP Connect 2020). The adoption of DHT is championed by both policymakers and practitioners due to its cheaper yet safer care and accessibility (Ziebland, Hyde, and Powell 2021).

Amid the growing advantages, rapid digitalisation without considering health factor determinants such as socioeconomic backgrounds, inadequate telecommunication infrastructure, and digital literacy can lead to a digital divide among the users, both health professionals and patients. These groups are less likely to find DHT useful in their healthcare decisions and delivery. Additionally, public distrust toward digital health services in Indonesia could have been associated with there being no reimbursement mechanism, and concerns around data security, and privacy (Deloitte Indonesia 2019a; Ziebland, Hyde, and Powell 2021).

Considering the wide adoption of DHT in the current global health services and barriers that the Indonesian healthcare system is facing, linking the assessment of the local DHT profile risks and benefits to be with health technology assessment (HTA) can assist Indonesia to re-evaluate their UHC reimbursement and policies (Huben et al. 2021).

1.2 Indonesian healthcare system

Indonesia introduced a UHC programme in 2014 called Jaminan Kesehatan Nasional (JKN) with BPJS as the agency responsible for implementation. The target was to cover 98% of the population by 2019 although the actual coverage was lower (83.5%). The progress is significant, compared to other countries which have taken longer to register most of the population (BPJS Kesehatan 2021). The other key feature, compared to the previous relief programme

(Jamkesmas), is that JKN covers not only the middle — to- poor for insurance but to the well-off for relief programmes and ensures that all its beneficiaries can access quality services without financial difficulties.

Indonesia had, until recently, the largest single-payer social health insurance, which aims to cover its 270 million population. Two categories of beneficiaries have been identified based on the payment scheme to ensure the financial sustainability of JKN. Payments made to primary healthcare or clinics are based on capitation, without taking into account the amount and services provided. This has posed increasing healthcare cost and burden experienced by BPJS. Further, the deficit has been influenced by the focus of the government on disease treatment rather than health promotion and prevention efforts (Deloitte Indonesia 2019b; Satriana 2020; Khoirunurrofik and Raras 2021).

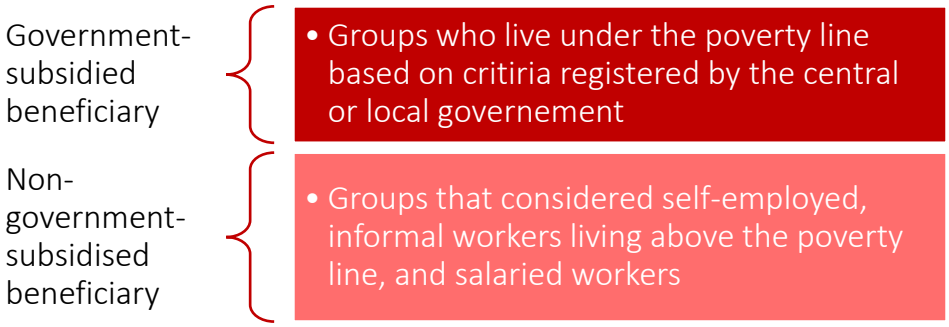

Figure 1 Types of JKN beneficiary

From the demand side, the deficit is also caused by the non-continuous or low collection of monthly payments from beneficiaries that are not subsidised by the government. Both, informal and self-employed workers only register themselves in the programme in the time of illness. After this, they discontinue monthly payments. There is no legal enforcement from the government to pay the premium. This, has contributed to the challenge of JKN's financing model. Different reasons identified as the root causes were limited insurance literacy, unstable source of income, distrust of the payment difference, and health facility inaccessibility (Deloitte Indonesia 2019b; Satriana 2020; Khoirunurrofik and Raras 2021).

The Indonesian population, especially those living in remote areas have to travel a very far distance to the nearest health facility. Health facilities can be limited but being too far from the city centre increases their transportation expense. Although JKN covers health services, such out-of-pocket payments by patients will become a burden if they have to travel frequently.

Since 2010, out-of-pocket expenditure on healthcare in Indonesia has been falling gradually from almost 57% in 2010 to 34.8% in 2019. This pattern is accompanied by the annual increasing income growth between 3% and 6%, and healthcare expenditure share on GDP (1.9% in 2000 — 2.9% in 2019). However, the figure is still lower than the world average and

Thailand (6.52% and 3.8% respectively in 2019) (Knoema n.d.; MTP Connect 2020). Moreover, such expense excludes travel expense as described earlier. This point cannot be neglected if Indonesia wants to achieve equitable and accessible UHC for the entire population.

1.3 Telemedicine in the JKN

Telemedicine has been chosen by the government since 2018 to narrow this gap in access, as per the Presidential Regulation of the Republic of Indonesia No.82/2018 Regarding Health Insurance. Both private and government-based telemedicine have been available in the country. JKN launched the JKN mobile application in 2017 that allows people to register, view billing information, pay monthly contributions, select, or change the primary healthcare provider, set appointments with healthcare providers, and file complaints, all from their cellular devices. The other reason for BPJS to launch the application was to reduce the administrative burden on the BPJS offices along with the increasing number of registered participants (Satriana 2020; Khoirunurrofik and Raras 202).

The use of the application is diverse among BPJS participants, mostly dominated by the non-poor informal workers and private formal (1.2 million and 1.5 million users respectively) (Satriana 2020). Unequal distribution of health information, technology, and literacy among BPJS beneficiaries with heterogeneous socioeconomic backgrounds can be one of the factors contributing to this difference. Not only that, but the divide also occurs among health workers especially on the recently launched feature, of telemedicine in the JKN mobile application (Indria, Alajlani, and SF. Fraser 2020).

The scope of the application is still limited to communication between primary health care and referral hospitals. Nowadays, the expansion to patient and hospital interface in the application has been piloted followed by the reimbursement formulation. The expansion was aligned with the digitalisation mission in several priority areas in Indonesia, including healthcare, and the rapid adoption of digital health technology during the pandemic (Kemenkes 2017a).

In identifying the strong supply and demand for digital technology in Indonesian health care, it is important to evaluate the different types of DHT to be included in the JKN benefit package. Going forward, BPJS should collaborate with the MoHI, Indonesia Health and Technology Assessment Committee (InaHTAC), Ministry of Finance, BPJS, and the National Team for the Acceleration of Poverty Reduction (TNP2K) to find the most suitable reimbursement mechanism (BPJS Kesehatan 2022). Trials have been conducted in Yogyakarta and Central Java since 1 April 2022 for a period of 20 months. Indonesia plans to integrate telemedicine into the BPJS claims systems as part of its UHC programme by 2023.

