National Department of Health

Papua New Guinea

NATIONAL DIGITAL HEALTH STRATEGY

2025–2030

The National Digital Health Strategy 2025-2030 was approved by the National Health Board in XXX 2025.

The development of this Strategy was coordinated by the Information and Communication Technologies Branch of the National Department of Health.

Contents

Foreword by the Honourable Minister for Health

The Government of Papua New Guinea (PNG) aims to achieve a smart, wise, fair and happy society as espoused in the Papua New Guinea Vision 2050. Among other priorities, Vision 2050 seeks to improve the quality of life of Papua New Guineans as the country achieves greater heights of socioeconomic development. A critical enabler of this vision is physically and mentally healthy citizens.

The National Department of Health (NDoH) has set directions for ensuring the physical and mental health of our citizens in the National Health Plan 2021–2030 (NHP 2021–2030), which has an overarching goal of leaving no one behind. It aims to reverse poor health indicators, with a focus on community engagement and empowering people to take ownership of their own health, the health of their family and the health of their community. A critical enabler towards achievement of these health goals are information and communication technologies (ICT), also referred to as digital technologies. The integration of digital technologies in the health sector has shown significant potential in improving health-care outcomes and access to services globally as well as in the Pacific Region.

I am pleased to present the Papua New Guinea Digital Health Strategy 2025–2030, a pivotal document outlining our vision for transforming healthcare through digital innovation. The COVID-19 pandemic has highlighted the critical importance of digital technologies in health-care delivery and well-being, accelerating the adoption of digital solutions globally. In response, this strategy aims to build a resilient and agile health system that leverages digital tools to meet evolving needs and challenges.

This strategy reflects our commitment to harnessing the power of ICT to strengthen health-care delivery, advance Sustainable Development Goals (SDGs), and achieve universal health coverage (UHC). The NDoH and our stakeholders have collaborated diligently to craft this strategy, which will guide our investments in digital health over the next six years. Together, we can create a health-care system that is accessible, efficient and equitable for all the people of PNG.

Elias Kapavore
Minister for Health

Acknowledgements by the Secretary for Health

On behalf of the Ministry of Health, I would like to express my sincere gratitude to all individuals and organizations who contributed to the development of the Papua New Guinea National Digital Health Strategy 2025–2030. This document provides guidance to the National Department of Health (NDoH), Provincial Health Authorities (PHAs), other government line agencies and departments, partners and private vendors on deploying and scaling digital technologies in the health sector. It outlines the priorities to pursue and activities to implement to build a sustainable, digitally connected health system that will improve the accessibility, quality and efficiency of health service delivery for all the people of PNG.

The National Digital Health Strategy was developed following a digital health maturity assessment conducted in 2023. This assessment evaluated nine building blocks of the digital health environment at the national level and in 14 provinces. The findings, which were shared and discussed with stakeholders during the Second Digital Health Convergence Workshop in November 2023, helped shape the three pillars of focus in this Strategy. The pillars are: (1) strengthening the enabling environment; (2) implementing appropriate technologies; and (3) connecting all parts of the health system through interoperable information systems. Our aim is for this Strategy to be both aspirational and practical, firmly rooted in the realities of the Papua New Guinea context.

The development of this Strategy was led by the Information and Communications Technology (ICT) and Performance, Monitoring and Research Branches of the National Department of Health, with the financial and technical support of the World Health Organization (WHO). Consultations were held with all stakeholders including NDoH programmes, provincial health authorities, central agencies, development partners, donors, churches and private vendors, with the financial support of WHO and UNICEF. Members of the NDoH eHealth Technical Working Group (eHTWG) provided key technical inputs towards refining the Strategy. The Department of ICT provided guidance on ensuring the Strategy was aligned with broader government digital plans.

I wish to extend my heartfelt thanks to our dedicated health professionals, programme managers and policy-makers who provided invaluable insights and expertise throughout development of the Strategy. Your commitment to advancing health outcomes in our nation has been instrumental in shaping this Strategy. I would also like to acknowledge the support of our development partners whose guidance and resources have helped us to align our digital health initiatives with global best practices. Your collaboration has been crucial in ensuring that our Strategy is both innovative and applicable to the unique context of Papua New Guinea.

Lastly, I wish to recognize the citizens of Papua New Guinea, whose needs and aspirations guided the development of this Strategy. We are committed to ensuring that our digital health initiatives empower you and improve your access to quality healthcare.

Together, we are paving the way for a healthier future for all Papua New Guineans through the effective use of digital health technologies.

Thank you.

Dr Osborne Liko
Secretary for Health

Abbreviations

API	Application Program Interface
DHMA	Digital Health Maturity Assessment
DICT	Department of Information and Communication Technology
EHR	Electronic Health Record
eHTWG	eHealth Technical Working Group
EMR	electronic medical record
eNHIS	electronic National Health Information System
ETL	Extract, Transform, Load
FHIR	Fast Healthcare Interoperability Resources
HIE	Health Information Exchange
HL7	Health Level Seven
HMIS	Hospital Management Information Systems
HRIS	Human Resources Information System
ICD-10	International Classification of Diseases version 10
ICT	information and communication technology
IFMS	Integrated Financial Management System
LIS	laboratory information system
LOINC	Logical Observation Identifiers Names and Codes
M&E	Monitoring and Evaluation
MDS	Minimum Data Sets
MSB	Medical Supply Branch
NDoH	National Department of Health
NHP	National Health Plan
OpenHIM	Open Health Information Mediator
PACs	Picture archive and communication system
PHAs	Provincial Health Authorities
PHIOs	Provincial Health Information Officers
PMRB	Performance, Monitoring and Research Branch
PNG	Papua New Guinea
RIS	radiology information system
SHR	shared health record
SOPs	standard operating procedures
TCO	total cost of ownership
ToR	terms of reference
TB	Tuberculosis
UHC	universal health coverage
WHO	World Health Organization

Glossary

Application Program Interface (API). An API is a set of technical protocols for building software applications. It specifies how software components should interact and allows different systems or applications to communicate with each other by defining the methods and data structures they can use.

Data standards. Data standards are formalized conventions for the representation, format and exchange of data. They ensure consistency, accuracy and interoperability across different systems and organizations by establishing common definitions, formats and procedures for data usage.

Data warehouse. A data warehouse is a centralized repository that stores large volumes of structured and unstructured data from multiple sources. It is designed to support business intelligence activities, such as data analysis, reporting and decision-making, by providing a consolidated, historical view of data.

Electronic Medical Record (EMR). An EMR is a digital version of a patient's paper chart in one facility. It contains the medical and treatment history of the patients at that facility and is used by health-care providers for diagnosis and treatment within that specific practice.

Electronic Health Record (EHR). An EHR is a digital record of a patient's comprehensive health information. It includes data from all facilities visited by the patient and can be shared across different health-care settings to provide a holistic view of a patient's health history, facilitating coordinated care.

Enabling environment. An enabling environment refers to the set of external factors and conditions that facilitate the successful implementation and sustainability of a project or initiative. This includes policies, regulations, infrastructure, human capacity, and strategy and investment that support the desired outcomes.

Extract, Transform, Load (ETL). An ETL is a data processing method used in data warehousing. It involves extracting data from various sources, transforming it into a suitable format or structure for analysis, and loading it into a data warehouse or another data storage system. This process ensures data is clean, consistent and ready for analysis.

Health Information Exchange (HIE). A HIE is the electronic movement of health-related information among organizations according to nationally recognized standards. It enables the sharing of patient information across different health-care systems, improving the quality, safety, and efficiency of health-care delivery.

Integration. Integration in the context of IT and healthcare refers to the process of linking different computing systems and software applications physically or functionally to act as a coordinated whole. This enables disparate systems to work together within and across organizational boundaries.

Interoperability. Interoperability is the ability of different information systems, devices, or applications to access, exchange, integrate and cooperatively use data in a coordinated manner through established data standards, within and across organizational, regional and national boundaries, to provide timely and seamless portability of information.

Registry. A registry is a systematic collection of data on individuals, places or things that are tracked or commonly used across digital health systems.

Figures

Tables

Executive Summary

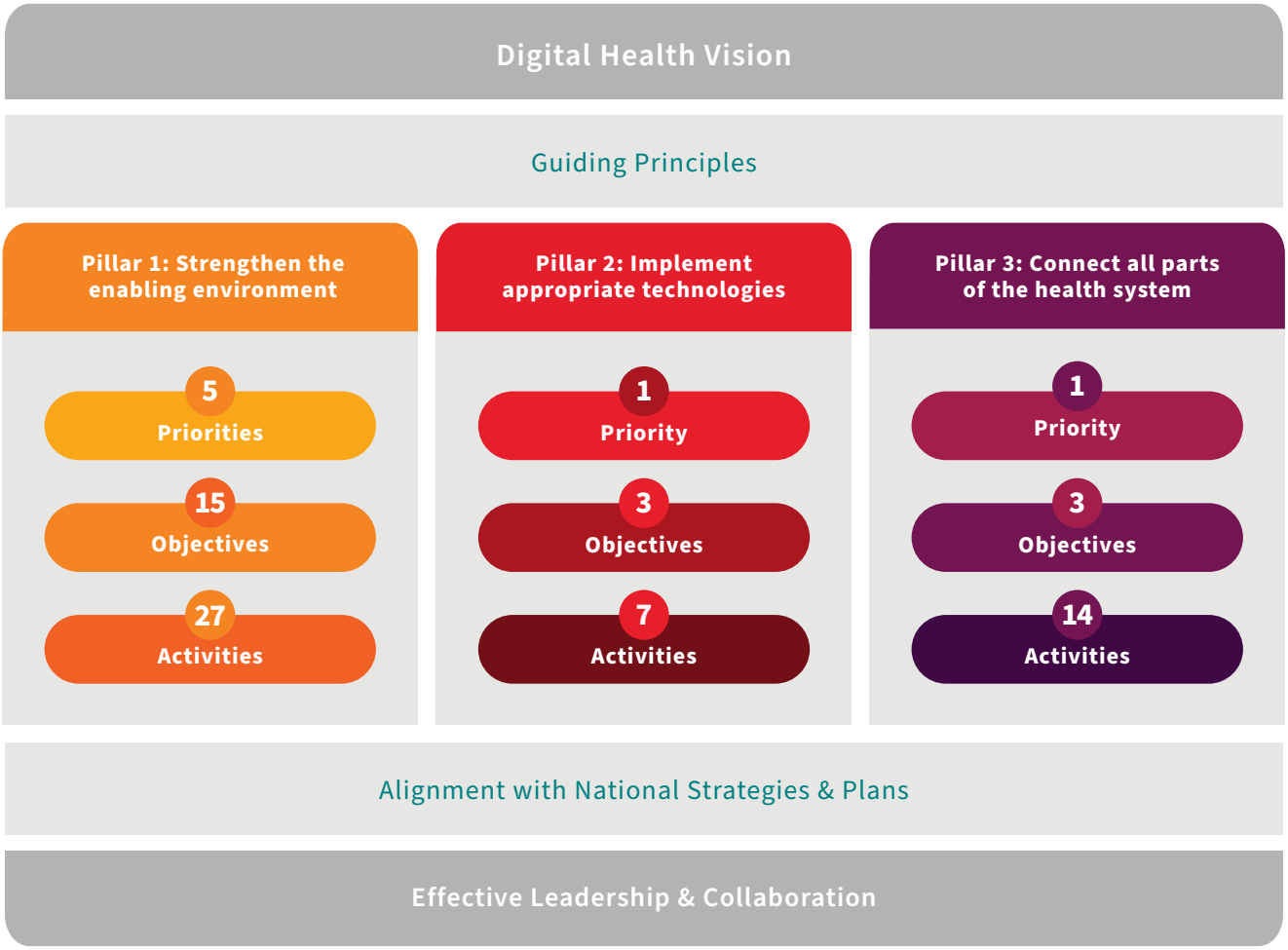
The Papua New Guinea (PNG) National Digital Health Strategy 2025-2030 presents a forward-looking framework to transform the health sector through digital transformation. This strategy is a critical response to the evolving healthcare needs of the nation and aligns with broader national plans and strategies, including the *National Health Plan (NHP) 2021-2030, the Monitoring and Evaluation Strategic Plan for the National Health Plan 2021–2030* (M&E Strategic Plan), and the draft National Health Information & Communication Technology (ICT) Policy of the National Department of Health (NDoH).

This digital health strategy is developed to address the pressing need for improved health-care delivery, efficient resource management, and enhanced data coordination and utilization. It is informed by the Digital Health Maturity Assessment (DHMA) conducted in 2023, which revealed a fragmented approach, underscoring the need for a cohesive long-term strategy. It seeks to address the gaps and leverage opportunities in the current health system highlighted in the DHMA to provide a structured framework for sustainable digital health adoption. The focus is on establishing a strong enabling environment and enhancing the application environment.

By 2030, the vision is to leverage digital health technologies to build a sustainable, digitally connected health system that will improve the accessibility, quality and efficiency of health service delivery for all the people of PNG. This vision is anchored on key principles such as interoperability, sustainability and stakeholder engagement.

The strategy is structured around three key pillars (Fig. A), each with defined priorities and activities to achieve the vision.

Fig. A. Overview of the structure of the Papua New Guinea National Digital Health Strategy 2025–2030



The strategy will be implemented through a phased approach designed to incrementally build PNG's capabilities to adopt advanced technologies and establish a comprehensive digital health ecosystem (Fig. B). The approach is divided into three phases with a total of 50 proposed activities or projects:

- **Short-term (2025–2027):** *focus on establishing foundational systems, improving information and communication technology (ICT) infrastructure, and initiating pilot projects, with 17 short-term projects;*
- **Medium-term (2027–2029):** *expand successful pilots, establish interoperability foundations, and scale up digital health solutions across more regions and facilities through 22 medium-term projects; and*
- **Long-term (2029–2030)**: *achieve interoperability of digital health systems, ensure sustainability, and continuously improve, based on feedback and evolving needs through implementation of 16 projects.*

The PNG National Digital Health Strategy 2025–2030 is a transformative initiative aimed at creating a resilient, efficient and inclusive health system. By addressing current gaps and leveraging digital technologies, PNG aims to significantly improve health-care delivery, resource management and health outcomes, ensuring a healthier future for all the people of PNG.

Fig. B. Proposed projects (short-, medium- and long-term) for implementation under the Papua New Guinea National Digital Health Strategy 2025–2030

	Short-term Projects (Y1)	Medium-term Projects (Y2-3)	Long-term Projects (Y4-6)
Governance & Regulation	• GR1.1: Formalize additional governance structures. • GR 2.1: Establish a Digital Health Repository. • GR 2.2: Setting up a Platform for Technology Vendors. • GR2.3: Participate in Regional and Global Events. • GR3.1: Develop key policies	• GR2.4: Strengthening Research Activities. • GR3.1: Develop key policies.	• GR3.2: Develop key laws
	Short-term Projects (Y1)	**Medium-term Projects (Y2-3)**	**Long-term Projects (Y4-6)**
Human Capacity	• HC1.1: Require computer literacy components in capacity plans. • HC1.2: Collaborate with educational institutions. • HC1.3: Establish and Distribute a Competency Framework.	• HC1.4: Develop an in-service training program. • HC1.5: Embed digital health literacy into Continual Professional Development. • HC1.6: Provide refresher training on existing digital health applications. • HC2.1: Co-develop a pre-service curriculum for digital health. • HC2.2: Recruit and train academic facilitators.	• HC3.1: Build sufficient ICT capacity within PHAs • HC3.2: Establish ICT support hubs

Digital Investment

Short-term Projects (Y1)	Medium-term Projects (Y2-3)	Long-term Projects (Y4-6)
• IN1.1 Develop a TCO framework for digital health projects.	• IN2.1 Create a digital health budget category in the funding structure. • IN3.1 Develop transition plans for digital health projects.	• IN4.1 Explore partnership models for digital health management

Infrastructure

Short-term Projects (Y1)	Medium-term Projects (Y2-3)	Long-term Projects (Y4-6)
• IF3.1: Develop technical specifications for equipment and hardware.	• IF3.2: Consolidate device usage across programs. • 1F4.1: Develop and implement an asset management system. • IF5.1: Develop SOPs for ICT maintenance	• 1F1.1: Prioritise internet connectivity across L3-L4 facilities. • IF2.1: Prioritise alternate energy sources in facilities with no electricity supply.

Applications & Interventions

Short-term Projects (Y1)	Medium-term Projects (Y2-3)	Long-term Projects (Y4-6)
• 1A2.1: Implement a pilot approval checklist and process.	• 1A1.2: Implement a central • Radiology and PACs system across PHAS. • IA1.4: Develop and implement a human resource information system. • 1A1.6: Pilot telemedicine interventions in PNG.	• 1A1.1: Develop a national HMS and EMR system. • 1A1.5: Select and implement a centralised laboratory information system (LIS). • 1A1.6: Pilot telemedicine interventions in PNG. • 1A3.1: Identify and pilot suitable portable diagnostic tools.

Interoperability Architecture

Short-term Projects (Y1)	Medium-term Projects (Y2-3)	Long-term Projects (Y4-6)
• EX1.1: Set up a governance structure for interoperability. • EX1.2: Develop business processes for health information exchange. • EX1.4: Develop data dictionaries for commonly shared data. • EX1.5: Define minimum datasets for national systems and registries. • EX2.3: Develop a facility registry. • EX1.7: Train ICT staff on interoperability	• EX1.3: Establish a data catalogue of health data sources. • EX1.5: Define minimum datasets for national systems and registries. • EX1.7: Train ICT staff on interoperability. • EX2.1: Develop essential terminology registries. • EX2.2: Develop a patient registry and unique identifier. • EX2.5: Develop national and provincial data warehouses.	• EX1.6: Establish a knowledge hub for health data interoperability. • EX1.7: Train ICT staff on interoperability. • EX2.4: Develop a shared health record repository. • EX2.5: Develop national and provincial data warehouses. • EX3.1: Setup a test server for the interoperability platform. • EX3.2: Develop and configure the OpenHIM platform on the test server

1. Introduction

1.1 The benefits of digital health

The COVID-19 pandemic and climate change have underscored the critical need for robust and resilient health systems capable of responding to unprecedented challenges. These global health crises have highlighted the growing demands on health systems and the necessity for adopting ICT to improve health services and outcomes – referred to as digital health. Digital health, as defined by WHO, is the field of knowledge and practice associated with the development and use of digital technologies to improve health. It involves the systematic application of ICT, computer science and data to support informed decision-making by individuals, health workers and health systems (Fig. 1). Countries worldwide have accelerated the integration of digital health solutions to enhance health-care delivery, improve disease surveillance and ensure continuity of care during disruptions.

Fig. 1. Overview of the benefits of digital health to different stakeholders

Citizens

- Telehealth and mHealth solutions can extend healthcare services to remote and underserved areas, reducing geographical barriers.
- Digital tools can support accurate diagnosis, effective treatment, and efficient management of diseases.
- Patients can access their health information, leading to better engagement in their own health management.

Health workers

- Access to comprehensive and up-to-date patient data through EHRs supports better clinical decisions.
- Digital tools reduce administrative burdens, allowing health workers to focus more on patient care.
- E-health platforms provide opportunities for ongoing education and professional development.

Health managers

- HIS and other digital tools enable real-time data collection and analysis, supporting evidence-based management.
- Efficient data management helps in the optimal allocation of resources and streamlining of operations.
- Digital platforms facilitate the tracking of health program outcomes and performance metrics.

Government

- Real-time health data supports the formulation of effective health policies and interventions.
- Digital health solutions enhance the system's ability to respond to emergencies, such as pandemics, through rapid information sharing and coordinated responses.
- Data-driven decision-making can lead to more effective public health interventions and improved overall health outcomes.

Similarly in PNG, the adoption of digital health can significantly enhance the health system, providing numerous benefits for patients, health workers, health managers and the government.

1.2 Rationale for a digital health strategy in PNG

The Government of PNG has long recognized the value of digital health in helping to build a resilient, efficient and inclusive health system that meets the needs of its population and addresses the challenges of the 21st century. Key national plans such as the National Health Plan 2021-2030 (NHP), the M&E Strategic Plan and the National Department of Health's (NDoH) ICT policy emphasize the strategic use of ICT to strengthen the health system and improve population health through accessible, affordable and quality health-care services (Fig. 2). These documents outline critical initiatives to use digital tools for efficient data management and informed decision-making.

Fig. 2. Digital health-related priorities and initiatives identified in national health documents of PNG

- **National Digital Health Strategy:** Development and implementation of a strategy to integrate ICT into all levels of healthcare.
- **Electronic Health Records (EHRs):** Improvement of data collection and management through the adoption of EHRs.
- **Telehealth Services:** Expansion of telehealth services to provide remote and underserved areas with access to healthcare.
- **Health Information Systems (HIS):** Strengthening of HIS to ensure real-time data availability for policy development and healthcare delivery.
- **Digital Tools for M&E:** Use of digital platforms for efficient data collection, reporting, and real-time monitoring and evaluation of health programs.
- **Infrastructure Development:** Establish a standardized and responsive ICT infrastructure, adhering to enterprise architecture principles for system development and monitoring hardware and software standards.
- **Human Resource Capacity Building:** Develop a sustainable health ICT workforce, integrating ICT training into curricula, and establish the role of a Digital Transformation Officer.
- **Data and Telecommunications Networks:** Create a secure, robust data and telecommunications network connecting all health facilities, using broadband and other technologies, and complying with international standards.
- **Data Security:** Protect and secure data at all levels, implementing encryption and secure storage solutions, and developing processes for secure data transfer and privacy.
- **Procurement and Maintenance of ICT Assets:** Standardize the procurement and disposal of ICT infrastructure, adhering to relevant financial and asset management laws, and ensuring effective lifecycle management.
- **Governance and Compliance:** Establish governance structures for ICT policy implementation, ensuring compliance with national legislation and health sector standards, and monitoring policy implementation for continuous improvement.

The development of this digital health strategy comes at an opportune time for PNG, as the country is embarking on a whole-of-government approach to adopt ICT across all public sectors. Specifically in the health sector, there are three key reasons for this strategy:

1. **Supporting sustainability and scalability:** existing digital health activities in PNG have alleviated some bottlenecks and shown potential for greater value when well-coordinated. A unified strategy is needed to mitigate fragmented efforts and provide a cohesive framework to guide the ongoing and future adoption of ICT in line with national priorities and plans.

2. **Enhancing stakeholder collaboration:** digital health involves various stakeholders, including government agencies, health-care providers, technology vendors, nongovernmental organizations, and the community. A unified strategy will improve collaboration and reduce duplication of efforts, ensuring efficient investment and resource use to achieve national health goals.
3. **Informing health system enhancements:** a digital health strategy will support health system enhancement. By leveraging digital health technologies, PNG can progress towards achieving its SDGs and universal health coverage (UHC), ensuring access to essential health services without financial hardship.

1.3 Approach to developing the strategy

The development of this Digital Health Strategy was guided by a comprehensive and structured methodology, aligning with the steps of the eHealth Strategy Toolkit by WHO and the International Telecommunication Union (ITU). This methodical approach ensured a thorough and inclusive process, engaging key stakeholders and leveraging best practices in digital health strategy formulation.

Situational analysis

The initial step involved conducting a digital health maturity assessment to assess the current state of digital health in PNG. The assessment, summarized in Section 2, highlighted gaps and opportunities across various domains such as governance, service delivery, and data management. These findings have provided a critical foundation for the strategy.

Stakeholder engagement and workshops

The development of this strategy involved extensive stakeholder engagement through a series of three workshops and consultations aimed at gathering insights, building consensus and ensuring a collaborative approach (Fig. 3).

Fig. 3. Stakeholder engagement workshops undertaken in PNG which supported development of the National Digital Health Strategy 2025–2030

November 2019: *"Architecting Our Future: Digital Convergence in the Health Sector" Workshop*	The objectives of this workshop included: • Undertake future thinking and scenario planning for digital health in PNG. • Utilize back casting to plan out a vision and digital health roadmap for national and provincial levels. • Employ the Health Information Governance and Architecture Framework (HIGAF) to further develop digital health roadmaps for the National Department of Health (NDOH) and provinces, with specific actions for the next 1-3 years. • Enhance implementers' understanding of the current digital health landscape.
November 2023: *"Second Digital Health Convergence Workshop: Sustaining Digital Health Technologies"*	The objectives of this workshop included: • Reviewing findings from the digital health maturity assessment and discussing the capabilities of the enabling environments in PNG for digital transformation. • Discussing existing initiatives that could help address identified gaps. • Agreeing on priority areas and actions for strengthening the digital health environment, which would be included in an updated national digital health/ eHealth strategy.
July 2024: *"Consultation on the Draft National Digital Health Strategy"*	The objectives of this workshop included: • Create awareness about the draft strategy. • Build consensus among key stakeholders. • Collaboratively finalize the strategy to ensure it reflects the collective vision and priorities for digital health in PNG.

These workshops and stakeholder engagements played a critical role in shaping the digital health strategy, ensuring that it is comprehensive, inclusive, and aligned with the needs and aspirations of all relevant stakeholders.

2. Situational analysis

Understanding PNG's landscape is vital for development of this digital health strategy so that it is contextually relevant, feasible and effective. It ensures that the strategy is aligned with the country's unique needs, resources and challenges, ultimately leading to better health outcomes and a more resilient health system. This section provides an overview of the country's context, the health system structure and the digital ecosystem.

2.1 About PNG

Geography and climate

PNG is located in the Western Pacific region, encompassing the eastern half of New Guinea island and numerous smaller islands. It shares a border with Indonesia to the west and is situated north of Australia. The country spans diverse geographical features, from coastal lowlands and vast river systems to mountainous highlands and dense rainforests. PNG's tropical climate results in high humidity and significant rainfall, particularly in the highland regions, contributing to the lush biodiversity.

Health system challenges

- Access to and coverage of health services across diverse geographical features.
- Supply chain disruptions due to mountainous terrain and dense rainforests.
- Difficulties in collecting health data for planning due to remote locations.

Digital transformation challenges

- High costs and logistical challenges in supplying ICT equipment to remote areas.
- Establishing and maintaining ICT infrastructure in varied and challenging terrains.
- Frequent maintenance required due to high humidity and significant rainfall causing early wear and tear.
- Low access to internet connectivity in less than 30% of health facilities.

Population and culture

With a population of over 11 million people (1), PNG is characterized by its cultural diversity, with over 800 languages spoken and a multitude of ethnic groups. The country's social structure is deeply rooted in tribal affiliations, which play a critical role in community and social organization. Urban areas, such as the capital city of Port Moresby, contrast sharply with rural areas, where traditional lifestyles prevail.

Health system challenges	Digital transformation challenges
• High cultural diversity with over 800 languages, complicating standardized health communication. • Tribal affiliations influencing community health organization and acceptance of health interventions. • Urban-rural divide with contrasting health needs and service availability.	• Limited local language content available online, excluding non-English speakers and the elderly from digital health benefits. • Challenges to ICT adoption due to cultural differences and digital literacy.

Economy and key drivers

The economy of PNG is largely driven by natural resources, including mining (gold, copper), oil and natural gas. Agriculture also plays a vital role, with coffee, cocoa and palm oil being significant export commodities (2). Despite these resources, PNG faces economic challenges such as limited infrastructure, fluctuating commodity prices and reliance on a narrow economic base. Efforts to diversify the economy are ongoing, with a focus on sustainable development.

Health system challenges	Digital transformation challenges
• Limited infrastructure impacting the delivery and quality of health services. • Economic challenges affecting funding and sustainability of health programmes. • Reliance on a narrow economic base, affecting long-term health planning and resource allocation.	• Economic volatility leading to fluctuating funding availability for ICT projects. • Longer implementation cycles due to dependency on external funding. • Limited availability of local skills.

2.2 Health system structure

Disease burden

PNG's disease burden is marked by a high prevalence of communicable diseases. Malaria remains a major health challenge due to the country's tropical climate, while tuberculosis (TB) and HIV/AIDS continue to have high incidence rates, with TB cases complicated by multi-drug resistance (3). Prevalence of dengue fever and 10 of the 21 world's neglected tropical diseases further exacerbate the health landscape. Noncommunicable diseases, such as cardiovascular conditions, diabetes and cancer, are rising, driven by lifestyle changes and urbanization (4). Although there has been improvement in maternal and child mortality rates, challenges related to inadequate access to skilled healthcare, essential medical resources, and low coverage of childhood immunization, hinder further progress. Additionally, climate change impacts PNG's health burden by altering disease patterns and increasing extreme weather events.

Leadership and governance

The health system operates under the guidance of the NHP 2021-2030 and M&E Strategic Plan. These emphasize improving primary healthcare and enhancing service delivery across all societal levels. The health system's administrative structure spans four levels—national, provincial, district and local—facilitated by the Organic Law on Provincial Governments and Local-level Governments. This law supports the decentralization of governance, allowing local governments to play a significant role in managing health services tailored to community-specific needs. At the national level, the NDoH spearheads policy development, strategic planning and operational management to ensure the delivery of health services. The Provincial Health Authorities (PHAs) provide crucial management and coordination to ensure integrated and efficient health service delivery within their jurisdictions, in accordance with the National Health Service standards. These standards guide the quality and safety of health services, ensuring consistency across all administrative levels.

Health financing

PNG's health financing system demonstrates a strong government commitment, complemented by support from international donors. In 2021, domestic general government health expenditure accounted for 50% of the current health expenditure. International partners contributed nearly 40% of total health financing, underscoring the value of partnerships in strengthening PNG's health system (5). Out of pocket expenditures represented approximately 10% of the current health expenditure, highlighting financial challenges for many households. The Policy on Free Primary Health Care and Subsidized Specialized Health Services, introduced in 2014, aims to reduce financial barriers to accessing health services. Although there have been challenges in its implementation, including insufficient subsidy payments and disparities in distribution across provinces, these issues highlight areas for strategic improvements.

Health workforce

The current supply of health workers fulfils only 39% of health system needs. According to 2022 statistics, the health worker density of 1 per 1000 people is significantly lower than WHO's recommended threshold of 4.45 per 1000 for achieving SDGs and UHC. This shortage may be related to the limited capacity for training new health workers, an aging workforce and a growing demand for health services driven by a steadily increasing population. Furthermore, there is a notable maldistribution of health personnel, with 52% of workers concentrated in urban areas, servicing less than 20% of the population (6). This uneven distribution contributes to inequities in health service provision across different regions of the country. Education and training infrastructure for health professionals includes approximately 20 community health worker training schools, 18 nursing colleges and two universities offering health-related courses nationwide.

Service delivery

Primary, secondary and tertiary health services are provided through a tiered delivery model that organizes health facilities into six levels. Availability of health services across the country according to PNG's UHC Service Coverage Index in 2021 was 30, which is significantly lower than the regional and global averages (79 and 68 respectively) and is the third lowest globally (7). This highlights the substantial disparities in service availability and accessibility, particularly in rural and remote areas. Major health issues include high maternal and child mortality rates, prevalent infectious diseases such as malaria and tuberculosis, and a rising incidence of noncommunicable diseases, including diabetes and cardiovascular diseases. These are addressed through various national health programmes such as the Expanded Program on Immunization, malaria control, TB control, and reproductive health initiatives.

Fig. 4. Overview of the tiered health service delivery model in PNG

Access to essential medicines and products

Frequent stockouts and logistical hurdles affect the availability of drugs at health facilities and impact critical health targets, including child immunization coverage. To improve procurement processes and supply chain management, the government utilizes the mSupply system to manage medication logistics. The mSupply system is used across all six area medical stores as well as provincial transit stores. Medications are provided primarily through a “pull” or demand-driven model, coordinated by the Medical Supply Branch (MSB) of the NDoH. Additionally, the MSB also manages a “push” system where medical supply kits are distributed to all health facilities throughout PNG, ensuring that even the most remote areas have access to necessary medical supplies (8). However, despite this system, other challenges affect the consistent availability of medications.

Health information systems

PNG has adopted several health information systems across its network of over 800 health facilities. These aim to improve data collection and health information management. The main system, the electronic National Health Information System (eNHIS), is implemented in all provinces to facilitate the collection of routine health data. The 2023 DHMA revealed a fragmented application landscape. This impacts the availability of data crucial for health planning and policy-making. This strategy leverages lessons learnt from the roll-out and implementation of various applications.

Purpose	Name	Type	Scale
Health management	eNHIS	Custom built	All provinces
Hospital/clinical information	Discharge Hospital Information System (DHIS)	Custom built	All provinces
Public health and disease surveillance	HIV Patient Database	Licensed	All provinces
	e-TB Module	Custom built	Selected provinces
	DHIS2 for COVID-19 data	Open-source	Pilot in selected provinces
	ODK, Go.Data	Open-source	All provinces
Logistics management	mSupply	Open-source	AMS, provincial stores and facilities in selected provinces
	Pharmaceutical registration system	Custom-built	National level
Financial management	IFMS, Alesco Payroll	Licensed	Most provinces
Laboratory information management system	Senait	Open-source	Selected provinces
Vaccine management	Cold Cloud	Licensed	All provinces
Hospital management and electronic medical records	Insta, ePMRS, TRIAS	Licensed or custom built	Selected hospitals
Ancillary services	Picture archive and communication system (PACs)	Licensed	Selected provinces
	Radiology information system	Open-source	Selected provinces

2.3 Digital ecosystem

PNG has undertaken several initiatives aimed at expanding internet connectivity and improving digital services. One of the major achievements has been the deployment of the Coral Sea Cable System, which connects PNG to Australia, significantly increasing internet bandwidth. However, the geographical terrain of PNG poses significant obstacles to infrastructure development. Many rural areas still lack reliable internet access and power outages disrupt ICT services. According to the 2022 Socio-Demographic and Economic Survey, 71% of PNG households have a mobile phone. In comparison, less than 30% of facilities are connected to the internet. The high cost of internet services also limits widespread adoption and use of digital health technologies. Only 36.2% of households in urban areas and 15% in rural areas have internet access, highlighting the digital divide between urban and rural regions (9).

Digital health maturity in PNG

The DHMA conducted in 2023 provided a comprehensive evaluation of the digital health landscape in PNG (see Annex 1 for the digital health profiles generated from the DHMA). The assessment aimed to understand the strengths, weaknesses, opportunities and threats to the enabling environment of the digital health ecosystem, guided by nine essential building blocks: (1) Data Ecosystem; (2) Infrastructure; (3) Human Capacity; (4) Governance and Regulations; (5) Strategy and Investment; (6) Interventions and Applications; (7) Interoperability; (8) Research and Innovation; and (9) Knowledge Management.

The overall score of 2.3 out of 5 indicates that digital health implementation in PNG is constrained by the lagging enabling environment. Key findings from the nine building blocks are highlighted below.

Table 2. Key findings of the Data Ecosystem Building Block

Data Ecosystem strengths	Data gaps
• eNHIS used to collect key data for health system planning. • Standardized registers, tally sheets, and forms are used consistently across facilities, aligned to a national M&E plan.	• Outdated census data affects resource planning reliability. • Large gap between reported and actual births and deaths. • Lack of patient perspective in data sources; low patient satisfaction data collection. • Limited data use due to lack of analysis skills and principles. • Event-based data capture limits interoperability. • Incomplete and non-standardized health workforce and finance data. • Absence or inconsistency of data quality processes at the facility level.

Table 3. Key findings of the Infrastructure Building Block

Infrastructure strengths	Infrastructure gaps
• Sufficient data storage capacity with on-site and cloud servers at the national-level. • Up-to-date data storage equipment. • Some availability of alternate power supply across health system levels. • Adequate equipment and technical support for eNHIS. • Local providers facilitate technical and user support nationally (PNG Remote-sensing). • PHAs are beginning to establish ICT teams.	• Lack of basic communication mediums in many lower-level facilities. • Poor infrastructure maintenance processes. • Outdated ICT devices unable to support modern digital health software. • Over one-third of sites reported non-functional or unused mSupply tablets. • Unreliable internet connectivity that cannot support all functions.

Table 4. Key findings of the Human Capacity Building Block

Human Capacity strengths	Human Capacity gaps
• Strong demand for digital literacy training among the health workforce. • Leadership recognizes and seeks digital transformation.	• Significant gaps in digital health skills and competencies. • Poor long-term development and engagement with education for digital literacy. • Insufficient capacity at national and provincial levels to manage digital health.

Table 5. Key findings of the Governance and Regulations Building Block

Governance and Regulation strengths	Governance and Regulation gaps
• Established national steering committee and technical working group for eHealth. • Emerging sub-national governance structures in PHAs. • NDoH prioritizing digital health policy development. • eNHIS partners align with government priorities.	• Governance structures lack diversity and focus primarily on ICT expertise. • Lack of digital health-focused policies; existing policies focus on ICT. • Insufficient national oversight of subnational digital health activities. • Data ownership policies and agreements are lacking for eNHIS and mSupply.

Table 6. Key findings of the Strategy and Investment Building Block

Strategy and Investment strengths	Strategy and Investment gaps
• eHealth/digital health is prioritized in key national plans. • eNHIS aligns with national priorities. • Strong political interest in eHealth/ digital health. • Successful public-private partnerships with church health services.	• No guiding national strategy for eHealth/digital health. • Digital health maintenance costs are unknown. • Limited funding pathways for eHealth/digital health activities. • No investment road map for long-term funding. • Digital systems lack strategic implementation beyond eNHIS, mSupply, and IFMS.