1.4 Definition and terminology limitation of digital health technology

MoHI, in the Decree No. 46/2017, defines e-health as the utilisation of information and communication technology to improve health quality service, efficiency, and effectiveness. These include health management information systems, electronic medical records, surveillance systems, health knowledge management, telemedicine, mobile health, consumer health informatics, e-learning in health sciences, and medical research (Kemenkes 2017b). This definition includes both medical and non-medical devices for DHT.

If DHT is considered a medical device, the definition and registration will be referring to the Decree of 62/2017 (Kemenkes 2017c), as follows:

- Medical Devices (Alat Kesehatan): these include instruments, apparatus, machines and/or implants that do not contain drugs used to prevent, diagnose, cure, and alleviate diseases, treat sick people, restore health to humans, and/or form structures and improve bodily functions.
- In vitro Diagnostics or IVD (Diagnostik in Vitro): which includes any reagents, reagent products, calibrators, control materials, kits, instruments, apparatus, equipment, or systems.
- Household Health Supplies or HHS (Perbekalan Kesehatan Rumah Tangga or PKRT): which includes a tool, material, or mixture of materials for maintenance and care for human health, intended for use in households and public facilities.

Medical devices and IVD are classified into classes based on the risk level: A (low risk) to D (high risk) whilst HHS are grouped into classes; 1 (low risk) to (high risk). The supplier or manufacturer will register the product on the MoHI website to obtain a market license and provide information on the device description, any pre-clinical studies, good device labelling, instructions for use, a risk analysis, Good Manufacturing Practices (GMP) certification, and any existing regulatory approvals or market authorisations already obtained. The National Agency of Drugs and Food Control (NADFC) Indonesia under the MoHI will assess the requirements, especially its safety, efficacy, and quality to approve the license (Andaman Medical 2022; Morulaa 2022).

For non-medical devices such as telemedicine, registration has yet to be regulated but its classification as a health technology has been recognised in the Indonesian HTA methods guideline as a support system. This means that non-medical DHT such as telemedicine has yet to be recognised to be used in the market but is ready to be evaluated in the HTA system. Later, HTA evaluates the product/service efficacy, safety, and effectiveness (InaHTAC 2017).

The methods guideline classifies health technology into three main categories based on type, the purpose of use, and the development and application of technology (InaHTAC 2017).

- Based on technology type:
  - Drugs, such as antibiotics, aspirin, or statins
  - Biological matter, such as vaccines, blood products, or stem cells
  - Devices, such as pacemakers, or diagnostic kits
  - Medical and surgical procedures
  - Support systems, such as electronic medical record systems, telemedicine, drug formularies, or blood banks
  - Organisational and managerial systems, such as insurance, or diagnostic related group (DRG)

- Based on the technology purpose of use
  - Promotive: health activities which prioritise health awareness, promotion of healthy lifestyle, etc.

- Preventive: activities which aim to prevent or decrease the risk of disease, or limit the sequelae, e.g., immunisation, hospital infection control programmes, or fluoride in the water supply
- Screening: early detection procedure on patients without any signs/symptoms, e.g., pap smear, mammography, or tuberculin test
- Diagnostic: process to determine a disease or medical condition in a subject with clinical signs/symptoms, e.g., electrocardiography,, Magnetic Resonance Imaging, or heart catheterisation
- Curative: treatment to reduce the signs and /or symptoms, control disease, or slow disease progression
- Rehabilitation: activity to restore, maintain, or increase physical or mental capacity of former patients to increase functioning, e.g., a training programme for post-stroke patients, exercise for post-heart-attack patients
- Palliative care: care which aims to increase the quality of life of the patient facing a threatening illness and that of his family, through reducing and preventing suffering, early detection, pain management, and comprehensive assessment of other problems (physical, psychological, or spiritual)

- Based on the technology maturity and saturation
    - Future technology: still in concept, anticipating future use, or still at a premature stage of development
    - Technology in an experimental stage, in animal or model trials.
    - Technology in the evaluation stage: application for patient use in certain conditions
    - Evidence-based technology: used by service providers in disease management or certain health conditions
    - Ancient or underdeveloped: the technology has been replaced, proven to be ineffective, or even harmful

Digital health product/service classification still leaves room for the rapidly growing and diverse e-health products due to insufficient accommodating terminology in the Health Dictionary and national standardisation (SNI) for electronic data and information systems, data privacy, and data interoperability (Kemenkes 2017b). Moving towards digital transformation, expansion in data standardisation and interoperability has been recognised as being significantly important for the adoption and deployment of DHT. Thus, Indonesia recently launched a digital health transformation guideline namely Blueprint of Digital Transformation Strategy 2024 to provide a roadmap on how to build the overall enabling ecosystem for different key players in health industries.

1.5 National digital health strategies

This roadmap is not a law and was developed in partnership with the United Nations Development Programme (UNDP) and funded by the Government of Japan (UNDP Indonesia 2021b).

The downside of digitalisation in healthcare is that data is still fragmented in different institutions. There have been more than 400 health applications developed by central and local governments excluding third parties innovations. Digitalisation, which is supposed to facilitate and improve health services, can create new problems. Therefore, the main strategy in this blueprint is not creating another application but rather restructuring the system through health data integration, a comprehensive citizen information system, and a new design of health business architecture (UNDP Indonesia 2021a).

The strategies are formulated into three activities (Ministry of Health Indonesia 2021):

Figure 2 Digital transformation strategies in Indonesia

1. Health data integration and development

The first strategy is expected to improve the quality of policy based on an integrated national health database. The development phase is laid out in four phases from 2021 until 2024. It was started by synchronising all public electronic medical and health records at local and central governments (e.g., BPJS) and other health industries under one single platform called Indonesia Health Service (IHS). Data integration will continue until 2022 and will begin to incorporate artificial intelligence (AI) for data analysis in the following years.

Figure 3 Indonesia health services (IHS)

IHS is the single platform that connects individual health information to other health providers. The citizen health application, or the PeduliLindungi mobile application, was built by MCIT initially as the national digital COVID-19 contact tracing system. However, the features have been expanding to include telemedicine and reimbursement information. In the future, it will be promoted as a personal health data and information gateway connected to IHS.

2. Integration and development of health service applications

After building a single system, data exchange and interoperability in the existing and new health applications would not be a concern. Various non- or mobile applications used in health institutions such as clinics/puskesmas (primary-level health centres), hospitals, laboratories, pharmacies, and other health facilities would connect to IHS, and be promoted to improve rapid response in an emergency, referral health services, health financing, future pandemic, human resource management, and internal management in governance.