Table 7. Key findings of the Interventions and Applications Building Block

Application strengths	Application gaps
• Nationwide adoption and use of eNHIS. • eNHIS is user-friendly, even for those with low digital literacy. • Multi-channel user support for remote users.	• Many proprietary/custom-built systems, including eNHIS. • Reports of non-functional mSupply devices. • Different devices for digital systems increase user burden. • Resistance from clinicians to adopt digital systems. • Data not easily accessible to NDoH or PHAs; lacking data ownership agreements. • Government ICT teams lack system management training. • Limited data analysis on eNHIS, leading to inefficient data use. • Lack of awareness at the national level about all subnational systems.

Table 8. Key findings of the Interoperability Building Block

Interoperability strengths	Interoperability gaps
• Existing components of a HIE platform. • Interoperability is included in key national strategies. • PNG is working on a unique health ID with other sectors.	• Low understanding of standards-based interoperability. • Lack of interoperability skills and training opportunities. • Absence of guiding documents or frameworks from NDoH.

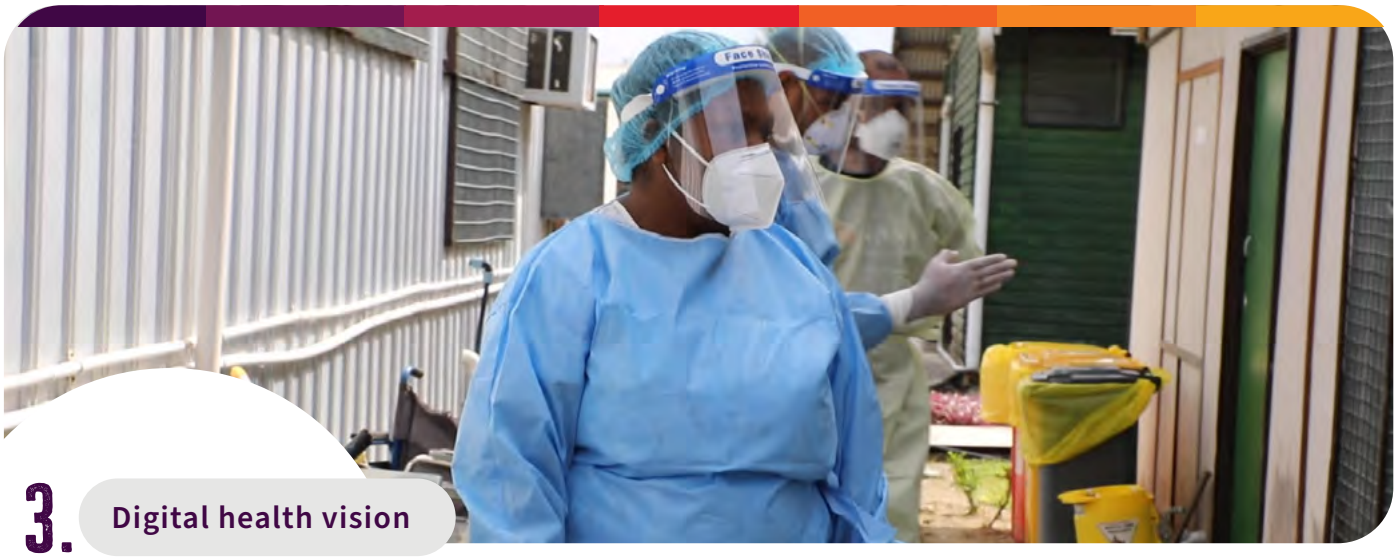
Table 9. Key findings of the Research and Innovation Building Block

Research and Innovation strengths	Research and Innovation gaps
• Some M&E indicators in the M&E Strategic Plan for digital health. • Partner support for research on digital health systems.	• No government-led research institute for digital health evaluation. • Few studies on the efficacy and impact of digital health systems in PNG. • No framework for evidence-based selection of digital health systems.

Table 10. Key findings of the Knowledge Management Building Block

Knowledge Management strengths	Knowledge Management gaps
• PHAs are creating websites for knowledge sharing through DICTA. • NDoH publishes policies and documents publicly.	• Information sharing limited to periodic reports. • Stakeholders must navigate multiple sites for resources and policies. • Few government campaigns to raise digital health awareness.

To address gaps and leverage opportunities identified in the DHMA, a comprehensive improvement framework was developed. This framework establishes the foundation for the digital health priorities and projects outlined in this strategy document. It provides a strategic road map for enhancing the enabling environment for effective digital health adoption in PNG.



3. Digital health vision

3.1 Vision

By 2030, our vision is to leverage digital health technologies to build a sustainable, digitally connected health system that will improve the accessibility, quality and efficiency of health service delivery for all the people of PNG.

3.2 Guiding principles

To ensure the effective and sustainable implementation of digital health initiatives in PNG, the following guiding strategic principles have been established.

Equity and inclusivity	Advocate for inclusive digital health initiatives that reduce inequities and bridge the digital divide. This includes focusing on underserved and vulnerable populations to ensure that no one is left behind.
Unified systems	Promote the use of standards and interoperability in all digital health solutions to ensure seamless data exchange between systems. This enhances efficiency, reduces duplication, and supports the integrated delivery of care.
Sustainability and scalability	Develop digital health initiatives that are sustainable and can be scaled up efficiently. Focus is on building solutions that can grow with the needs of the health-care system and adapt to future challenges.
Collaborative partnerships	Leverage strategic partnerships with governments, international partners, the private sector, academia, church organizations and local communities. Collaboration is key to sharing resources and expertise, and achieving common health goals.
Responsive to local needs	Adapt digital health solutions to the local context by considering unique human, financial and cultural factors. Ensure that digital health initiatives are sustainable and relevant to the local environment.
Client empowerment	Enable patients to access and control their health information. Promote patient engagement and self-management through user-friendly digital health tools and resources.
Secure and ethical use of data	Ensure the confidentiality, integrity and availability of health data through robust privacy and security measures. Protect patient information from unauthorized access and breaches.

3.4 An approach to sustainable digital health development

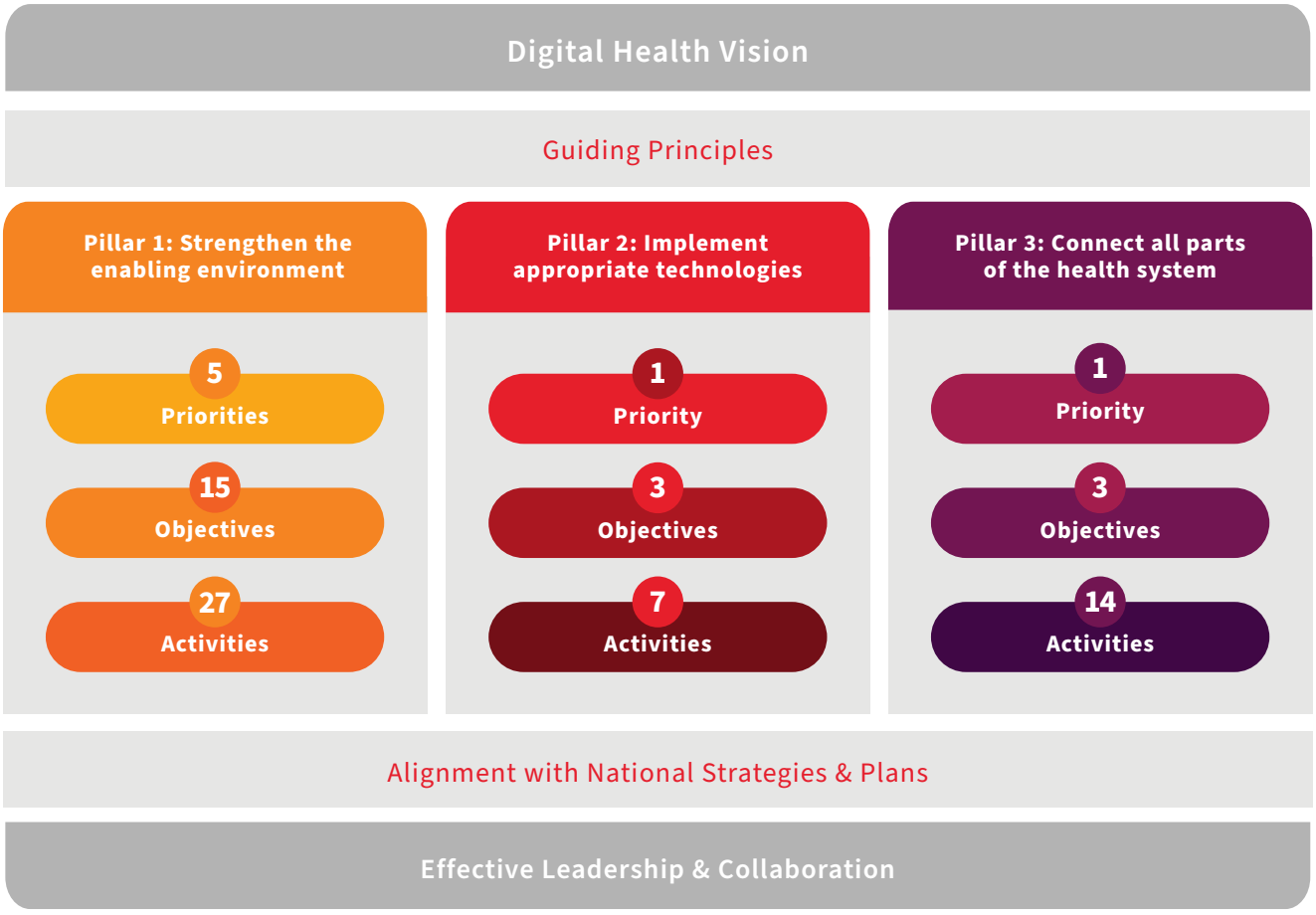
Overview of the Strategy

This Strategy seeks to prioritize investments and actions that focus on areas where the most value can be gained, thereby transitioning from addressing immediate challenges to unlocking long-term value through digital health. This will be accomplished through:

- strengthening the enabling environment (as per the recommendations of the DHMA)
- implementing appropriate technologies for the health system
- connecting all parts of the health system.

These represent the three pillars of digital health development in PNG and this Strategy (see Fig. 5). Each pillar consists of key priority areas, objectives and activities or projects to achieve the vision stated above.

Fig. 5. Overview of the Papua New Guinea Digital Health Strategy 2025-2030

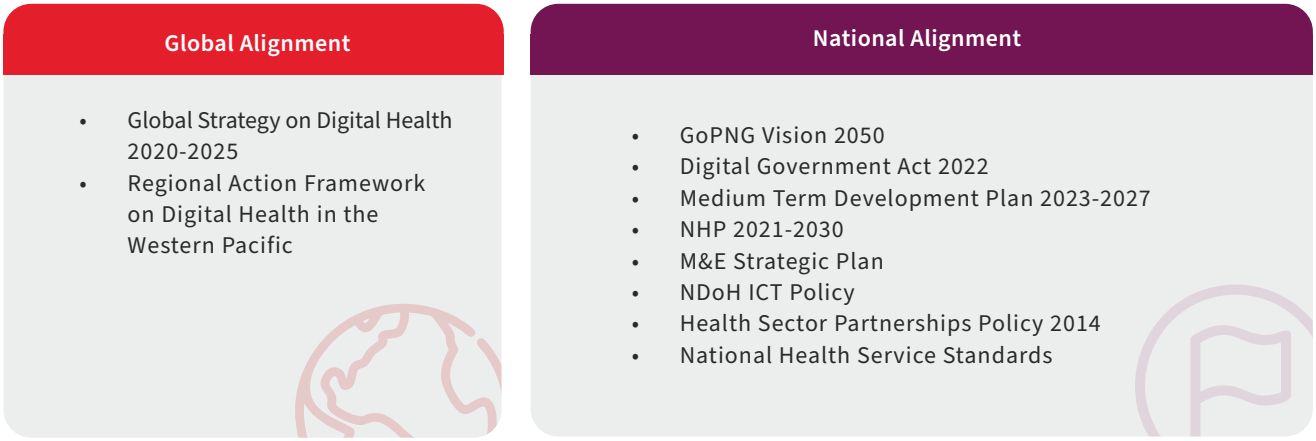


Objectives and activities in the Strategy are intentionally descriptive to support the knowledge gaps identified in the DHMA 2023 findings. Pillars 2 and 3 offer both strategic direction and detailed technical guidance, informed by the findings of the DHMA 2023, which identified a gap in digital health knowledge and skills among PHAs and the NDoH ICT teams. As a result, the technical guidance in these sections is designed to support PHAs and stakeholders in incorporating the strategy into their annual implementation plans. This is especially crucial for Pillar 3, where strengthening interoperability is a key focus. The strategy provides a foundational blueprint to guide the development of the interoperability framework, ensuring stakeholders have a clear and actionable path for implementation.

3.5 Alignment with global and national plans

This National Digital Health Strategy aligns with key national plans and other global strategies (Fig. 6) to ensure coherence and synergy in achieving the country's health and development goals. This alignment will facilitate coordinated efforts, optimize resource utilization and enhance the overall impact of digital health on the country's health system.

Fig. 6. Strategic alignment of the Papua New Guinea National Digital Health Strategy with global and national documents



Aligning digital health with PNG's broader digital government strategy is essential for the unified development of accessible, efficient public services. The NDoH and the Department of Information and Communication Technology (DICT) are collaborating to integrate digital health into the national digital transformation agenda. Key initiatives include shared digital infrastructures, such as data centres and communication networks, harmonized health and ICT strategies, and joint ICT training programmes.

To facilitate public engagement with increasingly digital services, enhancing digital literacy is pivotal. The E-Government Portal will serve as the primary access point for health and other public services, necessitating targeted efforts to equip all citizens with the necessary skills to use digital platforms effectively. This approach will ensure equitable access to services, improve health outcomes and enable active citizen participation in digital governance.

Digital health will leverage several components of the digital government stack:

- E-Government Portal
- Digital ID
- Cybersecurity measures
- National Electronic Data Bank
- Government Private Network
- Government Leased Cloud
- Other relevant shared digital services

Box 1. National Legislative and Policy Instruments Promoting Digital Transformation in PNG

Government of PNG Vision 2050

The Papua New Guinea Vision 2050 outlines a comprehensive long-term strategy to transform PNG into an emerging economy, emphasizing improved governance, service delivery and the adoption of new technologies.

Digital Government Act 2022

The Digital Government Act 2022 serves as the national guiding document for digitalization across all public sectors in PNG. DICT has been appointed as the implementer of this act and has developed a Digital Government Plan (2023-2027). This plan outlines key priorities for digital development, including enhancing digital public infrastructure, improving access to services via a government portal and improving digital services in the health sector. Under this initiative, DICT established various policies to support digital transformation:

- National Broadband Policy: focuses on expanding broadband access across PNG.
- Data Protection and Privacy Policy: ensures the protection of personal data in digital systems.
- Cybersecurity Policy: establishes protocols for safeguarding digital infrastructure.
- E-Government Policy: promotes the digitization of government services for better efficiency and transparency. (Under Development)
- Cloud Computing Policy: aims to guide the adoption of cloud services in public and private sectors.
- Digital Identity Policy: focuses on creating a unified digital identity framework.
- Open Data Policy: promotes the availability of government data to the public for transparency and innovation.

Medium Term Development Plan IV 2023-2027

Medium Term Development Plan IV incorporates the National Government's development agenda to become a middle-income country by 2030. Two of the 12 key strategic priorities, namely, "Connect PNG Infrastructure" and "Quality and Affordable Healthcare" are directly relevant to this strategy.

National Health Plan (NHP) 2021-2030

The NHP explicitly recognizes the role of digital health in achieving UHC and improving health outcomes. It outlines strategic priorities for leveraging digital technologies, such as establishing electronic health records (EHRs) and expanding telemedicine services.

M&E Strategic Plan

This plan supports the NHP by providing a framework for monitoring and evaluating health services. It emphasizes the use of digital tools for data collection, analysis, and reporting to improve decision-making and health outcomes.

NDoH ICT Policy

The NDoH ICT Policy provides a foundation for implementing ICT-supported health services and ensures compliance with regional and international standards.

NDOH ICT Architecture Principles (2017)

This document outlines the fundamental principles for ICT architecture within the health sector. It emphasizes interoperability, data security and the efficient use of ICT resources to support health services. The architecture principles guide the development and implementation of health information systems and ensure they align with national and international standards.

Health Sector Partnerships Policy

The Health Sector Partnerships Policy is crucial for sustainable investment in digital health. It outlines the framework for collaboration between the government, private sector and international partners to enhance the health system through ICT innovations. This policy ensures that investments are aligned with national health priorities and contribute to long-term health outcomes.

National Health Service Standards

These standards provide guidelines for health facilities, including ICT requirements. They ensure that health facilities are equipped with the necessary digital infrastructure to support efficient health service delivery and management.

4. Strategic priorities and objectives

The strategic priorities and objectives have been carefully selected to build a robust digital health ecosystem in PNG. They are informed by the recommendations from the 2023 DHMA and insights gained from the First and Second Digital Health Convergence Workshops. Furthermore, they have been refined through collaborative discussions during the Consultation on the Draft Digital Health Strategy held in July 2024.

4.1 PILLAR 1 Strengthen the enabling environment

Pillar 1 focuses on five priority areas to strengthen the digital health ecosystem: governance and regulations, human capacity, digital investment, infrastructure and data ecosystem based on findings and recommendations from the DHMA. These do not preclude the government and stakeholders from investing in other building blocks; however, prioritizing these five building blocks first is expected to yield the greatest benefits. This approach lays a solid foundation to enhance and expand other areas of the digital health in PNG.

4.1.1 Priority 1: Governance and Regulations

A well-established governance framework provides constructive guidance for all stakeholders to contribute collaboratively towards digital health implementation. This priority will establish the mechanisms and processes through which all stakeholders may articulate their interests, align with national priorities and oversee the effective adoption of the digital health.

Key Objectives for Governance and Regulations

- GR1 Establish an active and functional governance framework for digital health.
- GR2 Improve coordination and collaboration with external stakeholders.
- GR3 Establish key policies and regulations to coordinate digital health activities.

GR1 Establish an active and functional governance framework for digital health

The existing governance framework consisting of the eHealth Steering Committee and the eHealth Technical Working Group (eHTWG) will be expanded to include broader participation from partners and provincial representatives (see Fig. 7). The eHealth Steering Committee will continue to function as established, while the eHTWG will also include a secretariat function to strengthen processes for tracking digital health priorities. Other structures such as the partner advisory forum, sub-working groups and PHA ICT committees will be formally included. The roles and composition of the governance structure are described below.

Fig. 7. Proposed digital health governance structure for PNG

Structure	Role	Composition
National eHealth Steering Committee	Provide strategic oversight on national digital health activities. Approve major policies, plans and budgets for digital health.	Senior executive management and staff of the NDoH. Relevant central agencies and development partners.
eHTWG	Provide technical guidance and expertise for the implementation of digital health activities. Ensure alignment of digital health plans with national priorities. Facilitate coordination and collaboration among stakeholders. Review and endorse technical standards, guidelines and policies for digital health.	NDoH ICT and Performance, Monitoring and Research Branches and other technical staff. Department of ICT Technical experts from development partners
eHTWG Secretariat	Coordinate meetings, document proceedings and follow up on action points. Manage communication between the eHTWG, the Steering Committee and other stakeholders, including PHAs. Maintain a repository of digital health applications. Oversee the monitoring and evaluation of the Digital Health Strategy.	NDoH ICT and Performance, Monitoring and Research Branch staff
Partner Advisory Forum	Align partner support with national digital health priorities. Share lessons learnt and best practices from in-country implementations, other countries and contexts. Identify opportunities for co-financing and collaboration on digital health projects.	NDoH ICT and Performance, Monitoring and Research Branches PNG development partners.
Sub-working Groups	Focus on specific technical areas or components of digital health (such as interoperability, data privacy and security, research and applications). Develop detailed technical guidelines, standards, and protocols for their focus area. Provide specialized expertise and recommendations to the eHTWG and Steering Committee. Implement pilot projects or specific initiatives within their focus area.	NDoH technical staff Technical experts from development partners Representatives from relevant ministries, departments or partners. Private sector specialists, as appropriate.
PHA-ICT Committees	Establish implementation plans and oversee digital health activities at the provincial level. Ensure alignment of provincial digital health activities with national strategies. Provide feedback and report on the progress of digital health projects in the province. Coordinate with local stakeholders, including health-care providers and ICT service providers.	PHA management. ICT leadership within the PHAs. Provincial Health Information Officers (PHIOs). District health ICT officers.

Activity GR1.1: Formalize additional governance structures

Governance structures described above will be expected to complete the following activities:

- Develop a comprehensive terms of reference (ToR) document for sub-working groups and PHA ICT Committees that outlines the functions, responsibilities, membership and meeting schedules of the governance structure (a template to be provided by NDoH). Publish ToRs on the NDoH and PHA websites to promote transparency and accountability.
- Produce and circulate minutes of meetings within 14 days to all relevant stakeholders to ensure clear communication and record-keeping. Include key decisions, action items, and responsible parties in the minutes for effective follow-up and implementation.
- Oversee and monitor the implementation of this strategy and implementation plans.
- Report on quarterly updates on the progress of the digital health strategy implementation.
- Identify potential risks to digital health projects and develop mitigation strategies to address these risks proactively.
- Develop and update policies, standards and guidelines (as needed) to support the implementation and sustainability of digital health initiatives.
- Maintain a repository of digital health applications in the country.

GR2 Improve coordination and collaboration with stakeholders

Health and digital health initiatives in PNG are supported by a diverse range of stakeholders. Their contributions include technical assistance, capacity-building programmes, infrastructure development, programmatic support and financial assistance. Therefore, it is crucial to establish pathways, such as the partner advisory forum, for effective collaboration and coordination. This includes enhanced collaboration with PHAs and local government. Engaging stakeholders early, often and consistently will promote a culture of openness and transparency, enabling co-creation and fostering long-term commitment among stakeholders.

Table 12. Key health and digital health partners in PNG

Partner	Activity
Church health services	Partnered with NDoH to provide management and coordination of health centres and health services across PNG.
Catholic Church health services	Partnered with NDoH to provide management and coordination of health centres and health services across PNG.
Asian Development Bank (ADB)	Funds health infrastructure projects and initiatives aimed at improving access to health-care services.
Australian Government Department of Foreign Affairs and Trade (DFAT)	Provides financial and technical support for infrastructure development and health programmes.
FHI360	Implements health programmes related to HIV/AIDS, family planning, and reproductive health.
Global Fund	Provides funding and resources to combat HIV/AIDS, tuberculosis, and malaria
WHO	Provides technical assistance and guidance in policy-making and across a range of health areas for achieving sustainable health programmes and development.
United Nations Children's Fund (UNICEF)	Focuses on maternal and child health, immunization programmes, and nutrition interventions.
World Bank	Supports health system strengthening, financing, and infrastructure development in the health sector.
World Vision	Focuses on health, nutrition, water, sanitation, and hygiene (WASH) programmes, particularly for children and mothers. Supported the implementation of mSupply

To improve stakeholder coordination and collaboration, this strategy proposes four key activities:

Activity GR 2.1: Establish a digital health repository

The digital health repository, managed by the eHTWG, will function as a centralized database where stakeholders, including PHAs can access detailed and up-to-date information about various projects and applications. Key features of a digital health repository include:

- Cataloguing ongoing and planned digital health projects, including all relevant information about the projects, such as project objectives, geographic coverage, implementation status and funding sources.
- Enabling mapping and visualization of digital health initiatives to help stakeholders see where digital health efforts are concentrated and identify areas that might need more attention. Additional features such as including key documents (case studies, post-implementation review reports, user feedback and testimonials, manuals and capacity building materials) to inform subsequent design and implementation of digital health solutions could be considered by the eHTWG depending on cost, feasibility of maintenance and updating of the repository, and user needs.

To implement this cost-effectively, the NDoH will explore existing platforms. A link to the repository will be added to the e-government portal and PHA websites, making it accessible through PNG's web platforms. All digital health projects and implementers will be required to participate and update the repository.

Benefits of the digital health repository

- For implementing partners and PHAs, it may support the selection of appropriate software, understand investment costs, gather lessons from digital health implementations, identify geographical areas needing interventions, and more.
- For technology vendors, it may assist in understanding application needs or gaps in PNG, as well as the development processes of systems.
- For academic stakeholders, it will enable them to identify areas requiring research and evaluate the performance and suitability of digital health solutions.

Activity GR 2.2: Setting up a platform for local technology vendors

Digital health in PNG has generated significant interest among local technology vendors. An online webpage hosted on the e-government portal (later to be included as part of a larger e-government vendor system) will be established to streamline collaboration and ensure that these vendors are well-informed of digital health requirements so that they may align their products with government needs. Collaborating with the DICT on this initiative will ensure a unified approach across the government. Key features of the webpage include:

- Providing descriptions of digital health systems that the government is interested in, including their required features and functionalities.
- Explaining the application process for becoming an approved vendor, including criteria, submission guidelines, and evaluation procedures.
- Sharing information on the policies, design specifications and standards for software development to ensure that vendors align their products with government requirements.

Activity GR2.3: Participate in regional and global events

The eHTWG Secretariat will establish and maintain an events calendar published on the NDoH website to inform NDoH departments and PHAs of key regional and international events. By engaging in global conferences and workshops, PNG's leaders and stakeholders can gain insights from other countries' experiences, stay informed about emerging trends, and present PNG’s digital health initiatives to attract investors and foster international collaborations.

Activity GR2.4: Strengthening research activities

Digital health research will be included within the national research agenda and engage academic institutions and other stakeholders to generate valuable insights to guide the development and implementation of digital health solutions that are customized for PNG's unique context. This locally driven research will provide the necessary evidence to select appropriate digital health applications, update policies, and assess the potential of technologies including artificial intelligence (AI) to meet the specific challenges and opportunities in PNG. It is recommended that research activities align with open data principles and promote open data initiatives for administrative and routine health data.

GR3 Establish key policies and regulations to coordinate digital health activities

Digital health policies and laws ensure that stakeholder actions align with the goals of the government and the broader digital health strategy, preventing misalignment, fragmentation and adoption of incompatible technologies. During this strategic digital health period, two policies on data governance and ownership, and interoperability and standards will be developed. It is also recommended that two laws on electronic health records and data protection are established. Others may be identified and developed as needed to address emerging challenges and opportunities in digital health. This proactive approach will ensure that the regulatory framework remains robust, comprehensive and adaptable to the evolving digital health landscape.

Activity GR3.1: Develop key policies

Policies will be subject to review and updates. This approach ensures they remain aligned with national priorities, reflect advancements in the digital health ecosystem, and continue to be relevant and effective in addressing emerging needs.

Table 13. Key policies to be developed in PNG

Topic	Description
Data governance and ownership	This policy addresses the governance and ownership of key data sources. It defines responsibilities and ownership rights to ensure the integrity and security of vital health data.
Interoperability and standards framework	Standards and interoperability policies will ensure that digital health systems implemented in PNG can exchange relevant data according to prescribed rules.

Activity GR3.2: Develop key laws

Table 14. Key laws recommended for development

Topic	Description
Data Protection and Privacy Law	The Data Protection and Privacy Law will safeguard individuals' personal data by ensuring it is collected, processed, and stored lawfully and securely. It empowers individuals with rights over their data, such as access, correction and consent, while mandating that organizations implement robust security measures and comply with legal obligations. The law outlines penalties for non-compliance, thereby promoting trust in digital environments and encouraging ethical data usage. This legislation will be developed in collaboration with the DICT, as it applies to all digital services across PNG and is a critical component of the larger e-government plan. As such, it should be developed with the involvement of all government sectors to ensure comprehensive and cohesive application across various public services. Note: Existing and ongoing digital health applications and interventions must embed privacy-by-design principles, even if the legislation is still under development.
EHR Law	An EHR Law will establish the essential legal framework for the collection, management, handling, and sharing of patient records. This legislation will set clear guidelines for safeguarding patient privacy, ensuring data security, and enabling the interoperability of health systems—key factors as PNG transitions toward a unified Hospital Management Information System (HMIS) and EHR software. Currently, PNG lacks comprehensive, updated laws on data protection, confidentiality and data security. The introduction of the EHR Law will fill this legal gap, ensuring that as digital health systems evolve, they do so within a secure and accountable framework. This will protect sensitive patient information, promote trust in digital health systems, and foster smoother integration across health platforms, ultimately improving the quality of care and efficiency of health services in PNG.

Note: the above laws and policies may necessitate updating existing ICT and health sector policies to incorporate digital health requirements. For example, ICT policies should address backup and recovery protocols and remote device management, while health policies, such as those on health promotion, should include guidelines for the safe use of digital health applications.

4.1.2 Priority 2: Human Capacity

Health workers, managers, administrative and ICT staff play a crucial role in the adoption, implementation, and maintenance of digital health within the health system. Enhancing their knowledge and skills requires a combination of short-term and long-term efforts to build a digitally competent health workforce. Achieving this goal necessitates close collaboration with human resources departments at the district, PHA and national level to plan for the necessary skills and competencies that digital health transformation demands.

Key objectives for human capacity

- HC1 Improve computer and digital literacy among health workers
- HC2 Prepare the future workforce for a digitally enabled health system
- HC3 Improve ICT capacity at the provincial and local levels

Computer literacy vs digital health literacy

Computer literacy involves having the knowledge and skills to perform basic functions on computers, laptops, tablets, or other smart devices, such as communicating via email, developing documents, and gathering information from the internet and basic troubleshooting.

Compared to computer literacy, digital health literacy ensures that the health workforce has a uniform grasp of digital health terms, comprehends the benefits of digital health tools, and recognizes the importance of integrating digital health into the health system and are aware of the risks and how to manage these effectively. Digital health literacy competencies will differ across health workforce cadres.

HC1 Improve computer and digital literacy among health workers

Digital health will introduce various hardware and devices into PNG's health system, making computer and digital literacy crucial for successful digital health transformation. A competent workforce will ensure the effective implementation of digital health applications, reduce data quality issues and enable participation in online training opportunities. To support this, the strategy outlines activities aimed at improving computer and digital literacy for clinical, non-clinical and ICT staff. These efforts will help staff accurately navigate electronic health systems, enter data, access critical health information, and stay updated with evolving health-care technologies and best practices.

Activity HC1.1: Require computer literacy components in capacity buidling plans
Implementing partners rolling out digital health applications and interventions will be required to include a computer literacy component in their capacity-building plans.

Activity HC1.2: Collaborate with educational institutions
NDoH and PHAs should partner with local schools and colleges to provide training programmes for health workers (including non-clinical staff) to enhance their computer literacy skills.

Activity HC1.3: Establish and distribute a competency framework
The NDoH will develop a competency framework that outlines the knowledge and skills required for different cadres of the health workforce, including community health workers, health extension officers, provincial health information officers, doctors, nurses, clerical and administrative staff and ICT officers. These may be adapted from existing competency frameworks and will inform human resources components such as job descriptions and performance evaluations.

Activity HC1.4: Develop an in-service training programme

The NDoH will collaborate with academic institutes to implement in-service training programmes that covers a range of digital health topics. The training programme may leverage existing learning materials available through global sources, such as Digital Health: Planning National Systems, to include practical and theoretical components for a comprehensive digital health education.

Activity HC1.5: Embed digital health literacy into continual professional development

Digital health literacy will be integrated into the continuous professional development requirements for health, administrative, and ICT staff. This ensures that all relevant personnel regularly update their skills and knowledge in digital health. PHAs should ensure staff and facilities participate in these continuous professional development events.

Activity HC1.6: Provide refresher training on existing digital health applications

NDoH and implementing partners will ensure users are aware off and understand new features and functionalities of national systems by providing annual refresher training. This will ensure the effective use of digital health applications and improve data quality in data collection.

HC2 Prepare the future workforce for a digitally enabled health system

As the health system becomes increasingly digital, it is vital that the skills of the future workforce are aligned with this environment. The NDoH will collaborate with the Department of Higher Education, Research, Science and Technology and academic institutions to update healthcare curricula. This includes integrating computer and digital literacy, aligned with national digital health competency standards. The strategy proposes two activities to prepare the future health workforce.

Activity HC2.1: Co-develop a pre-service curriculum for digital health

NDoH will work with academic institutions to co-develop a pre-service curriculum for digital health. This curriculum may be adapted from existing pre-service curricula developed and shared regionally or globally. The curriculum will initially be implemented in nursing and CHW training programmes.

Activity HC2.2: Recruit and train academic facilitators

NDoH will work with academic institutes to capacitate facilitators to deliver digital health training by enrolling them into NDoH identified digital health courses and train-the-trainer programmes. This will ensure they have the skills and knowledge to effectively teach in-service digital health programmes. (Note: academic institutes may also need to equip their facilities with ICT hardware and equipment to support computer and digital literacy training.)

HC3 Improve ICT capacity at the provincial and local levels

Digital health requires robust ICT support to ensure seamless system operation, provide users with necessary assistance and address technical issues promptly. Improving ICT capacity at the provincial and local levels involves two critical aspects: strengthening PHA ICT teams and providing effective ICT support to end users. The strategy proposes two activities to improve ICT capacity.

Activity HC3.1: Build sufficient ICT capacity within PHAs

The NDoH and PHAs will engage with ICT colleges to attract talent and prevent brain drain. Cost-effective strategies such as establishing internship or apprenticeship programmes for new graduates will be employed. These programmes will build experience and prepare graduates for long-term employment with PHAs, ensuring that PHAs can develop the necessary ICT capacity. Additionally, PHAs may build capacity through knowledge sharing of ICT implementations.

Activity HC3.2: Establish ICT support hubs

NDoH and PHAs may select from two options to implement end-user ICT support:

Option 1: Outsourcing help desk functions. Help desk services will be outsourced to local vendors and organizations with the necessary expertise. These vendors will be trained on the digital health applications used within the health system to provide effective user support.

Option 2: Establishing support hubs. Support hubs will be managed by ICT teams at district and provincial hospitals, providing technical assistance via phone, text, web and in-person when possible. Technical issues may be addressed through a tiered approach based on support complexity. This will ensure that ICT hubs are not overwhelmed and can efficiently address technical challenges.

- Level 1 issues will be handled by district hubs.
- Level 2 and some Level 3 issues will be managed by provincial hubs.
- Level 3 issues will be escalated to NDoH ICT, DICT, the National Information and Communication Technology Authority, or external stakeholders for resolution.

4.1.3 Priority 3: Digital Health Investment

Digital health sustainability requires adequate, long-term, and diverse funding channels and investment. Without this, digital health projects risk failure or disruption after their initial or pilot phases. Establishing a solid financial foundation is essential for these initiatives to thrive and enhance the health system's resilience and efficiency. Ensuring that leadership fully understands the importance of digital health is key to prioritizing and securing the necessary investments.

Key objectives for Digital Health Investment

- IN1 Adopt a total cost of ownership framework for digital health activities.
- IN2 Restructure the health budget to accommodate digital health investment.
- IN3 Establish transition plans for partner-supported projects.
- IN4 Establish partnerships with public and private entities.

IN1 Adopt a total cost of ownership framework for digital health activities

Effective digital health planning requires stakeholders to understand all associated costs, not just development expenses. This includes upfront, implementation and ongoing maintenance costs, which typically account for around 30% of the total upfront costs (World Bank, 2023). By recognizing the full cost of digital health projects, NDoH and PHAs can better plan, ensure long-term sustainability, and allocate sufficient funding in annual budgets.

Activity IN1.1: Develop a total cost of ownership (TCO) framework for digital health projects

The eHTWG will develop a TCO framework for defining major cost drivers and identifying ongoing maintenance costs, such as capital expenditure, operational costs, implementation and training costs and decommissioning or upgrade expenses. Guidelines and tools will be developed to facilitate adoption across all PHAs and partner implementing digital health projects. The framework will be tested in pilot projects to assess its applicability before scaling up.

IN2 Restructure the health budget to accommodate digital health investment

Currently, digital health lacks a dedicated budget category. This limits the ability of PHAs to effectively allocate funding towards essential digital health investments. Given that digital health is a priority across several national plans and policies, it is crucial to review and revise the funding allocation processes within the health system.

Activity IN2.1: Create a digital health budget category in the funding structure

The NDoH, in collaboration with the finance department, will review and restructure the health funding categories to create an independent digital health budget category. This will grant PHAs greater flexibility and autonomy in managing their digital health investments, allowing them to prioritize projects based on their implementation plans. The approach will also promote accountability and transparency, as digital health investments will be clearly tracked and monitored.

IN3 Establish transition plans for partner-supported projects

Transition planning is essential for ensuring a smooth handover of digital health projects from partners to government stakeholders. It outlines the necessary capacity, financial resources and operational aspects required for the government to effectively take over and maintain the system without disruption or failure.

Activity IN3.1: Develop transition plans for digital health projects

The framework below provides key considerations for the NDoH and PHAs when developing transition plans with project partners. Initiating this process early in the project timeline (ideally at 25%, but no later than halfway through) ensures that government counterparts have ample time to prepare.