3. Health technology ecosystem development

The next phase is creating an enabling ecosystem for all stakeholders in health systems including private, academic, and non-governmental organisations (NGOs). Private technology developers are facing an obstacle to registering their operation since there is no legal basis to

auspice the process under MoHI, but MICT generally. In the coming years, they will be accommodated, and the records will be connected to IHS as well.

1.6 The advantage of IHS to telemedicine and biotechnology developers

Private telemedicine and biotechnology developers are the leaders in the sector. The inclusion of them in the health information system (HIS) will accelerate systematic digital transformation in Indonesian healthcare by bridging their interaction with the government, the public, and within the private businesses themselves.

- Telemedicine: Patient data on different telemedicine should not be an issue anymore. All inquiries on medical, medicine and billing will be handled by the application separately while having the records in IHS. This mechanism will ensure sufficient records in BPJS and hospitals to issue reimbursement mechanisms, as well as to control online medicine distribution.

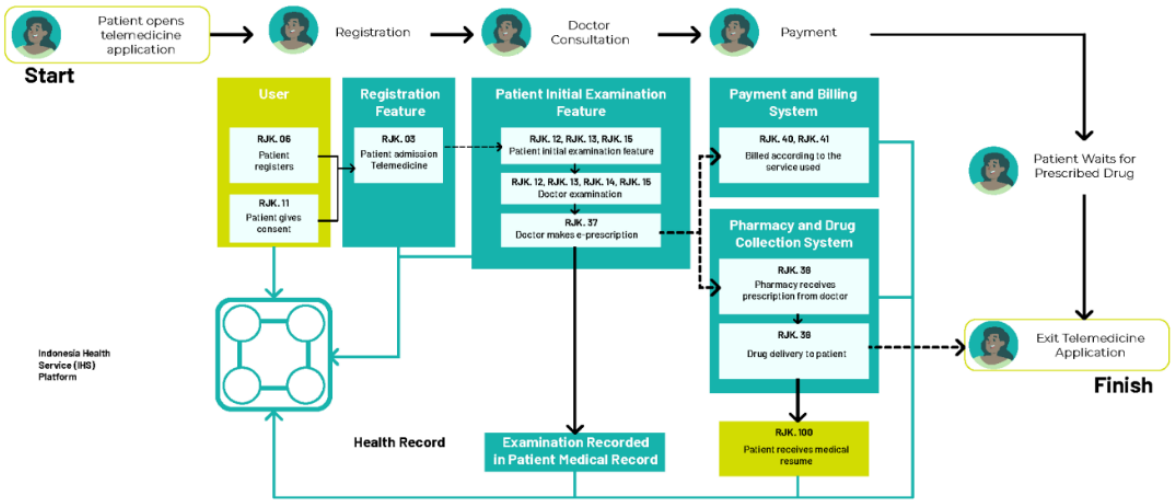

Figure 4 Telemedicine service flow

- Biotechnology: Genomic data (e.g., genomes of microorganisms, plants, animals, and humans) in Indonesia is inadequately collected and scattered at different institutions, for instance, at the Research Biobank Faculty of Medicine at the University of Indonesia and Faculty of the Medicine University of Gadjah Mada. Including biotechnology services in IHS will make IHS a national data warehouse of pre-clinical, clinical, genomic, and health chemistry, manufacturing, and control (CMC) data and a centre of biotechnology supporting ecosystem database.

  To support the implementation, MoHI will create a board of committees coordinating the data gathering and sharing. The first board will evaluate the gathering process based on the requirements of Minimum Information about

Biobank Data Sharing (MIABIS) and Bio Standard and Biosecurity documents. The other committee will control the sharing process based on cyber security issues. In addition, MoHI will also develop a regulatory sandbox programme and Hub Start-up & Capital Provider to accommodate biotechnology-based innovators and capital providers.

These two functions within the biotechnology service under IHS will enhance centralised data collection and support the utilisation of research product development in various areas. The pilot study of the regulatory sandbox for both start-ups in telemedicine and biotechnology started in 2021 and is expected to complete this year, 2022. Implementation and expansion will continue in the next years, especially to be able to accommodate global product markets in the sandbox in 2024.

1.7 IHS platform approach and system architecture

Two business activities provided in the IHS consist of microservice and base service. Microservice functions to bridge communication among users and base service manage the data so the outputs can be utilised. Service sectors that will be used such data are primary and secondary care, pharmacy and medical equipment, financing, human resource, internal management, biotechnology, health security, and MyHealth Record. To enable communication, data architecture is supported by FHIR and OpenEHR.

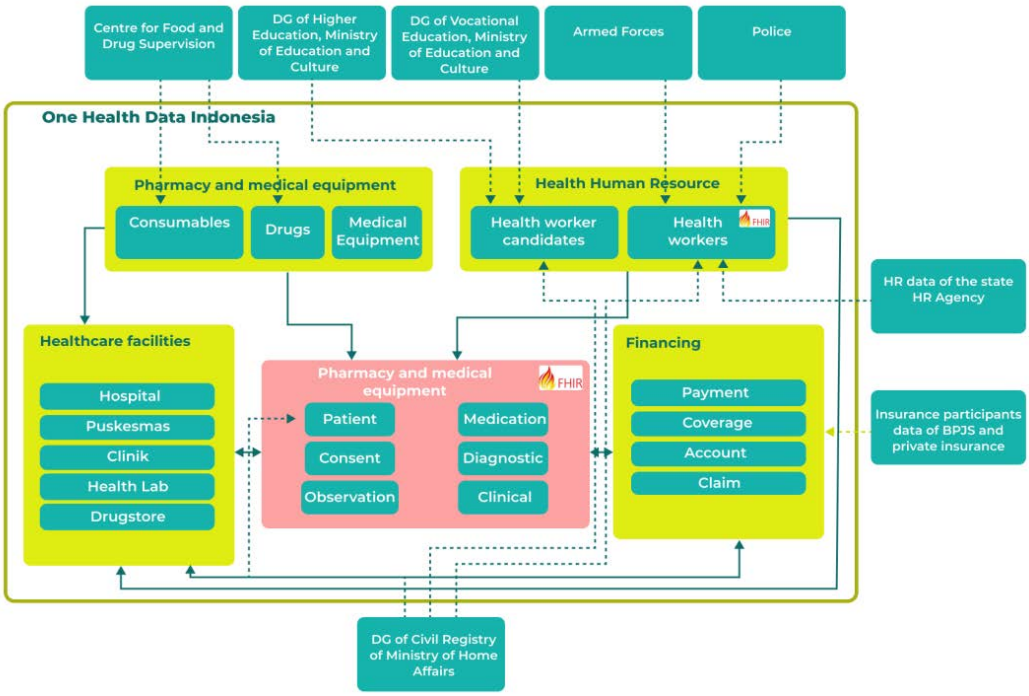

Figure 5 Data architecture in IHS

- Data exchange architecture

FHIR allows health data sharing for multiple purposes based on representational state transfer architectural style application programming interface *(*REST API), e.g., clinical information such as treatment plans or orders of diagnosis, and OpenEHR ensures data consistency to enable exchange and interoperability. These two frameworks will create the communication between PeduliLindungi application and Partners.

Personal information recorded in the IHS includes health service activities such as examinations, medical procedures, and clinical procedures. This data provides information for the organisations that customers have a tie with such as the pharmacy, medical devices used, health workers who performed the treatment on the customer, and related costs and reimbursement. On a larger scale, such information can be used for policy formulation and allows communication with other countries that use FHIR such as Malaysia, the Philippines, Australia, and the United States.

- Data security

  The Blueprint did not elaborate on personal or anonymous health data protection. Health data is defined as patient data used for health development collected by health facilities and government institutions. In the context of health data collected and exchanged within the IHS ecosystem, it will fall into four main regulations Health Law No. 36/2009, Government Regulation No. 71/2019 on the Provision of Electronic Systems and Transactions (GR 71/2019), Electronic Information and Transactions Law (Law No. 11 of 2008 on Electronic Information and Transactions (EIT Law), and MCIT Regulation No. 20 of 2016 on Personal Data Protection in Electronic Systems (MR 20/2016). The commonality between them is that data utilisation should be based on consent.

  Health Law No. 36/2009 on Health serves for the protection of patients' medical records as it needs to be kept confidential by doctors, dentists, certain health workers, management officers and heads of health service facilities. The data can only be released based on the patient's consent and request, upon the government's request for purpose of law enforcement, and research purposes without the identifiable identity. It does not cover electronic-based data storage.

  Digital health businesses or organisations collecting and storing patient records must (1) provide a standard protection procedure that guarantees the security or confidentiality of patient data (in the form of electronic information or documents); (2) apply risk management in the event of any damage or loss arising out of the operation of an electronic system; (3) provide and carry out procedures and facilities to protect an electronic system from interference and material or non-material loss; (4) provide a security standard covering procedures and systems to prevent and overcome any threat or attempted interference. In the case of anonymised data sharing from the IHS, it will not be regulated under these regulations, as there is no specific law or regulation on anonymised data protection.

Data breach incidents will be subject to sanctions in GR 71/2019 and MR 20/2016 that include administrative sanction, verbal and written warnings, fines, temporary business suspension, termination of access, exclusion from the registry within MCIT, and announcement on the MCIT's website. Although the cyber security law is currently being developed, the EIT Law is touching on some restrictions in electronic data sharing that could be applied to regulate digital health in Indonesia. The main principle of personal data sharing is based on the subject's consent. Sharing without consent is only permitted for purposes that are consistent with the initial purpose of collection that has been disclosed to the data subject. Otherwise, the receiving and disclosing party shall obtain consent from the patient (Hakin and Parded 2021).

2. Regulatory framework

2.1 Legal frameworks/mandate

The legislation of digital health transformation was derived from the ruling government's vision of Indonesia's digital society in 2025. It was extracted from the Constitution of 1945 and translated into other regulations. However, there is no legal law enforcing digitalisation or digital health transformation in the country. The two decrees, Decree No.46/2017 and the Digital Health Transformation Strategy serve as the main guidance (Ministry of Health Indonesia 2021).

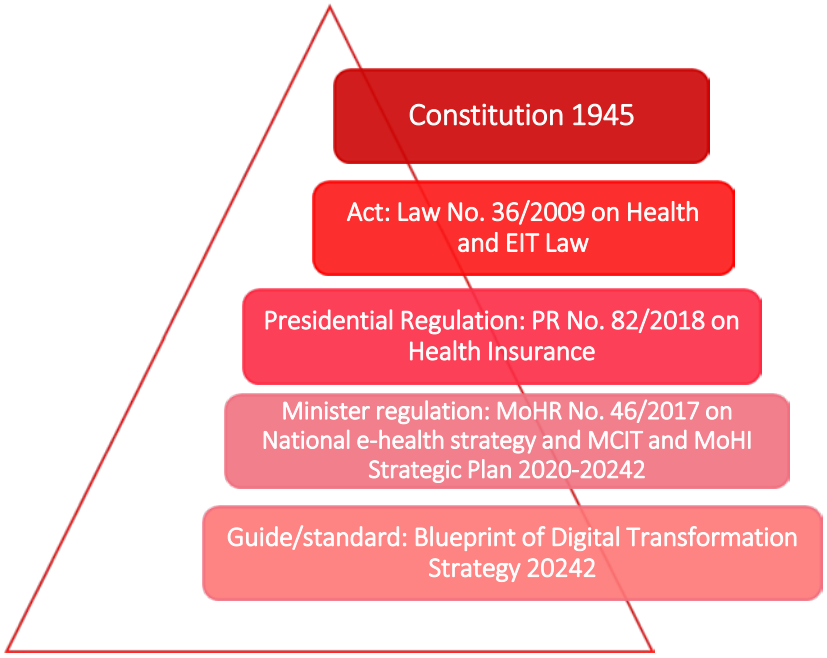

Figure 6 Hierarchy of law in Indonesia

The highest level of the law that relates to digital health transformation and UHC in Indonesia is the Constitution of 1945 Article 28 (1) which assures the right to health for everyone. This mandate has then been translated into Law No. 36/2009 on Health and the Presidential Regulation 82/2018 on Health Insurance. To implement it across ministries, the government integrated the digitalisation goal in different priority sectors, including health in the middle- and long-term action plans. MoHI and MCIT lead on this process as per the Ministry of Health Regulation No. 46/2017 on National e-health strategy and MCIT and MoHI Strategic Plan 2020-2024. Lastly, MoHI recently launched a blueprint to guide digital transformation in healthcare of Indonesia (Deloitte Indonesia 2019a).

The MCIT Strategic Plan has major implications for DHT as it lays out Indonesia's broadband plan and digital literacy programme. This is important to understand for DHT private investors as any technology should engage MCIT to test their technology's capability and compatibility with the broadband to run in some locations. Besides, developers should be aware of personal data protection schemes as there is currently no law clearly defining this with regards to the

electronic storage database in health. MCIT currently refers to the Electronic Information and Transactions Law (Law No. 11 of 2008 on Electronic Information and Transactions (EIT Law) and MCIT Regulation No. 20 of 2016 on Personal Data Protection in Electronic Systems (MR 20/2016) for this matter.