Table 15. Transition framework for PNG

Partner activities	Government activities	Dual activities
Assessment and planning		
Conduct above-site and onsite assessments of people, processes, and technology to inform the handover plan.	Identify components of the programme that will be transitioned to the government versus components that will be outsourced to a vendor.	Develop a comprehensive handover plan including timelines, milestones, and responsibilities. Identify key stakeholders to drive the handover process.
Documentation and knowledge transfer		
Develop system documentation including system architecture, technology configuration, management aspects and technical standard operating procedures (SOPs). Facilitate knowledge and skills transfer sessions.	Create dedicated schedules for capacity building. Establish and identify a platform for the partner to upload resources and knowledge instruments.	Develop a communication plan for the handover process.
Capacity building (ongoing)		
Establish a competency framework and capacity building programme to train government personnel. Provide technical manuals and training on the operations and management of the system for ICT teams.	Identify government personnel who will take over specific components. Ensure attendance at capacity building sessions.	Establish a mentorship or shadowing programme to support ongoing capacity building. Set up a support system to address enquiries and issues after the handover or address any unforeseen challenges.
Legal and regulatory aspects		
Transfer any licenses or vendor agreements to the government. Provide system access and administrative permissions to government teams.	Draft memorandums of understanding and other necessary agreements.	Notify stakeholders of transition (example vendors supporting the system).
Technical handover		
Transfer all data to the government. Transfer any assets as per handover agreement.	Conduct thorough validation of data transfer to ensure accuracy and integrity. Procure any necessary infrastructure.	Develop and implement a quality assurance process and plan for the migration. Perform rigorous testing to ensure the migration is successful.

IN4 Establish partnerships with public and private entities

Building on successful partnership models, such as collaborations with faith-based organizations to manage health facilities, is a critical strategy for sustaining digital health investments. Partnerships mitigate the risks associated with short-term, project-based funding and offer a collective bargaining approach supporting reduced costs compared to individual facilities contracting service providers independently. This advantage also ensures uniformity and consistency in the implementation and maintenance of digital health solutions across the health system. Furthermore, partnerships facilitate better planning and budgeting, as costs and resources can be projected and managed more effectively over an extended period.

Activity IN4.1: Explore partnership models for digital health management

The strategy encourages the NDoH and PHAs to actively seek partnerships with public and private organizations, both locally and internationally, to support and advance digital health initiatives. In alignment with the Health Sector Partnership Policy 2014, the NDoH will develop clear guidelines and frameworks for these partnerships, including defining roles and responsibilities, setting measurable objectives, and ensuring transparent and accountable governance structures.

Table 16. Potential areas for partnerships development to support digital health

Partnership category	Potential services or products
Telecommunications and technical support	To support internet connectivity and provide technical support to facilities.
ICT hardware, equipment and maintenance	To supply and maintain ICT equipment and hardware essential for digital health infrastructure.
Capacity development	To provide ICT capacity building for health sector staff.
Software development	To develop and implement various health information systems.
Health financing with banks	To develop health financing schemes for the public health sector.
Alternate energy sources	To provide equipment and maintenance for solar panels.

Steps in establishing partnerships

- Define partnership model and objectives: determine the type of partnership, such as a vendor partnership, public-private partnership, consortium or joint venture, and the specific goals of the partnership, such as improving infrastructure or implementing new technologies, ensuring alignment with broader health system goals.
- Identify potential providers through a tender process: create and advertise a Request for Proposals/ Request for Quotes and evaluate proposals based on such criteria as technical capabilities and financial stability, and select a shortlist for further negotiations.
- Define roles and responsibilities: clearly outline the contributions and accountability of each partner and develop a governance structure to manage the partnership.
- Negotiate terms and conditions: establish the financial, legal, and operational terms of the partnership, including data sharing, compliance, and dispute resolution mechanisms.
- Develop a detailed implementation plan: Outline key milestones, timelines and deliverables, assign resources, and establish mechanisms for monitoring progress.
- Plan for sustainability and continuity: regularly review and update the partnership agreement to reflect changes and ensure knowledge transfer for local capacity building.

4.1.4 Priority 4: Infrastructure

The essential infrastructure for digital health requires stable power, reliable internet connectivity, appropriate hardware, and suitable building facilities. Once established, effective management processes, including maintenance, troubleshooting and staff training, are critical to ensuring the longevity and reliability of this infrastructure. Addressing these needs is crucial to supporting the continuous operation of digital health tools and preventing digital divides in PNG. While Infrastructure plans are described more comprehensively in the NDoH ICT policy, specific areas that are critical to this digital health strategic plan are highlighted here.

Key objectives for Infrastructure

- IF1 Improve internet connectivity across all health facilities.
- IF2 Invest in alternate energy sources in lower-level facilities.
- IF3 Improve procurement of essential digital health equipment.
- IF4 Establish an asset management system and register for digital health equipment.
- IF5 Develop ICT maintenance SOPs.

IF1 Improve internet connectivity across all health facilities

Internet connectivity remains a major challenge in PNG due to difficult terrain and small populations in remote areas, which make infrastructure investment commercially unfeasible. To overcome this, the government is exploring innovative solutions, including low-orbit satellite connectivity such as Starlink, to provide high-speed internet to remote and rural areas, ensuring even isolated facilities are included in the digital health revolution.

Activity IF1.1: Prioritize internet connectivity across L3–L4 facilities

PHAs that sign up for Starlink connectivity should prioritize internet connectivity in L3–L4 health facilities to improve the timeliness and completeness of eNHIS reporting. The cost of Starlink connectivity may be offset by partnering with other sectors, such as education, by sharing connectivity with nearby schools. As more digital health applications are adopted, PHAs should ensure sufficient upload and download speeds, maintain low latency for real-time applications, and regularly reassess connectivity needs to meet the growing demands of these digital tools.

IF2 Invest in alternate energy sources in lower-level facilities

A significant challenge highlighted by the DHMA is that up to 30% of health facilities in PNG are without electricity. Without a reliable power supply, especially in remote and rural areas, health facilities are severely limited in their ability to leverage digital health to improve service coverage and access.

Activity IF2.1: Prioritize alternate energy sources in facilities with no electricity supply

PHAs should prioritize investment in alternate energy solutions for facilities lacking electricity to ensure they have the necessary power to operate digital health tools. This may involve exploring partnerships with local providers and other sectors to introduce sustainable energy sources such as solar power, thereby enhancing the ability of these facilities to participate in digital health activities.

IF3 Improve procurement of essential digital health equipment.

According to the results of the DHMA, over 50% of health facilities in PNG have outdated computer and hardware devices, creating challenges for adopting digital health systems. To address this, it is crucial to assess the equipment needs of digital health applications. This strategy proposes two activities to improve procurement of ICT equipment.

Activity IF3.1: Develop technical specifications for equipment and hardware

The NDoH will lead the development of detailed technical specifications for digital health equipment and hardware, ensuring that all procured devices meet the required standards for compatibility and functionality. Once developed, these may be published for vendors to reference.

Activity IF3.2: Consolidate device usage across programmes
Efforts will be made to consolidate the usage of devices across different health programmes, such as using a single tablet for multiple applications or programs, to reduce redundancy and streamline operations within health facilities.

IF4 Establish an asset management system and register for digital health equipment

As technology advances, hardware and ICT equipment will periodically become outdated, impacting the use of digital health applications. An asset management system, prioritized within the broader NDoH ICT Policy, ensures standardized and integrated management of digital health equipment. The system should collect vital information, such as location, condition and lifespan, which is crucial for making informed decisions on upgrades, replacements and budgeting. It will also help identify gaps in equipment distribution, ensuring all facilities are adequately equipped. The NDoH will consider and compare various approaches to asset management including using existing software, purchasing software or engaging a vendor for managed services.

Activity IF4.1: Develop and implement an asset management system
The NDoH, in collaboration with PHA ICT teams and finance departments, will develop and implement an asset management system for digital health equipment.

IF5 Develop ICT maintenance SOPs

SOPs provide structured guidelines for the upkeep and repair of digital health equipment, minimizing downtime and extending the lifespan of assets by ensuring they are regularly serviced and remain functional.

Activity IF5.1: Develop SOPs for ICT maintenance
The NDoH ICT team and PHA-ICT committees will be tasked with developing relevant maintenance SOPs and training programmes for health facility staff on basic maintenance tasks, ensuring that equipment remain functional and minor issues are promptly addressed.

The following are recommended maintenance topics:

- Hardware maintenance procedures for routine inspection, cleaning and testing of physical components such as servers and computing equipment.
- Software updates and patch management SOPs for regular updates and patching of operating systems, applications and firmware.
- Backup and recovery procedures for regular data backups, including frequency, storage locations and methods, and define procedures for data recovery in case of hardware failure, data corruption, or cyber-attacks.
- Network maintenance checks and tasks for network infrastructure, including routers, switches, firewalls and cabling.
- Security management processes for regular security audits, vulnerability assessments and penetration testing.
- User account and access management procedures for creating, updating and deleting user accounts, and establish policies for password management, access levels and monitoring user activities.
- Incident management and reporting processes for logging and responding to ICT incidents, including hardware failures, software issues and security breaches.
- Disaster recovery plans that outline procedures for maintaining operations during and after a disaster, including roles and responsibilities, communication plans and recovery steps.

4.1.5 Priority 5: Data Ecosystem

The introduction of digital health systems will significantly increase the volume and complexity of data available. If this increased data is not managed and utilized appropriately, there will be missed opportunities to improve the health system and health service delivery. Therefore, it is essential to strengthen the data ecosystem in the health sector.

As the objectives and activities for this priority are outlined in the M&E Strategic Plan for the NHP, these are not detailed here. The objectives focus on:

(1) Implementing data quality guidelines and tools sub-nationally (outlined in Section 5.5 of the M&E Strategic Plan); and
(2) Fostering a data use culture within the health workforce (outlined in Section 5.1 of the M&E Strategic Plan).

Implementing these will ensure that digital data is accurate, reliable and actionable.

4.2 PILLAR 2 Implement appropriate technologies

Pillar 2 focuses on the selection and adoption of applications and interventions to strengthen the health system. However, not all opportunities can be pursued simultaneously. PNG must prioritize digital health applications that address the key health system challenges and bottlenecks. This section proposes a core set of digital health applications designed to support the PNG health system in delivering effective and efficient services across a person's life course.

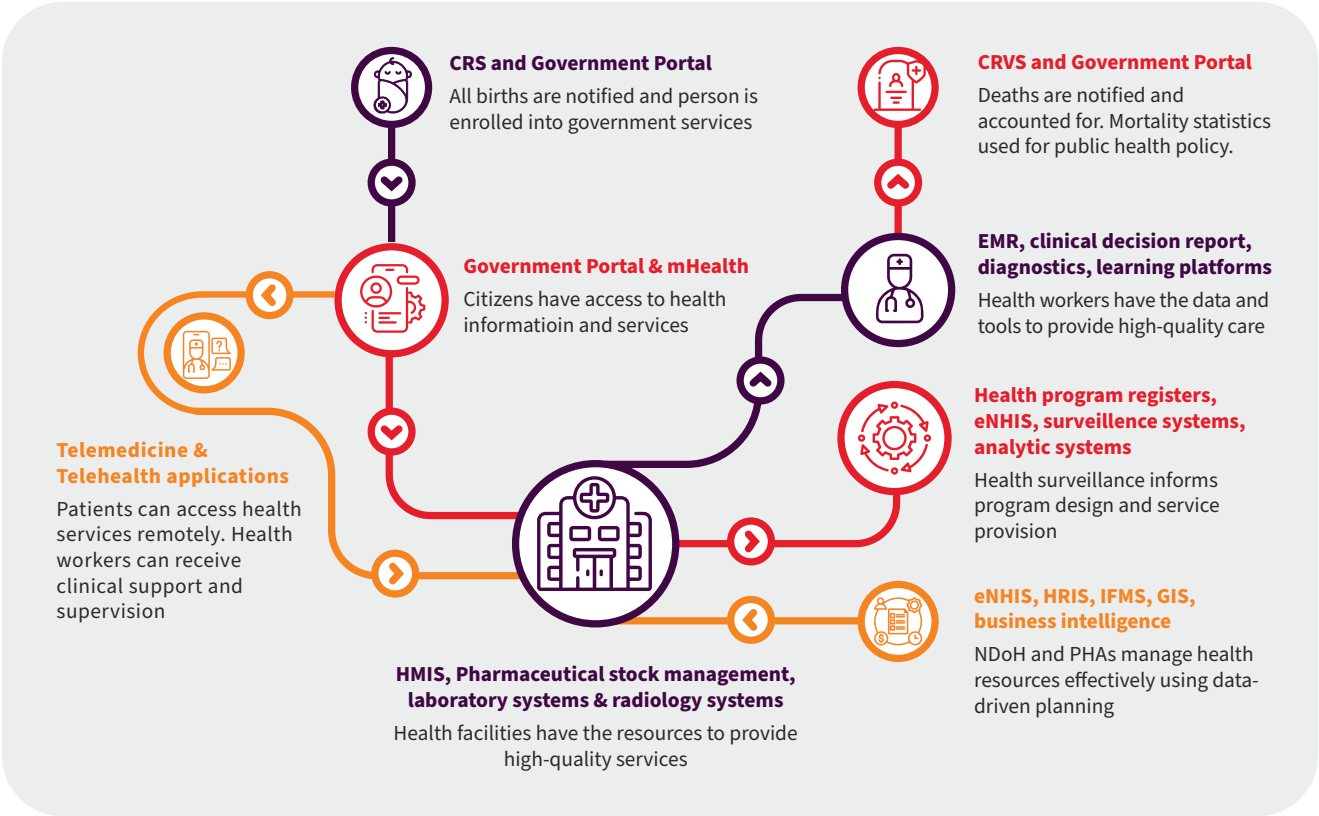
The long-term vision in implementing appropriate technologies is to ensure that all citizens receive consistent, high-quality care, and that the health system is equipped to respond effectively to their needs throughout their lives.

It begins with birth registration through the civil registration and vital statistics system, enabling access to health services and social benefits. As citizens grow, they can access health information and services via a government portal and mHealth applications, which empower them to make informed health decisions. Telemedicine and telehealth applications provide remote access to care, ensuring continuity of services, even in isolated areas. Health workers are supported with integrated EMRs, clinical decision support, diagnostic tools and learning platforms to deliver evidence-based care.

Health facilities are equipped with robust HMIS, pharmaceutical stock management, laboratory and radiology systems, ensuring they have the resources and information needed for effective service delivery. Health surveillance systems and programme registers, along with eNHIS, enable continuous monitoring and inform client-centric programme design. At the national level, tools such as eNHIS, Human Resource Information System (HRIS), IFMS, geographic information system (GIS), and business intelligence platforms support efficient health resource management. Finally, deaths are recorded through the civil registration and vital statistics system, contributing to the integrity and completeness of the health system's data.

Together, these applications create a cohesive and interconnected health ecosystem that supports service delivery, resource management, workforce development and informed decision-making, (see Fig. 8) ensuring PNG's health system provides quality, accessible care during a person's life course.

Fig. 8. Digitally enabled health services across the life course



4.2.1 Priority 6: Enhance the application environment

Achieving an application environment that supports services across the life course requires a structured approach guided by key considerations. Applications and interventions will be categorized into two groups: central and diverse. This distinction allows PNG to balance the need for national standardization with the flexibility to address regional and local needs across PHAs. This approach ensures that all health facilities, regardless of size or resource availability, can benefit from digital health advancements, thus promoting a more sustainable and scalable application environment.

Table 17. Application groups established for PNG

Category	Description	Applications
Central	A central system is a standardized, unified system or platform, that promotes a platform as service approach and is managed by the national or provincial level. It enforces uniform standards, protocols, and practices across all users, ensuring consistency in data collection, management and analysis. Central systems are centrally managed and often more cost-effective by reducing duplication of efforts. This approach allows for cohesive operations, making it easier to aggregate and analyse data at a higher level.	• eNHIS • mSupply • Exchange registries • Birth and death registers • Hospital management information systems • Electronic medical records systems • Integrated surveillance system • Health portals • Laboratory systems • Radiology systems • PACs
Diverse	A diverse system is characterized by flexibility and customization, tailored to meet the specific needs of different PHAs or facilities. These systems are independently managed, allowing for localized decision-making regarding implementation, updates and maintenance.	• EMR systems* • HMIS* • Program-specific registers • Telehealth applications • mHealth solutions • Patient facing applications • Pharmacy systems

*The EMR systems and HMIS are included in both the central and diverse categories because the NDoH aims to develop a national system during this strategic period while also acknowledging the efforts of PHAs in implementing such systems in the absence of a national solution.

The strategy promotes the use of open-source software for their flexibility, ease of development and extensive implementation resources. However, since they require sufficient ICT capacity for maintenance and updates, licensed and custom-built software may be considered where appropriate. A comparative framework for these software types are discussed in the DHMA report.

Key objectives for the Application Environment

- IA1 Develop core new applications
- IA2 Evaluate new digital health projects for alignment
- IA3 Invest in portable diagnostic and management tools

IA1 Develop core new applications

The life course approach necessitates the development of core systems to support essential health system functions. The activities outlined below provide a foundational framework for focusing application investments. However, this framework remains flexible, allowing for the development and implementation of additional applications as new needs arise.

Activity IA1.1: Develop a national HMIS and EMR system

PNG envisions a patient-centric health-care system, which requires shifting from aggregate and event-based data collection to capturing person-level data in uniquely identified records. As of 2024, the Port Moresby General Hospital and Mount Hagen Provincial Hospital have already initiated this transition, with two more provinces preparing to pilot an HMIS and EMR system in the coming year. However, while provinces have begun adopting these systems, there has previously been no guidelines outlining the minimum specifications and interoperability requirements needed to connect with other applications within the PNG ecosystem. Furthermore, an evaluation of the systems at Port Moresby General Hospital and Mount Hagen Hospital conducted in 2023 revealed inconsistent and poor use of HMIS software due to several challenges. To prevent fragmentation in collecting patient-level data, the NDoH will prioritize the development of a national HMIS and EMR system for use in provincial and district hospitals (L4–L5 facilities). This approach will strengthen data interoperability, ensure standardized, efficient and sustainable data collection, and make HMIS and EMR adoption more cost-effective for PHAs.

The NDoH will oversee the system's development and maintenance, while PHAs will be responsible for operational aspects at the facility level, such as ensuring internet connectivity and procuring and maintaining equipment. For facilities with existing HMIS and EMR systems, such as those in Port Moresby General Hospital and Mount Hagen Hospital, the NDoH will provide technical support to enable data interoperability through the HIE platform. Alternatively, provincial hospitals may opt to phase out their legacy systems and fully adopt the national HMIS and EMR system. In such cases, the NDoH will offer support for data migration to the national system, ensuring a seamless transition, minimal service disruption and data integrity.