Regulations	Implementation body	Details
Health Decree of 62/2017	NADFC and MOHI	Medical device registration
MoHI Letter No. HK.02.01/MENKES/303/2020	MoHI	Accelerating telemedicine since the pandemic
Indonesian Medical Council 74/2020	Indonesian Medical Association	Limitations on doctors to provide diagnosis via telemedicine
Regulation 8/2020	NADFC	Pharmaceutical and medicines distribution through electronic systems
Strategic Action Plan 2020-2024	MCIT	Broadband Infrastructure development and digital literacy program

Figure 7 Other legal frameworks supporting DHT in Indonesia

There are a few other regulations which have promoted the use of DHT such as MoH Letter No. HK.02.01/MENKES/303/2020 on Health Services through the Utilisation of Information and Communication Technology for Limitation of the Spread of Coronavirus. This regulation allows doctors to use telemedicine to provide health services, including diagnosing, treating, preventing, and evaluating a patient's health under their competence and authority.

Although the above regulation allows doctors to carry out diagnosis through telemedicine, in performing their services, doctors are also subject to the regulations under the Indonesian Medical Council No. 74 of 2020 on Clinical and Practical Medical Authority through Telemedicine during the Coronavirus Pandemic in Indonesia. This imposes limitations on doctors to provide diagnosis via telemedicine under the Regulation of the (Hakin and Parded 2021).

To address such issues while accommodating the growing telemedicine start-ups, a regulatory sandbox was set-up to create enabling regulations that respond to real conditions that occur more quickly and accurately, bridging the needs between digital health industry developers and health regulators, and providing guarantees to investors. In addition, pharmaceutical activity in telemedicine is monitored under Regulation 8/2020 by NADFC. Only a pharmacy may engage a third party to provide the system, while the pharmaceutical industry and wholesalers may only use their electronic system (Soeklola 2022).

2.2 Governance and structure

In the blueprint, MoHI is the focal point of digital transformation and has established a special team namely Digital Transformation Office (DTO) in March 2021 to realise the digital health transformation process. The tasks include management processes such as planning and managing the development process, collecting various information, analysing and compiling a national digital health vision, conducting research and stakeholder consultation, as well as

harmonising and centralising the development of information technology (Ministry of Health Indonesia 2021).

Unit/stage	Planning	Product service/ research	Product/ service development	Piloting	Implementation	Monitoring & Evaluation
DTO	All unit plan priority programs for health data integration and development	All units conduct research on product feature and technology services for health data integration and development	Only DTO and Pusdatin develop product/service for health data integration and development NA	All unit pilot testing products/services for health data integration and development	The working groups implement products/services for health data integration and development according to programs target; DTO and Pusdatin support the implementation	DTO- Pusdatin evaluate products/ services
Directorate General of Health Services "Pusdatin"						
Directorate General of Disease Prevention & Control						
Directorate General of Pharmacy & Medical Devices						
Other relevant working groups including BPJS						

Figure 8 Governance structure of DTO

DTO is also working with Pusat Data dan Information (Pusdatin) or the Centre of Data and Information and Satker or working units such as Setditjen Yankes or Directorate General of Health Service, Setditjen P2P or Directorate General of Disease Prevention and Control, Directorate General of Pharmacy and Medical Devices, and other bodies including BPJS to carry out the planning and implementation. These three units provide direction and substance for product and service research while, uniquely, only DTO and Pusdatin will perform product and service development. The relevant work units then perform a trial application with DTO and Pusdatin. Furthermore, the work units will undertake field implementation while continuing to evaluate the application. DTO and Pusdatin will support the implementation by monitoring and evaluating (Ministry of Health Indonesia 2021).

A key lesson from the governance structure that is the new management team does not show cross-collaboration, especially with MCIT. Meanwhile, as elaborated earlier, MCIT is an important agent to ensure the feasible adoption of a DHT to a group of population and area since it will be associated with user literacy and training, the development of broadband infrastructure, and patient data protection compliance. In the regulatory sandbox, MCIT's presence is critical in the piloting and implementing activities. Moreover, MCIT should also be involved in the monitoring and evaluation phase for measuring user digital literacy.

3. Market overview

3.1 Market size and trends

Digital health is growing rapidly in Indonesia and has the potential for digital health business. The first reason is that the revenues of digital health are expected to increase from $85 million

to $973 million in 2017-2022 at an annual growth rate of over 60%. As the ecosystem grows and the investment climate is favourable, more businesses are applying new and existing technologies (MTP Connect 2020).

Secondly, Indonesia is the fourth-largest country in terms of population (270 million), with a young demographic (more than 40% of the population is under 25 years old) as the tech-engaged group. It was also the 16th largest economy in terms of Gross Domestic Product (GDP) in 2018. Being an archipelago, access to digital health is limited in some areas. Such market conditions and geographical features have made Indonesia one of the largest market and presented opportunities for technology-based products including in the health sector.

Lastly, the Indonesian digital economy will be the largest growing digital economy in Southeast Asia and is expected to grow to $174 billion by 2025. E-commerce, which has been dominating the digital economy, accounted for 8% of the GDP in 2030. Other components such as digital health (learning) accounted for a small number yet growing proportion. There are roughly 170 million internet users (64.8% of the population), which is dominated by young users aged 15-19 years old (91%), and 20-24 years old (88.5%) (Deloitte Indonesia 2019a; MTP Connect 2020).

3.2 Market opportunities

As the government begins to boost health technology services in Indonesia, the market has become more established and there is increasing demand. Currently, Indonesia is home to many digital health start-ups, which are mainly dominated by e-pharmacy and online consultations. Other types of health technology businesses available in Indonesia include information systems, on-demand healthcare, e-learning, online marketplace, artificial intelligence (AI), IoT, genetics and others. A few significant telemedicine providers are AloDokter, HaloDoc, and GO-MED (MTP Connect 2020).

As spending by hospitals is increasing followed by the need for health practitioners online, it is expected that health tech businesses will penetrate the market. This condition will create an environment for domestic platforms to partner with hospitals, driving the demand, and increasing revenues.

The increase in demand for medical devices is driven by the increasing trends in chronic and non-communicable diseases, which require advanced and high-tech solutions. Changes in lifestyle also influence the demand for more specialised drugs and other pharmaceutical products. Companies will need to find a new strategy to deliver those needs (Deloitte Indonesia 2019a).

AI is a good example of a health tech product to leverage healthcare in Indonesia as it becomes more prevalent in everyday life. It has the potential to assist in patient care and administrative processes. However, adopting it for diagnostic and treatment plans in Indonesia is still challenging, especially if it must be integrated into the clinical and human resource competencies. Integrating AI systems into the IHS platform will be a barrier to mainstream use (Hani 2021b).