Activity IA1.2: Implement a central radiology and PACs system across PHAs

Currently, radiology information systems (RIS) and PACS systems are available only in a few hospitals. The strategy recommends PHA-ICT committees adopting a central RIS and PACs system within PHAs. Moreover, by collectively negotiating license fees, PHAs can potentially secure more favourable terms, resulting in cost savings. Centralized management would also simplify maintenance and updates, ensure better data security and provide a unified approach to training and support for staff.

Activity IA1.3: Develop and implement a HRIS

Currently, the health sector's human resources system only captures government staff and is primarily used for payroll. A HRIS is needed to manage all health workers, both government and nongovernment working in the public health sector. Although a previous attempt to develop an HRIS faced challenges, this strategy reprioritizes its development to improve health worker allocation and targeted recruitment efforts. The HRIS will handle key human resources functions, such as managing information on qualifications, continued medical education, licensing, certifications and supporting recruitment and allocation. Professional councils, such as the Nursing Council, can use the HRIS to ensure professionals meet necessary standards.

Activity IA1.4: Select and implement a centralized laboratory information system (LIS)

The DHMA identified the absence of a laboratory system as a critical gap, making it urgent to prioritize the selection of an LIS. The strategy recommends the selection and implementation of a centralized LIS managed by the NDoH. Centralizing the LIS will enable seamless data exchange across laboratories, support nationwide disease monitoring and strengthen public health surveillance, thereby optimizing laboratory operations and improving health-care services in PNG.

Activity IA1.5: Pilot telehealth interventions in PNG

Telehealth interventions may facilitate access and coverage of health services in remote and rural areas. PHAs have already begun to pilot and experiment with telehealth interventions. The strategy encourages further exploration of telehealth interventions with an emphasis on provider-provider telehealth platforms to support health workers in remote and rural areas with clinical supervision and decision support.

Stakeholder requirements for IA1 and IA2

- Map business process workflows to ensure digital solutions address bottlenecks and meet needs, acknowledging potential changes to existing workflows.
- Develop regularly update requirement specifications documents for software development, serving as a resource for team members and maintaining accountability.
- Conduct a cost of ownership analysis to aid in planning for system sustainability and maintenance, using tools such as Digital Square's estimator for informed decision-making.
- Establish a technical change request process to coordinate system updates and new feature developments with technology vendors and partners.
- Provide annual refresher training on scaled digital health applications.
- Develop a change management plan when implementing new applications.
- All national applications must be setup on the government network for security purposes.

IA2 Evaluate new digital health projects for alignment

A strategic approach is needed to track digital health initiatives and ensure that they are cohesive, address critical health needs and contribute to national health objectives.

Activity IA2.1: Implement a pilot approval checklist and process

The eHTWG will implement a structured project approval process that requires stakeholders to submit a comprehensive proposal detailing key project components, including feasibility and sustainability considerations. This process will clearly define the steps to be followed for project evaluation and approval. Initially, all digital health projects will require approval through the eHTWG. As the process matures, the eHTWG will consider introducing a threshold to streamline approvals based on predefined criteria.

IA3 Invest in mobile health tools

Limited road infrastructure and logistical challenges in PNG hinder service coverage and quality in remote and rural areas. Portable diagnostic and treatment tools, which are ideal for low-resource settings, can bring essential health-care services directly to remote areas, reducing the need for patients to travel long distances and enhancing overall health-care delivery in these regions.

Activity IA3.1: Identify and pilot suitable portable digital tools

PNG will explore the following portable diagnostic tools:

- Portable ultrasound machines for immediate imaging in various medical fields
- Handheld ECG monitors for rapid cardiac assessments
- Portable X-ray machines for immediate imaging needs
- Portable ventilators for critical respiratory support during patient transport.

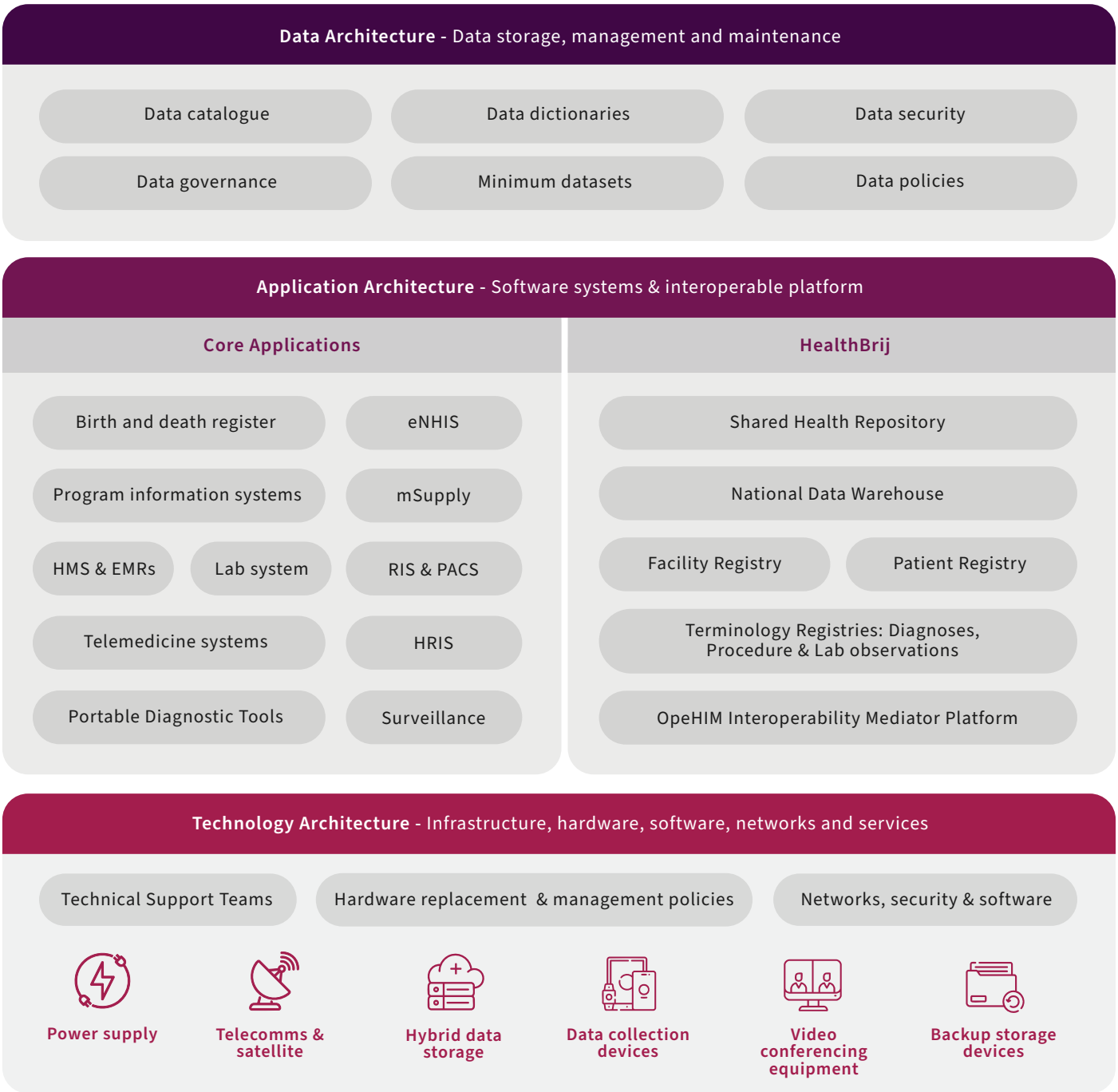
4.3 PILLAR 3 Connect all parts of the health system

Pillar 3 focuses on the interoperable architecture needed to fully leverage the benefits of digital health applications and interventions in PNG. Without such an architecture, the adoption of digital health will continue to grow in a fragmented manner, as highlighted by the DHMA. This pillar outlines the architecture that PNG will adopt to establish a health information exchange platform called the “HealthBrij”. The architecture recommends a set of considerations rather than strict specifications to allow for flexibility in developing it in response to the maturing digital health ecosystem and evolving health sector.

Defining interoperability

For the purpose of alignment, the following definition will be used to describe interoperability in PNG: “Interoperability in digital health refers to the ability of different health information systems, devices, and applications to access, communicate and exchange data through the use of structured data standards to provide timely and seamless healthcare to individuals and communities.”

This definition helps differentiate interoperability from integration, a term often used synonymously. Integration achieves data exchange across systems through the development and maintenance of custom protocols or APIs. While integration facilitates linkages between health information systems, it lacks the standardized protocols or standardized APIs that interoperability relies on. Although integration can achieve similar outcomes to interoperability (data exchange across systems), it requires significantly more resources and effort to maintain and sustain, especially in a growing and evolving digital health ecosystem.



4.3.1 Priority 7: Establish a health information exchange platform

The HealthBrij, PNG's health information exchange platform-as-a-service, is central to the interoperable architecture. It is supported by a robust enabling environment and a functional application landscape, as outlined in Pillars 1 and 2. To manage HealthBrij effectively, PNG will adopt a proven enterprise approach, the Open Group Architecture Framework. The architecture will leverage the Open Health Information Exchange (OpenHIE) framework. Both frameworks provide structured methodologies ideal for complex and adaptive systems, such as health and digital ecosystems. This approach also enables PNG to capitalize on existing digital health systems within its ecosystem.

To ensure effective health data exchange, the NDoH will adopt the Fast Healthcare Interoperability Resources (FHIR) standard as the foundational framework, augmented by other critical standards. FHIR's modular "resources" concept allows for versatile representation of diverse health information types. The standards architecture will include terminology standards, content standards, data transport standards and security standards to support structured and secure data exchange.

Given PNG's challenging connectivity environment, a federated architecture will be used for data storage in the health system. This approach allows facilities to function independently, storing data locally and synchronizing with the national architecture when connectivity is restored. It also bolsters security and privacy by distributing data across multiple independent systems, thereby reducing the risk of breaches. As the digital health ecosystem expands, this federated model efficiently manages growing data volumes and user demands by distributing the load across various systems.

Key objectives for the interoperable architecture

- EX1 Strengthen the enabling environment for interoperability.
- EX2 Develop technical components for the HealthBrij.
- EX3 Prototype and pilot an interoperable use case.

EX1 Strengthen the enabling environment for interoperability

Based on the results of the DHMA, it is essential for the government and stakeholders to enhance the current maturity of the interoperability enabling environment. While general enablers such as infrastructure and policies are addressed in Pillar 1, this section focuses on other specific enablers for developing the HealthBrij efficiently and with minimal risk of failure.

Activity EX1.1: Set up a governance structure for interoperability

Interoperability must be driven by strong leadership and effective governance to ensure that resources are effectively utilized. The eHTWG will establish an interoperability sub-working group dedicated to implementing interoperability initiatives, ensuring alignment with national health priorities and facilitating collaboration among stakeholders. The composition of the sub-working group may include NDoH ICT team, the national Performance, Monitoring and Research Branch (PMRB) team, PHA ICT leads, DICT representatives, interoperable experts and implementing partners.

Activity EX1.2: Develop business processes for health information exchange

Business processes are a series of structured activities or tasks that are performed by individuals or systems to achieve a specific goal. They ensure that tasks are carried out in a consistent, efficient and effective manner. For the interoperable architecture they may assist in identifying specific standards and requirements for the HealthBrij. The following are key business processes to establish for interoperability:

- Data standardization and normalization: ensuring that the data collected in legacy systems is standardized, formatted, and normalized according to agreed-upon standards, such as Health Level Seven (HL7), FHIR).
- Data storage and management: processes for storing health data securely in warehouses, managing data repositories, and ensuring data integrity, privacy and security in line with regulatory requirements.
- Data access and retrieval: enabling authorized users to access and retrieve health data as needed.
- Consent management: managing patient consent for data sharing, ensuring that data is exchanged in compliance with privacy regulations and patient preferences.
- Identity management: ensuring accurate patient identification and matching across different systems to prevent errors and duplication in health records.
- Incident management: processes for handling data breaches, system outages and other incidents that may affect the operation of the HealthBrij, including recovery and mitigation strategies.

Activity EX1.3: Establish a data catalogue of health data sources

A data catalogue serves as an organized inventory of data assets within the health system, providing detailed information about each data set's content, source, dictionaries and usage. This tool enables health information staff, research staff and statisticians to easily locate and access relevant data, thereby facilitating informed decision-making and efficient resource management. Furthermore, the data catalogue may inform the interoperable landscape. The NDoH ICT team will review suitable software options to establish a health data catalogue.

Activity EX1.4: Develop data dictionaries for commonly shared data

Data dictionaries provide detailed descriptions of data elements, including their definitions, formats, and permissible values. They play a crucial role in standardizing data terminology across various health programs and applications (such as HMS and EMR systems). As PNG adopts the FHIR framework, the development of data dictionaries should be derived from FHIR resources. Each FHIR resource includes elements with specific definitions, constraints and relationships that effectively serve as a data dictionary. The interoperability sub-working group will be tasked with selecting and adapting relevant FHIR resources to create key FHIR profiles, which will form the foundation of PNG's standardized data dictionaries.

Activity EX1.5: Define minimum datasets for national systems and registries

Minimum Data Sets (MDS) refer to the essential data elements that must be consistently collected across health systems for specific use cases, such as patient referral and discharge. These data sets ensure that critical information is uniformly gathered, enabling comprehensive analysis and informed decision-making. While PHAs have the flexibility to include additional data elements in their digital health applications, the standardized MDS ensures that all necessary data for health planning is captured. Adopting standardized MDS supports interoperability, enhances data quality, and enables more effective health service delivery across different systems. The following MDS will be developed during this strategic period:

- Data sets for hospital and patient medical record systems (including patient demographics, out-patient management, in-patient management, clinical diagnoses and treatment plans). The development of these MDS should be led by the PMRB team in close collaboration with clinical head of departments at PHAs.
- Data sets for key registries in the health information exchange platform. (facility registry and patient registry). The development of these MDS should be led by the interoperability sub-working group.

Activity EX1.6: Establish a knowledge hub for health data interoperability

To support stakeholders in connecting with the HIE, the NDOH will establish a dedicated portal on its website. This portal will provide access to various resources including:

- Implementation guidelines that detail technical specifications for interfacing with the HIE, encompassing data standards, communication protocols and security measures.
- Comprehensive API documentation detailing available endpoints, authentication methods, and usage examples to aid developers in connecting their systems effectively.
- Guidelines on maintaining data privacy and security, covering encryption standards, access controls and compliance with national and international data protection regulations.
- Procedures for testing and validating systems before connecting to the HIE to ensure compatibility and functionality.
- Resources for support and troubleshooting, including contact information for technical support, FAQs and troubleshooting guides.
- Training materials and resources for developers and system administrators to ensure they are well-equipped to implement and maintain connections to the HIE.
- Case studies and lessons learnt from PHAs who have implemented interoperability activities across their application environment.

Activity EX1.7: Train ICT staff on interoperability

To effectively train ICT staff on interoperability for the development and maintenance of the HealthBrij platform, a comprehensive and structured approach is essential. Initially, engaging external consultants may provide valuable insights through an assessment of current competencies, identifying gaps and facilitating knowledge transfer to national and PHA teams. This foundation will be critical for sustaining long-term development efforts.

Other strategies to consider include:

- Workshops and certification programmes: enrol ICT staff in targeted workshops and certification programmes that focus on interoperability, enterprise architectures, warehouse development and best practices.
- Practical exercises: use test environments to help ICT staff apply knowledge and skills. These practical experiences can also prepare them to troubleshoot and overcome potential challenges during real-world implementations.
- Hackathons and regional collaborations: participate in global and regional interoperability hackathons that expose ICT staff to innovative solutions and new technologies. These events provide a collaborative environment for learning.

Example competencies required by ICT staff

- Interoperability standards: FHIR, HL7, IHE, DICOM
- Interoperability architecture design
- API development
- Database management and ETL processes
- Security and privacy management (including data encryption and user access)
- Data models and mapping
- Server management and DevOps

EX2 Develop technical components for the HealthBrij

The HealthBrij, based on the OpenHIE framework, will include key components to enable interoperability in PNG's health system:

- Terminology Registries: manage standardized terminologies such as International Classification of Diseases version 10 (ICD-10) and Logical Observation Identifiers Names and Codes LOINC), ensuring consistent coding and accurate data exchange.
- Patient Registry: central database for patient demographics, providing unique identifiers to support accurate identification across health-care providers.
- Facility Registry: maintains an updated list of health-care facilities, supporting facility data management and patient direction.
- Interoperability Layer: mediates data exchange between health information systems using standards such as HL7 FHIR.
- Shared Health Repository (SHR): centralized repository of patient health information, shared across health-care settings.
- National and provincial data warehouses: centralized repositories (prioritized in the NHP 2021-2030) consolidating data from various sources to provide a unified view of health information.

Activity EX2.1: Develop essential terminology registries

The strategy recommends the development of three initial terminology registries: diagnoses, procedures and laboratory results. For diagnoses, PNG will continue to use ICD-10. The International Classification of Health Interventions developed by WHO will be adopted for coding medical procedures, benefiting from WHO's guidance as an implementing partner. For laboratory and clinical measurements, the LOINC standard will be utilized. These terminology registries will be established using a FHIR-based registry, leveraging FHIR resources such as CodeSystem, ValueSet, and ConceptMap to ensure standardized and interoperable healthcare data management.

How does the FHIR registry resources work?

- CodeSystem: this FHIR resource defines the codes and terms used in healthcare (for example, ICD-10, ICHI and LOINC). It provides details about each term, such as its unique code, description and hierarchical relationships with other terms.
- ValueSet: this resource allows you to define a subset of codes from one or more code systems, for example, a condensed list of ICD-10 codes, such as the one used in the eNHIS.
- ConceptMap: this resource defines mappings between concepts in different code systems. For example, a ValueSet ICD-10 term in eNHIS can be mapped to a detailed ICD-10 term in Mount Hagen's system OR an ICD-10 term can be mapped to the equivalent SNOWMED-CT term.

Activity EX2.2: Develop a patient registry and unique identifier

The patient registry will be developed using the FHIR framework, specifically leveraging the Patient Resource Profile. This profile will include essential demographic information such as name, gender, birth date, address, contact details and other identifying characteristics. A core feature of the registry will be the generation of a unique patient identifier. While PNG plans to eventually use a Digital ID as the unique patient identifier across the health sector, the patient registry will initially generate a temporary functional ID using FHIR's capabilities.

Multiple identifiers will be embedded within the patient resource profile, including name, surname, gender, date of birth and a hashed biometric fingerprint. The profile will also include placeholders for future identifiers such as the Digital ID. All national systems, including the eNHIS and existing HMS (such as Mount Hagen and Port Moresby General Hospitals), will be adapted to collect patient data according to this standardized profile. These systems will then interface with the patient registry through FHIR APIs.