However, a legal framework to develop AI in healthcare is now supported by the National AI Strategy developed in 2020 by the Minister of Research and Technology and the head of the BRIN (the National Research and Innovation Agency) and presents a framework to develop AI between 2020 to 2045 (Hani 2021a).

The digital health wave in the country is still finding its footing, unlike other digital economy sectors in fintech, e-commerce, travel, and ride-sharing which have found their "doers". The enthusiasm from legal entities driven by technological improvements and availability by private innovators increases the chances of rapid adoption of the technology (MTP Connect 2020).

3.3 COVID-19 and digital health in Indonesia

Throughout the pandemic, there was an urgent need for healthcare management, clinics, and other health facilities, including technology-based healthcare solutions. However, the solutions were divided between government and private-owned initiators.

The pandemic has driven the use of such technology especially m-health applications for mitigation purposes such as self-assessment, contact tracing, disseminating information, minimising exposure, and reducing face-to-face health consultation. A prominent m-health developed by the MCIT for COVID-19 screening during these times is PeduliLindungi. BPJS also integrated the COVID-19 screening function into its JKN mobile application including the claim process. The use is still less favourable compared to private telemedicine for the public (Ministry of Health Indonesia 2021).

Private m-health experienced a surge in popularity. The most demanded feature is teleconsultation which increased up to 600% during the times. A leading telemedicine provider, i.e., Alodoc, received financial growth increase of 130% in the first year of the pandemic. It accommodated 20,000 health consultations/month to 450,000 general practitioners, 300,000 specialists, and 1,500 hospitals and clinics. The advantage and popularity of private teleconsultation is wide coverage with hospitals, which reduced transport distance expenses by 4% and commuting time (UNDP Indonesia 2022a).

Reflecting on the success of private m-heath to reach a wider population by delivering health services, this situation drove digital health transformation by the ruling government while engaging private sectors in creating enabling ecosystems for all. Thus, a regulatory sandbox was proposed as a mechanism to engage the private sector. It is expected that teleconsultation/telemedicine will take over in other disease areas beyond COVID-19 patients.

4. Digital literacy

4.1 Overview of the national digital literacy curriculum

The digital literacy programme was developed in response to the President's mandate on the acceleration of digital health transformation (Point 4 Preparation of digital society) and the latest IMD survey in 2019. To improve digital skills at all levels of society, MCIT determined 8 focus areas:

- Public digital competitiveness
- The proportion of students and teachers
- Increase the ratio of female researchers
- Smartphone ownership
- Opportunities and threats
- Big data & analytic use
- Knowledge transfer
- Cybersecurity

These 8 main focus areas have been translated into the national literacy roadmap consisting of a national curriculum and programme. The backbone of the roadmap refers to the main four pillars, namely, digital skills, digital culture, digital ethics, and digital society, which became the parameters to measure digital literacy in Indonesia (Deloitte 2021).

Figure 9 Digital literacy framework

- Digital skill is defined as the ability to use hardware and software of technology to fulfil daily life needs.
- Digital culture skill is the individual ability to utilise information.
- Digital ethics skill is the ability to practise ethics in the digital world.
- Digital safety skill includes the ability to use all information to protect data safety.

These four pillars have been incorporated into three levels of a digital curriculum that targets different groups as illustrated below.

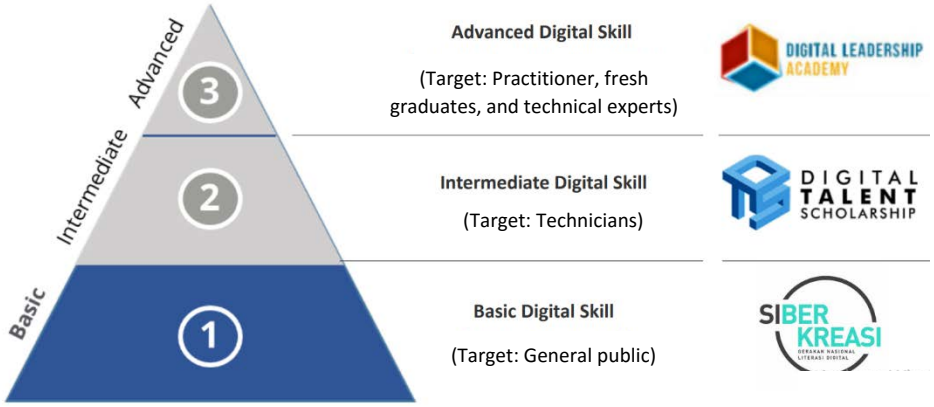

Figure 10 Digital literacy program of Indonesia

At the top of the pyramid is the more advanced and specific digital skills which will be delivered to academics and experts. The highest level of skills requires users to have the ability to create content and use digital platform themselves. The next levels refer to the less technical aspects delivered in the curriculum. Basic digital skills enable the user to operationalise platform and digital identities, data searching, digital transaction, digital communication, and interaction. Each level of skills has a different curriculum and module for each digital literacy pillar.

4.2 Measurement of digital literacy in Indonesia

The first measurement of digital literacy in Indonesia was conducted by MCIT in collaboration with Katadata Insight Center in 2020-2021. This survey was an initial step to selecting priority programmes based on the digital literacy roadmap that has been formulated in earlier years. The survey used "A Global Framework of Reference on Digital Literacy Skills" framework to measure the level of digital literacy.

The results showed that the Indonesian literacy index was at 3.49 meaning a 'moderate' level. Although digital culture was found to be increasing among the population (index of 3.90), priority should be given to digital safety and ethics which received the lowest score among other pillars. People are still displaying personal and identifiable information on social media and are unable to filter hoaxes.

Internet access in the Indonesian population is most influenced by the ownership of handphones. All of the respondents had a handphone that can connect to the internet. Meanwhile, access to the internet was discontinued mostly due to unstable connection (77%), expensive internet package fees (40%), and occasional unavailability of electricity (0.7%). Such figures inform DHT innovators to collaborate with MCIT to improve broadband infrastructure and ensure that the technology is cost-saving and mobile-friendly for users to utilise it.