When a patient visits a health facility, their data will be entered into the eNHIS or HMS, formatted according to the FHIR Patient Resource Profile, and sent to the central FHIR registry. The registry will check for existing records with matching identifiers. If a match is found, the unique patient ID is returned to the originating system in real-time or through deferred synchronization in cases of unstable internet connectivity. If no match is found, a new unique patient ID will be generated using a deterministic hash algorithm and stored in the registry. This ID is also sent back to the originating system for local record updates.

The FHIR registry also includes robust record-matching capabilities, preventing duplicate records by identifying existing patients in the system. In offline scenarios with deferred synchronization, a probabilistic algorithm will be used to catch and match potential duplicate IDs, allowing the system to flag possible duplicates and take appropriate action, such as merging records or notifying the data capturer for review.

The patient registry will also incorporate data from paper-based records. Non-digital such as L1 and L2 facilities will use FHIR-based templates to capture patient data in a standardized format, which will later be digitized and imported into the registry. Upon import, the FHIR registry will conduct patient matching, assigning existing unique patient IDs to matching records. The inclusion of biometric fingerprint data significantly enhances the matching process, particularly when demographic data is incomplete.

This dual approach ensures rapid expansion of the registry while accurately capturing new patient data. Adherence to stringent data security and privacy standards will be maintained, with all data stored securely according to the digital identification standards developed by DICT.

In the future, once the Digital ID system is fully implemented, the patient registry will integrate with this system to validate identities, update records and incorporate the Digital ID as an additional identifier, ensuring the registry remains comprehensive and up-to-date.

Activity EX2.3: Develop a facility registry

The facility registry serves as a comprehensive and up-to-date database of all health-care facilities in the country. Leveraging the Master Facility List already established within the eNHIS, the registry will be further developed in alignment with the WHO MFL Resource Package.

The existing MFL in PNG has effectively assigned unique identifiers to each health-care facility, ensuring clear and distinct recognition within the health information system. This unique ID is crucial for the facility registry, enabling precise tracking, management and coordination of facilities across various health programmes and applications.

Activity EX2.4: Develop a SHR repository

The SHR repository will be established as a central FHIR server, utilizing various FHIR resources (such as Encounter and Observation) to store comprehensive clinical records of patients. It will work in conjunction with both the future national EMR and legacy EMR systems to consolidate patient records into this longitudinal format. The SHR will play a critical role in integrating and consolidating patient data from all patient management systems across the health system, forming a comprehensive longitudinal record for each patient. This dual approach will ensure seamless integration and interoperability between different systems, enabling the aggregation of patient data from multiple sources.

The combination of the Patient Registry and the SHR ensures that while patients are uniquely identified across the health system, their clinical data remains secure and is consolidated and accessed only as needed to support comprehensive and effective health-care delivery across PNG.

Key distinctions between the Patient Registry vs. Shared Health Record:

- The Patient Registry is used to uniquely identify patients across the health system. It contains essential demographic information but excludes clinical data to prioritize confidentiality and security.
- The SHR, on the other hand, serves as a repository that collects and consolidates clinical information from various health facilities and applications, creating a comprehensive patient record. The Patient Registry is instrumental in ensuring that health records from different parts of the health system are accurately consolidated in the SHR.

Activity EX2.5: Develop national and provincial data warehouses

The establishment of a National Data Warehouse is a critical priority outlined in both the National Health Plan (NHP) 2021-2030 and the M&E Strategic Plan. This centralized system will enhance the collection, storage and management of health data, supporting more effective reporting, planning and policy development. In addition to the national warehouse, Provincial ICT committees will establish decentralized data warehouses to aggregate local health data before synchronizing with the national system. This approach ensures a seamless flow of information across all levels of the health system, enabling timely and accurate decision-making at both the provincial and national levels.

The development of these warehouses will leverage FHIR-capable software to align with the broader HIE architecture, incorporating robust ETL processes to ensure data quality and integrity. ETL will clean, standardize, and transform data from various sources into a consistent format before loading it into the centralized repositories.

EX3 Pilot an interoperable use case in a test environment

The interoperability layer is a fundamental component of the HealthBrij. PNG will adopt the Open Health Information Mediator (OpenHIM) for the interoperability layer. This platform is selected for its user-friendliness and suitability for low-resource settings, making it ideal for PNG's current environment. OpenHIM's adaptability, scalability and compatibility with FHIR make it a robust and effective solution for establishing a secure and efficient interoperability layer.

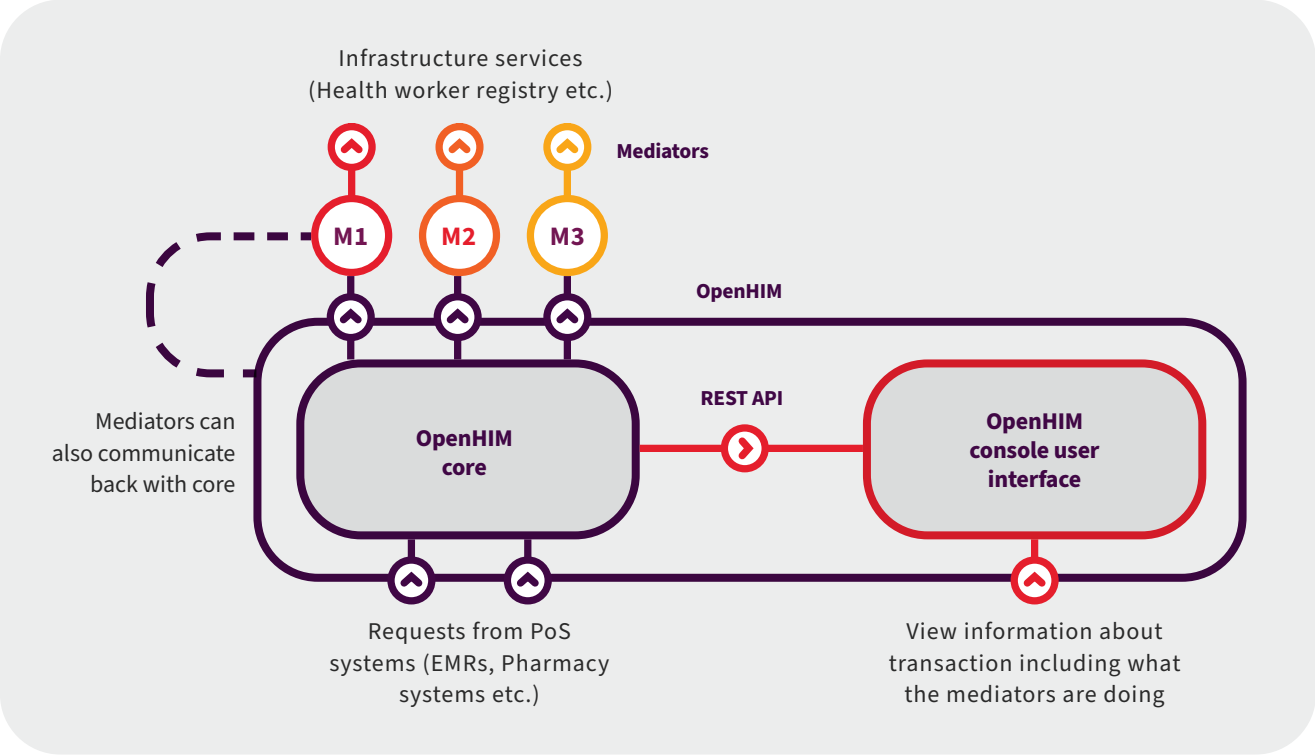
Activity EX3.1: Setup a test server for the interoperability platform

The NDoH, with support from partners, will establish a dedicated test environment to configure and evaluate the HealthBrij prototype. The testing environment will also inform a future production environment, allowing for the validation of platform features, performance and security.

Activity EX3.2: Develop and configure the OpenHIM platform on the test server

The OpenHIM platform will be configured according to the official implementation and developer guidelines. Following the setup components will be configured on the test server. These will connect with the relevant registry and warehouse components specified in a pilot use case. The mediators will handle critical tasks such as data transformation, validation and routing, ensuring seamless data flow between different systems and components within the health information exchange architecture.

Fig. 10. OpenHIM (source: OpenHIM)



5. Phased implementation strategy

The strategic priorities and activities outlined will be rolled out over a six-year period (2025–2030), in alignment with the NHP and M&E Strategic Plan. This phased implementation aims to strengthen the enabling environment while promoting the widespread adoption of digital health initiatives across PNG. The strategy's goal is to elevate the current DHMA score from 2.3 to 3.5 by progressively enhancing the readiness and capability of the enabling environment. This improvement is expected to lead to significant advancements in both the application environment and interoperability within the health system.

A phased approach will be employed to ensure that priorities and projects are completed without overburdening available resources, capacity, or time. Projects will be categorized into short-term, medium-term and long-term based on their complexity and resource needs:

- Short-term projects (quick wins) will be completed within the first year, addressing immediate gaps with minimal effort and resources. These projects aim to build initial momentum and stakeholder confidence by delivering visible results early on.
- Medium-term projects will be executed between years 2 and 3, requiring more substantial resources, effort and time. These initiatives will build upon the foundations established by short-term projects.
- Long-term projects, scheduled for completion in years 4 and 5, will be the most resource-intensive and time-consuming, relying on groundwork laid by both short-term and medium-term projects.

The strategic implementation plan includes 50 total activities distributed across these six years (some activities extend over two phases):

- 17 short-term projects targeted for completion in the first year
- 22 medium-term projects scheduled for the second and third years
- 16 long-term projects planned for the fourth and fifth years.

Given the evolving nature of the health system and technological advancements, this strategy advocates for the implementation plan to be treated as a living document. The eHTWG and PHA ICT committees will provide ongoing oversight, ensuring continuous alignment with emerging needs. A mid-term review will be conducted at 2.5 years into the strategy, to assess progress and make necessary adjustments.

5.1 PILLAR 1 IMPLEMENTATION Strengthen the enabling environment

Fig. 11. Pillar 1: Phased Implementation Plan

Governance & Regulation

Short-term Projects (Y1)	Medium-term Projects (Y2-3)	Long-term Projects (Y4-6)
• GR1.1: Formalize additional governance structures. • GR 2.1: Establish a Digital Health Repository. • GR2.3: Participate in Regional and Global Events. • GR3.1: Develop key policies	• GR2.4: Strengthening Research Activities. • GR3.1: Develop key policies. • GR 2.2: Setting up a Platform for Technology Vendors.	• GR3.2: Develop key laws

Human Capacity

Short-term Projects (Y1)	Medium-term Projects (Y2-3)	Long-term Projects (Y4-6)
• HC1.1: Require computer literacy components in capacity plans. • HC1.2: Collaborate with educational institutions. • HC1.3: Establish and Distribute a Competency Framework.	• HC1.4: Develop an in-service training program. • HC1.5: Embed digital health literacy into Continual Professional Development. • HC1.6: Provide refresher training on existing digital health applications. • HC2.1: Co-develop a pre-service curriculum for digital health. • HC2.2: Recruit and train academic facilitators.	• HC3.1: Build sufficient ICT capacity within PHAs • HC3.2: Establish ICT support hubs

Digital Investment

Short-term Projects (Y1)	Medium-term Projects (Y2-3)	Long-term Projects (Y4-6)
• IN1.1 Develop a TCO framework for digital health projects. • IN3.1 Develop transition plans for digital health projects.	• IN2.1 Create a digital health budget category in the funding structure. • IN3.1 Develop transition plans for digital health projects.	• IN4.1 Explore partnership models for digital health management

Infrastructure

Short-term Projects (Y1)	Medium-term Projects (Y2-3)	Long-term Projects (Y4-6)
• IF3.1: Develop technical specifications for equipment and hardware.	• IF3.2: Consolidate device usage across programs. • 1F4.1: Develop and implement an asset management system. • IF5.1: Develop SOPs for ICT maintenance	• 1F1.1: Prioritise internet connectivity across L3-L4 facilities. • IF2.1: Prioritise alternate energy sources in facilities with no electricity supply.

5.2 PILLAR 2 IMPLEMENTATION Implement appropriate technologies

Fig. 12. Pillar 2: Phased Implementation Plan

	Short-term Projects (Y1)	Medium-term Projects (Y2-3)	Long-term Projects (Y4-6)
Applications & Interventions	• 1A2.1: Implement a pilot approval checklist and process.	• 1A1.2: Implement a central Radiology and PACs system across PHAS. • IA1.4: Develop and implement a human resource information system. • 1A1.6: Pilot telemedicine interventions in PNG.	• 1A1.1: Develop a national HMS and EMR system. • 1A1.5: Select and implement a centralised laboratory information system (LIS). • 1A1.6: Pilot telemedicine interventions in PNG. • 1A3.1: Identify and pilot suitable portable diagnostic tools.

5.3 PILLAR 3 IMPLEMENTATION Connect all parts of the health system

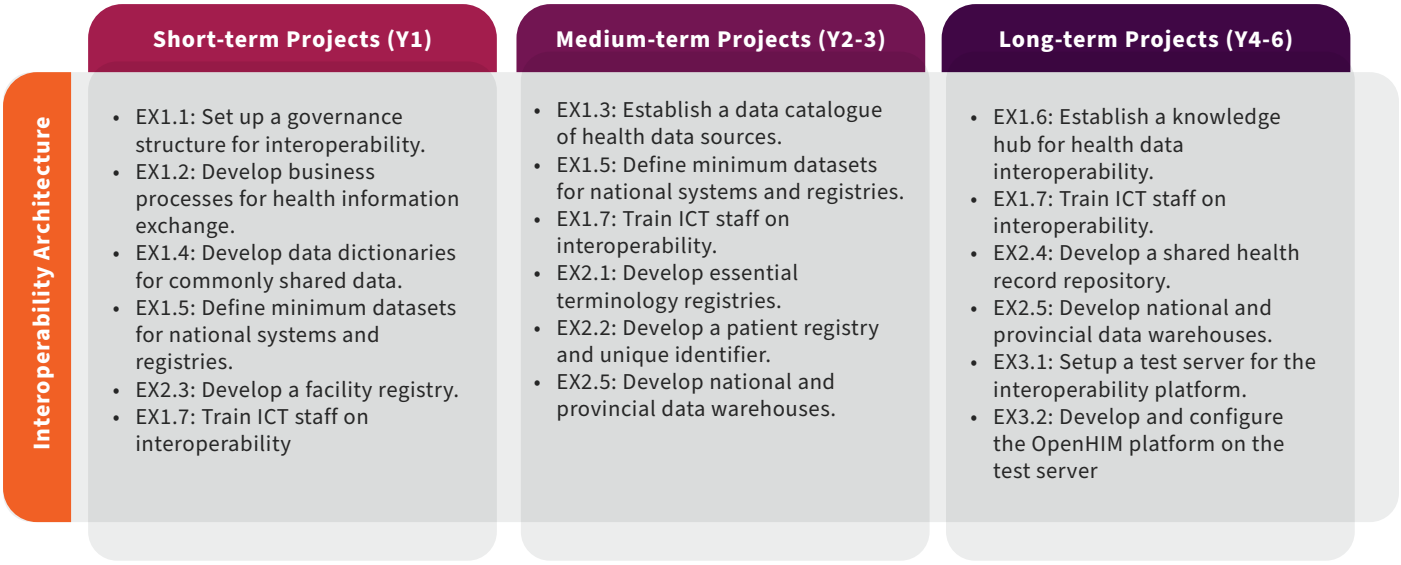
The implementation of the interoperable architecture is strategically phased according to the three objectives to ensure that PNG incrementally builds the necessary infrastructure, capacity and governance structures to support a comprehensive and robust HIE platform.

In the first phase, the focus will be on establishing a robust foundation for the HIE platform by developing the business and data architecture. This phase is crucial for achieving semantic interoperability, which involves standardizing the vocabulary used within the health system to ensure a common understanding and consistency in health data usage. This standardization will be supported by in-depth stakeholder engagements to align business processes and the creation of a governance structure to oversee the interoperability efforts.

In the second phase, attention will shift to building the application and technology architecture required to support the HIE platform. This will involve designing and developing standardized APIs that facilitate communication between different health systems, as well as establishing a secure and scalable technical infrastructure for data exchange. The integration of health data systems with the HIE platform will be a key focus, supported by the development and configuration of middleware components such as the OpenHIM platform, which will enable syntactic interoperability. This phase ensures that data is exchanged in a consistent and secure format across the health system.

The final phase will involve the prototyping and piloting of the HIE platform. During this stage, prototypes for key components of the platform will be developed and tested in selected regions or systems to validate their functionality. User training will be conducted, and feedback will be gathered to refine the platform further. This phase will also include rigorous testing of the platform's performance, scalability and security to ensure that it can handle real-world demands. By the end of this phase, PNG will have a functional prototype of the HIE platform that demonstrates effective interoperability and secure data exchange across the health system, setting the stage for broader implementation and institutionalization in the next strategic period.

Fig. 13. Pillar 3: Phased Implementation Plan



5.4 Cost considerations

The estimated costs provided offer a financial framework to assist the government in planning and budgeting for digital health initiatives. As these are preliminary estimates, it is essential for project owners to conduct a detailed costing at the time of implementation to ensure accuracy and adequacy of funds. These budget estimates, calculated in PNG Kina, are based on an activity-based costing approach. Unit costs for labour, fieldwork, workshops, training, and equipment have been derived from a combination of available online sources, regional and global benchmarks, particularly for international consultants. The budget intentionally excludes internal staff costs, ongoing operational expenses, overhead, and project management fees, focusing solely on the primary cost drivers essential for initiating the digital health activities.