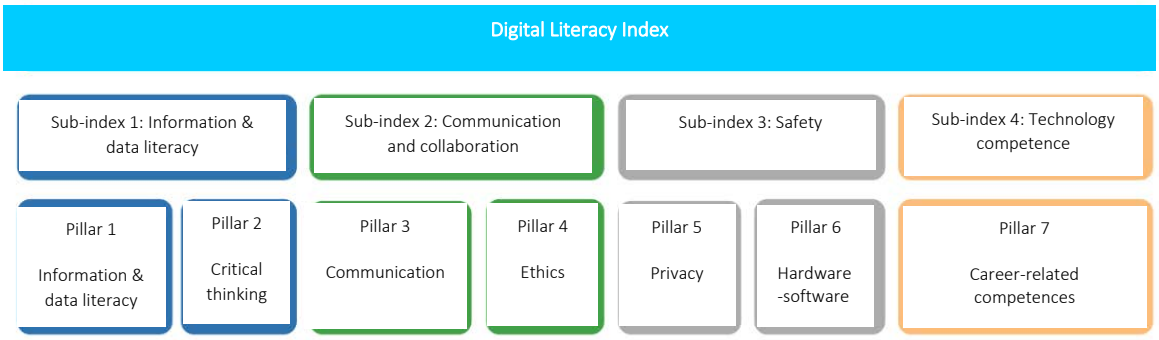

Figure 11 Digital literacy measurement framework

Furthermore, the Indonesian population mainly receives information through social media (76%) followed by TV. As such, it was found that WhatsApp is more popular for disseminating health information among family members. Information spread via social media might not be trustworthy or from reliable sources. Hence, television is still the preferred and trusted mode of communication due to its accurate and authoritative information.

All the above information summarised that the digital literacy divide occurs in Indonesia as seen based on education status, socioeconomic status, geographical location, age, and sex. People living outside of Java and in rural areas tend to have unstable internet connections and lower infrastructure development, which correlates with their economic status and education. Young people (19-25 years old) and males are more exposed to internet access (Katadata Insight Center and Kominfo 2020; Suhariyati, Ekawati, and Rini 2021).

4.3 Narrowing digital literacy gap in competent workforces

Developing a digitally competent workforce seems challenging due to socioeconomic and development status. Having a talented workforce with digital competencies can extend the DHT application to strengthen healthcare. Narrowing the gap in Indonesia's digital literacy requires special attention to the quality of basic education and basic literacy outcomes.

One example of integrating digital literacy curriculum in formal education is the implementation of Higher Order Thinking Skills (HOTS), which the Ministry of Education aims to integrate across all school subjects. The proposal is that Information, Communication and Technology (ICT) will no longer be considered an independent compulsory subject but should be integrated across all subject areas.

Increasing access to ICT through formal education will gradually produce digitally competent workforces. It will require the government to pay significant attention to the workers' access to ICT education and training to improve their skills. Currently, less than 1% of Indonesian workers have advanced digital skills, while basic to intermediate skills have reached 50%. Increasing the accessibility and incentives for the adoption of digital culture will improve DHT adoption in Indonesia.

One example of literacy programmes is that of MCIT in partnership with MoHI, the Indonesian Medical Association (IDI), hospitals, the World Health Organisation (WHO), pharmaceutical companies, and start-ups to train health workers on the basic and advanced curriculum. They focused on how referral systems between hospitals should work and the importance of real-time data for healthcare services. The programme was conducted through a hybrid method, through webinars and at health facilities once a month for four months. At the end of the year, health professionals go through an annual test (UNDP Indonesia 2022a; Deloitte 2021)

5. Health Technology Assessment (HTA) and reimbursement process of digital health technologies

5.1 HTA methods and process guidelines for digital health

The Indonesian HTA Committee (InaHTAC) was established in 2013 to provide evidence-based policy recommendations to the MoHI to support monitoring the quality and financing of Indonesian healthcare, in the context of the JKN. The assessment conducted by InaHTAC was based on the technology's safety, efficacy, effectiveness, economic analysis, sociocultural values, budget impact analysis, and if necessary, religion. The results will determine the procurement and financing of health technologies that are cost-effective to include in the JKN benefit package and may discontinue those which are not (InaHTAC 2017).

HTA could be conducted on both, new and existing technologies. The HTA process starts with topic identification and selection, followed by review and assessment, critical appraisal of the evidence, synthesis of the results and recommendation, dissemination of HTA results, and monitoring of the recommendation. Key points about the process are as follows:

- Topic identification and selection are proposed by any HTA stakeholders, e.g., InaHTAC, MoHI, BPJS, professional organisations, hospitals, industry, and even individuals. Topics will be selected and prioritised based on certain criteria.
- During the first phase, research questions regarding technology validity, importance, and applicability will be formulated. The scientific evidence will then be appraised to answer these questions.
- The outcomes of the appraisal are HTA synthesis and recommendations which can be conducted by systematic reviews and meta-analysis methods.
- The results will be disseminated to other relevant parties to be reviewed. The revised version will be then distributed to external peer reviewers who are not involved in the HTA process. The final version of the report will determine whether a technology can be adopted or not and this should be agreed upon by InaHTAC.
- The report only serves to provide a recommendation. InaHTAC does not have the authority to implement this recommendation, but they will monitor it. The timeline for the adoption is not specified, as other factors such as costs, facilities, politics, etc need to be considered.

Typically, policymakers are the parties which have active interest in HTA even though not all of them would be decision makers of the HTA adoption. Stakeholders that have an interest in HTA may include the MoHI itself, NADFC, BPJS (JKN payer), universities, hospitals, civil organisations, the public, etc according to their scope of work.

- MoHI with BPJS determines the inclusion of a certain technology into the JKN benefit package.
- NADFC requires input on whether a certain health technology can be used (drugs, medical devices).
- BPJS should receive input as to whether certain procedures, screening tools, drugs, or devices should be included in the items guaranteed by the insurance.

- Professional health service providers (doctors, dentists, pharmacists, nurses, midwives, and others) require HTA to obtain valid evidence of whether a certain technology can be used for service.
- Professional organisations can use HTA results to develop or revise the National Guidelines for Medical Practice (PNPK) or Clinical Practice Guidelines (PPK).
- Educational institutions, such as medical faculty/dentistry / public health, and other medical institutions can apply the assessment in the educational process.
- Hospitals, service networks, medical drugs/device providers
- Producers/industries for pharmacies and medical devices
- Parliament or political leaders can use the results for technology innovation, research/development, regulation, insurance, etc.
- Patients whom the service targets are the most concerned (InaHTAC 2017).

5.2 Using the current HTA guideline of Indonesia for DHT

There is limited information on whether there has been an economic evaluation for DHTs, especially telemedicine. The majority of assessments are carried out for studies of drugs (InaHTAC 2017). However, a scoping review on the cost-effectiveness of telemedicine in Asia was conducted by an HTA research agency in Indonesia (Salsabilla et al. 2021). Both the reimbursement trials and this study show that Indonesia is trying to develop a reimbursement mechanism for telemedicine based on scientific evidence.

Some countries have a specific HTA guideline for DHTs such as South Korea, the United Kingdom (UK), France, and Germany, which were launched around 2019-2020 (Bourcet, Suh, and Sarno 2022). These guidelines usually presents innovators and policymakers with the standards of evidence required for different types of DHTs. The assessment of DHTs, for instance at the National Institute for Health and Care Excellence (NICE), does not have a separate evaluation programme, but rather DHTs assessed via the most appropriate NICE programme.

Indonesia's HTA on DHTs might be done by the new focal unit of digital transformation (DTO) in collaboration with InaHTAC. The Indonesian HTA method guideline provides a few key points for InaHTAC, DTO, and other relevant stakeholders to potentially broaden the classification that accommodates diverse types of DHTs. One lesson which Indonesia could learn from NICE is using the category of technology purpose of use to fit non-medical or -equipment DHTs (Brassel, S., Radu, P. 2022). These points should be considered by the DTO to expand DHTs into the UHC package.

5.3 Reimbursement for digital health technology in Indonesia

Salsabilla (2021) summarised that telemedicine has been proven in Asia as a promising intervention in health services, by reducing travel costs and time savings. The overall health treatment cost is lower and the quality of life of patients can be improved. This can expand access to essential health services, especially in remote areas.

Currently, there is no reimbursement pathway for DHTs. The current payment of JKN to health facilities is based on a capitation system and the advance amount paid is based on the number of patients registered in the hospital. Health providers who conduct teleconsultation through JKN mobile will be automatically recorded by BPJS to be paid.

In the case where teleconsultation is conducted through separate mobile chatting platforms such as WhatsApp, health providers must report independently to the BPJS system. The advantage of such a capitation system in post-COVID-19 times is that it is independent of the number of actual hospital visits (UNDP Indonesia 2022b).

Based on Presidential Regulation 82/2018 Article 65 (2), BPJS can determine a payment system for health services, including for telemedicine for areas with inadequate health facilities (BPJS Kesehatan 2018). This has become the legal foundation for MoHI to set the new non-capitation system (based on a fee schedule) of 40,000 IDR ($2.69) for the telemedicine reimbursement trial (Lazuardi et al. 2022).

Teleconsultation first occurs between patients and primary-level hospitals (community based). The primary-level hospitals will then refer patients to referral hospitals if needed (hospital based). BPJS will divide the fund into primary-level hospitals (25%) and referral hospitals (75%) for each consultation that takes place. The cases that are covered in the trials are maternal health, diabetes mellitus, hypertension, heart diseases, asthma, chronic and obstructive lung diseases, epilepsy, schizophrenia, strokes, and systemic lupus erythematosus (UNDP Indonesia 2022b).

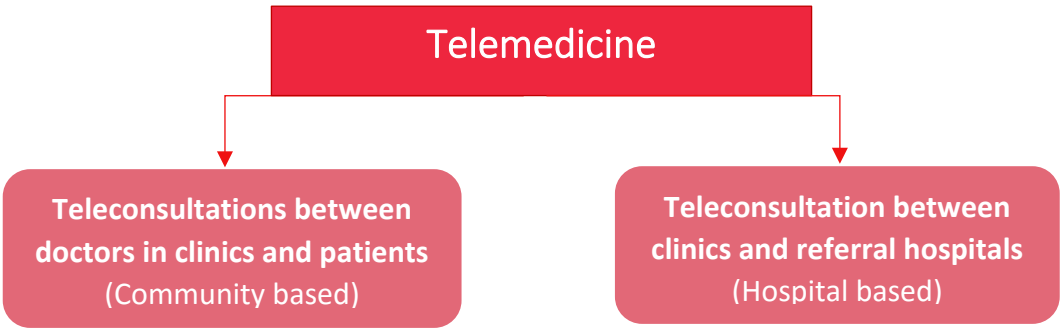

Figure 12 Telemedicine services of JKN mobile

In 2020, telehealth/telemedicine services on the JKN mobile applications were tested by MoHI in five cities like Medan, South Jakarta, Gorontalo, and Yogyakarta. Through the application, hospitals can process claims and reimbursement to BPJS. The trials have been expanded to a

total of 18 cities in 2022, and the full implementation is expected to begin in 2023 (UNDP Indonesia 2022b).

Potential challenges for future implementation are associated with the double payment for the patients who must still visit the referral hospital. Furthermore, it is difficult to monitor and evaluate the quality of healthcare services provided to the patients, since the claim is only based on the number of consultations at primary-level and referral hospitals (UNDP Indonesia 2022b). Therefore, this scheme has been criticised for failing to provide holistic health outcomes in the JKN, particularly for chronic diseases that require continuous monitoring.

5.4 Other considerations for funding digital health technology in Indonesia

A study of health workers' perspectives on the usage of telemedicine in Makassar showed that additional funding for the daily operational costs of delivering telemedicine services, such as electricity and gasoline, should also be considered. This is because primary-level hospitals usually have a very tight budget. Moreover, remuneration/incentives to the clinicians who provide the services should be increased to support their welfare and motivate them (Indria, Alajlani, and SF. Fraser 2020).

MoHI should also consider cooperating with MCIT and the Ministry of Home Affairs (MOHA) to establish a stable broadband network and ensure the availability of electricity with regard to the funding of telemedicine.

MOHA has set up a new financing scheme to fund the local government for special programmes such as telemedicine (Government Regulation 12/2019). This could potentially be used to cover operational costs in telemedicine (UNDP Indonesia 2022b).

Figure 13 SWOT Analysis of Digital Health Landscape: Indonesia

6. Lessons Learned from the Indonesian digital health technology landscape

The key lessons for DHTs from the Indonesian landscape that is moving toward digitalisation are summarised below and in Figure 14 in the form of Strengths, Weaknesses, Opportunities and Threats (SWOT).

The ecosystem for DHTs in Indonesian is young and energetic. Having a bigger legal umbrella on the digitalisation vision will drive a fast change in different ministerial bodies and relevant sectors at the central and local levels. Such top-down enthusiasm will need to be linked with what is happening in society and will affect the demand and supply of digital health transformation.

The country's large young population is technologically adaptive and has used digital solutions in leading sectors, i.e., the travel, transport, and e-commerce sectors before healthcare. As internet and smartphone penetration will make digital solutions more accessible, people will become more aware of health issues and digital adoption as well as literacy in the healthcare sector will continue to grow. This has become a favourable climate investment for technology-driven products.

The social divide based on socioeconomic factors among DHT users is still prevalent. It may give rise to public distrust of digital solutions and instead widen health inequality. Coordination across stakeholders led by MoHI and MCIT not only covers digital literacy education/curriculum and infrastructure but also narrows these gaps through HTA and the reimbursement scheme.

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