Table 19. Estimated Governance and Regulations implementation plan

Governance & Regulations costed implementation plan				
Obj.	Activities	Est. completion	Cost drivers	Est. Cost (PGK)
GR1	GR1.1: Formalize additional governance structures	Y1Q2 (+ ongoing tasks)	Employment of ICT staff in PHAs (annual salary budget for 2 IT staff per province)	2 744 868 (130 708 per PHA)
GR2	GR 2.1: Establish a digital health repository	Y1Q4	Software developer, database developer, system analyst	136 910
	GR 2.2: Setting up a platform for technology vendors	Y1Q3	None (in-house development)	
	GR2.3: Participate in regional and global events	Annually	Participant registration, travel and logistics (estimated 5 events per year for 2 pax travelling for 3 days)	481 600 (96 320 per year)
	GR2.4: Strengthening research activities	Continuous	Dependent on research activity	
GR3	GR3.1: Develop key policies	Y2Q2	Technical experts and specialists	278 850
	GR3.2: Develop key laws	Y4Q2	Legal consultant, technical experts (Cost to be shared with DICT)	410 300
Subtotal for Governance & Regulations				**4 052 528**

Table 20. Estimated Human Capacity implementation plan

Human capacity costed implementation plan				
Obj.	Activities	Est. Completion	Cost drivers	Est. cost (PGK)
HC1	HC1.1: Require computer literacy components in capacity plans	Y1Q1 (+ ongoing implementation)	Cost managed by implementing partner	
	HC1.2: Collaborate with educational institutions	Y1Q4 (+ ongoing implementation)	New computer equipment at training facilities (4 per facility) Note: excludes logistical costs for delivering computer equipment.	532 000
	HC1.3: Establish and distribute a competency framework	Y1Q4	Digital Health and HR consultants	98 560
	HC1.4: Develop an in-service training programme	Y2Q2 (Implement Y3)	Content developer, Digital health domain specialists, (Curriculum specialist recruited from academic institute to reduce cost)	205 200
	HC1.5: Embed digital health literacy into Continual Professional Development	Y3Q1	None	
	HC1.6: Provide refresher training on existing digital health applications	Every 2 years	Cost Strategy: Train PHIOs virtually and have PHIOs provide training during planned facility visits; travel, accommodation and per diem for facilitator to train PHIOs in every province.	100 800 (4800 per province)
HC3	HC3.1: Co-develop a pre-service curriculum for digital health	Y2Q4 (Implement Y4)	Content developer, digital health domain specialists	145 100
	HC3.2: Provide access to health reports and dashboards	Continuous	None	
	HC3.3: Recruit and train academic facilitators	Y3Q4	Digital health course fee for one facilitator from every training institute (38)	66 880
HC4	HC4.1: Build sufficient ICT capacity within PHAs	Y4Q2	Est. 2 interns per PHA annually for 3 years	4 895 478 (annual salary per intern 38 853)
	HC4.2: Establish ICT support hubs	Y4Q2	Managed full-stack ICT support service per annum (in 89 districts)	657 888
Subtotal for Human Capacity				**6 701 906**

Table 21. Estimated digital Investment implementation plan

Digital investment costed implementation plan				
Obj.	Activities	Est. Completion	Cost drivers	Est. cost (PGK)
IN1	IN1.1 Develop a TCO framework for digital health projects	Y1Q4	Health economist consultant	68 000
IN2	IN2.1 Create a digital health budget category in the funding structure	Y2Q4		
IN3	IN3.1 Develop transition plans for digital health projects	Continuous	Digital health project consultant	34 000
IN4	IN4.1 Explore partnership models for digital health management	Continuous	Variable depending on partnership. Time cost on NDoH staff and legal teams to support negotiations, technical specialist.	TBD
Subtotal for digital investment				**102 000**

Table 22. Estimated Infrastructure implementation plan

Infrastructure costed implementation plan				
Obj.	Activities	Est. Completion	Cost drivers	Est. cost (PGK)
IF1	IF1.1: Prioritize internet connectivity across L3-L4 facilities	Continuous (see M&E plan for targets)	Annual internet subscription (est. 480 of facilities)	14 400 000
IF2	IF2.1: Prioritize alternate energy sources in facilities with no electricity supply	Continuous (see M&E plan for targets)	Basic setup of solar equipment (est. 200 facilities)	7 000 000
IF3	IF3.1: Develop technical specifications for equipment and hardware	Y1Q4	Purchase new laptop/computer and routers (Est 520 sites)	3 380 000
	IF3.2: Consolidate device usage across programs	Y3Q2	Reconfiguring devices at facilities (dependent on approach: remote configuration versus sending all devices to support vendor).	TBD
IF4	IF4.1: Develop and implement an asset management system	Y3Q4	Dependent on software selection. If open source: assume software development costs, training costs for NDoH ICT staff.	255 200
IF5	IF5.1: Develop SOPs for ICT maintenance	Y3Q1	Technical experts (Cost strategy: have experts attend annual ICT workshop to provide technical assistance).	96 800
Subtotal for infrastructure				**25 132 000**

Table 23. Estimated applications and interventions implementation plan

Applications and Interventions costed implementation plan				
Obj.	Activities	Est. Completion	Cost drivers	Est. cost (PGK)
IA1	IA1.1: Develop a national HMS and EMR system	Y5Q4	Cost drivers	2 150 000 – 13 500 000
	IA1.2: Implement a central radiology and PACs system across PHAs	Y3Q1	Dependent on software selection (software development and configuration, infrastructure, training, data migration and integration, licensing costs, implementation costs).	170 000 - 350 000 (shared cost between provinces)
	IA1.3: Develop and implement a human resources information system	Y3Q2		12 848 000
	IA1.4: Select and implement a centralized laboratory information system (LIS)	Y4Q1		12 848 000
	IA1.5: Pilot telehealth interventions in PNG	Continuous		TBD
IA2	IA2.1: Implement a pilot approval checklist and process	Y1Q1	Digital health consultant	7250
IA3	IA3.1: Identify and pilot suitable portable diagnostic tools	Y4 & Y5		TBD
Subtotal for infrastucture				**28,023,250 - 39,553,250**

Table 24. Estimated interoperability architecture implementation plan

Interoperability architecture costed implementation plan				
Obj.	Activities	Est. Completion	Cost drivers	Est. cost (PGK)
EX1	EX1.1: Set up a governance structure for interoperability	Y5Q4	Technical expert (employed at 25% capacity)	176 000
	EX1.2: Develop business processes for health information exchange	Y3Q1	Systems analyst (employed for 1 year)	152 100
	EX1.3: Establish a data catalogue of health data sources	Y2Q4	Dependent on software selection (assume open-source development costs)	211 200
	EX1.4: Develop data dictionaries for commonly shared data	Y1Q4	FHIR consultant	91 520

EX1	EX1.5: Define minimum datasets for national systems and registries	Y1Q4	None	
	EX1.6: Establish a knowledge hub for health data interoperability	Y4Q2	None (in-house: update NDoH website)	
	EX1.7: Train ICT staff on interoperability	Continuous	Assign annual training budget for 2 persons per PHA and NDoH	387 200 (3520 per year per PHA)
EX2	EX2.1: Develop essential terminology registries	Y1-Y3Q1	FHIR developer, database developer, system analyst	408 320
	EX2.2: Develop a patient registry and unique identifier	Y3Q2	FHIR developer, database developer, system analyst, security specialist	476 760
	EX2.3: Develop a facility registry	Y1Q4	Software developer, database developer, system analyst	218 240
	EX2.4: Develop a shared health record repository	Y4Q2	FHIR developer, database developer, system analyst, security specialist	501 920
	EX2.5: Develop national and provincial data warehouses	Y3Q2	Database developer, security specialist, database analyst	410 400
EX3	EX3.1: Setup a test server for the interoperability platform	Y4Q4	Depends on server specifications	TBD
	EX3.2: Develop and configure the OpenHIM platform on the test server	Y5Q3	Development and configuration, training, infrastructure	302 720
Subtotal cost range for applications and interventions				**3 336 380**

5.4.1 Cost strategies

In order to effectively manage the costs associated with implementing the strategy, several cost-saving strategies are proposed.

- Combine training activities to reduce the travel and logistical costs associated with in-person training. By scheduling multiple training sessions together, economies of scale can be achieved, thereby minimizing expenses.
- Leverage online platforms to facilitate training where possible to eliminate travel and logistical costs, which are particularly high in PNG due to its challenging geography. Online training not only reduces costs but also allows for greater flexibility and accessibility for participants.
- Utilize existing or developed resources, such as learning materials, established standards, and frameworks, to reduce development costs. Instead of creating new materials from scratch, adopting and adapting available resources can save on implementation time and budget. Additionally, collaborating with other national and international organizations to share resources and best practices can further lower costs.
- Mobilize funding that may be available for whole of government digitization initiatives through DICT, other ministries and even private sector.

By combining these strategies, the strategy can be implemented in a cost-effective manner, ensuring that financial resources are maximized to achieve the desired health outcomes.

5.5 Management and coordination

The successful implementation of the strategic plan relies on a robust management and coordination approach, with the overall responsibility falling under the eHTWG and eHSC. To ensure effective oversight and manageable workloads, the implementation plan will be coordinated through a collaborative effort between government and external partners. This approach is designed to leverage the strengths of various stakeholders and ensure comprehensive oversight across all projects.

Coordination structure: The eHTWG will oversee the entire implementation, ensuring alignment with strategic objectives and providing high-level guidance and support. They will monitor progress, make necessary adjustments to the implementation plan, address challenges and ensure that resources are appropriately allocated. Key issues will be raised to and recommendations made to the eHSC for any major decisions related to the Strategy.

Coordination pairs: Each project within the implementation plan will be assigned a pair of coordinators:

- Government coordinator: Either from NDoH or PHA. Government coordinators will provide leadership and direction for project activities within their jurisdiction, ensure alignment with national and provincial health priorities and policies and facilitate collaboration with other government entities and local stakeholders.
- External coordinator: From implementation partners, other ministries, or relevant agencies. External coordinators will bring specialized expertise and resources to support project implementation, foster partnerships and coordination with other external stakeholders and ensure that project activities are in line with international best practices and standards.

The need for coordination pairs was identified and agreed upon during the strategy development workshop. While most pairs have been established, some will be confirmed during the implementation phase to ensure the most suitable and effective partnerships.

By adopting this comprehensive management and coordination approach, the strategic plan aims to achieve its objectives effectively, leveraging the strengths of various stakeholders and maintaining the flexibility to adapt to changing circumstances. This approach not only ensures robust oversight but also fosters a collaborative and inclusive environment for all parties involved.

5.6 Risk management

Table 25. Primary risks and mitigation strategies

Risk	Risk Factor	Description	Mitigation
Inadequate ICT infrastructure	High	Limited internet connectivity and frequent power outages in rural areas can hinder the implementation and usage of digital health systems.	Partner with private sector companies to enhance internet and power supply. Implement backup power solutions such as solar power for critical health facilities.
Data privacy and security concerns	High	Potential breaches of sensitive health data can undermine trust in digital health systems and result in legal repercussions.	Develop and enforce strict data privacy and security policies. Regularly conduct security audits and risk assessments to identify and address vulnerabilities. Implement robust data encryption and access control measures.
Inadequate funding and resource allocation	High	Limited financial resources, such as no increase in health budgets, can restrict the scope and pace of digital health initiatives. Timelines for development partners funding commitments may not align with implementation plans.	Establish public-private partnerships to leverage additional resources and expertise. Explore diverse funding channels including international donors and local government budget reallocations. Engage transparently with development partners on the digital health implementation plan. Maintain implementation plan as a living document that is reprioritized according to available resources.

Risk	Risk Factor	Description	Mitigation
Sustainability of digital health initiatives	High	Digital health initiatives may face challenges in maintaining long-term sustainability.	Build local capacity to manage and maintain digital health initiatives from the outset. Develop a total cost of ownership framework to plan for ongoing costs and integrate it into financial planning and budgeting processes.
Resistance to change	Medium	Health workers and management may resist adopting new digital health systems and workflows.	Conduct comprehensive training and change management programmes to build digital health literacy and demonstrate the benefits of digital health. Engage stakeholders early in the planning process to foster buy-in and support.
Technical skill gaps	High	Lack of skilled ICT professionals and health workers proficient in digital health technologies.	Develop and implement targeted training programmes for ICT and health professionals. Collaborate with academic institutions to integrate digital health into curricula and offer professional development opportunities.
Operational restrictions	High	Regulations preventing the restructuring or recruitment of staff.	Partner with other sectors and industries to address capacity needs.
Vendor dependency	Medium	Over-reliance on specific technology vendors can lead to vendor lock-in and potential service disruptions.	Promote the use of open-source solutions where feasible. Negotiate clear service level agreements with vendors. Develop in-house capabilities to reduce dependency on external vendors.

6. Monitoring, Evaluation (M&E) and Learning

The M&E framework for the Digital Health Strategy 2025–2030 is essential to ensuring that digital health initiatives are properly implemented and achieve the intended outcomes. This framework also serves to accumulate learnings and gather lessons for future digital health strategies. There are three main activities that will be carried out under this framework:

- Monitoring: involves the routine review of indicators to measure the fidelity and progress of the digital health implementation plan. This continuous process ensures that all activities are on track, resources are being used effectively and any deviations from the plan are identified early. Targets and progress indicators are tabled below.
- Evaluation: focuses on the availability of inputs to achieve the implementation plan. A mid-term review will be conducted at the halfway point of the strategy to review the progress of the implementation plan and adjust or reprioritize activities based on the availability of resources, funding and capacity or in response to changes in the environment.
- Learning: involves gathering feedback from monitoring and evaluation activities and formative assessments to refine processes, address challenges and capitalize on opportunities. By documenting and sharing lessons learnt, the framework fosters a culture of continuous improvement and knowledge sharing.

This comprehensive M&E framework ensures that the PNG National Digital Health Strategy is not only implemented effectively but also continuously improved based on empirical evidence and adaptive learning.

6.1 Monitoring Indicators

Table 26. List of monitoring indicators for the digital health strategy

Activity	Target	Indicator	Frequency of measure
Governance & Regulation			
GR1.1: Formalize additional governance structures.	Functional national eHTWG (meets at least quarterly) and eHSC (meets at least twice a year). At least 15 PHAs have established ICT Committees.	Number of eHTWG and eHSC meetings per year Number of PHAs that have established ICT committees	Annually
GR 2.1: Establish a Digital Health Repository	95% of digital health projects catalogued in repository	% of digital health projects catalogued in repository.	Half-yearly
GR3.1: Develop key policies	Law published on DICT and NDoH website	% systems compliant with law	Annually
Human Capacity			
HC1.3: Establish and distribute a digital health competency framework	Competency framework published and disseminated	In-service training programme is based on the competency framework (Yes/No)	Annually
HC1.4: Develop an in-service training programme	In-service programme institutionalized across PHAs	% of PHAs that have conducted in-service training on digital health	Annually
HC3.1: Co-develop a pre-service curriculum for digital health	Digital health is included within pre-service curricula of at least 2 cadres	Number of health worker pre-service curricula including digital health	Annually
Digital health investment			
IN1.1 Develop a TCO framework for digital health projects	TCO Tool developed and orientations on its use provided to stakeholders	% projects with TCO projections	Annually
IN3.1 Develop transition plans for digital health projects	Transition plan available for scale-up projects	% projects in their last year with transition plan	Annually
Infrastructure			
IF1.1: Prioritize internet connectivity across L3-L4 facilities	50% of health facilities connected to internet	% of health facilities connected to the internet	Annually
IF3.1: Develop technical specifications for equipment and hardware	All PHAs have functional teleconferencing digital services	Number of PHAs with functional teleconferencing digital services	Annually
IF4.1: Develop and implement an asset management system	All PHAs are reporting in the asset management system	% PHAs reporting assets on asset management system	Annually

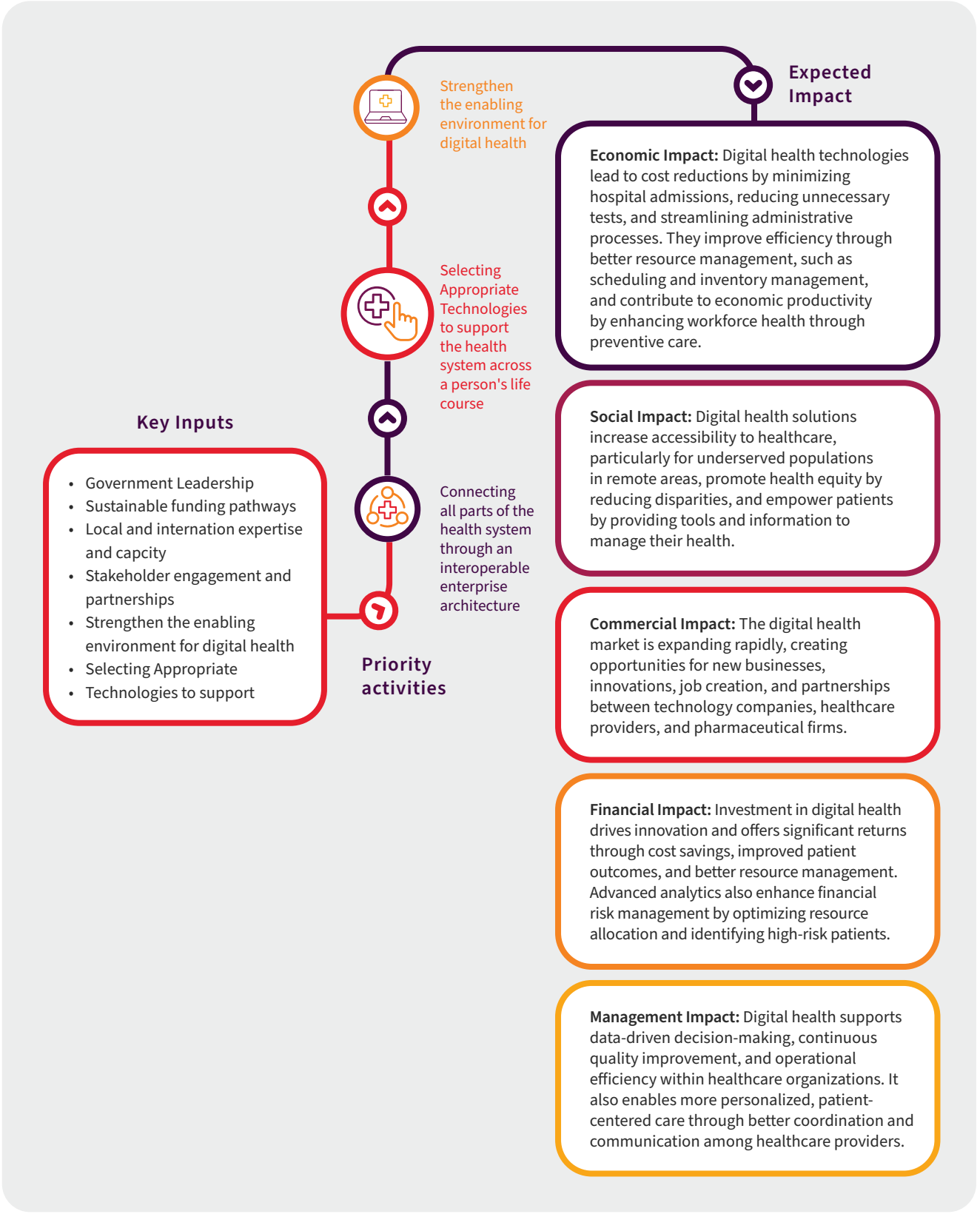
Applications and interventions			
IA1.1: Develop a national HMS and EMR system	National HMS piloted in 2 provinces	% provincial hospitals using national system	Annually
IA1.4: Develop and implement a human resources information system	At least 50% of provinces are reporting data in the HRIS	Number of provinces implementing and reporting data in the HRIS	Annually
IA1.6: Pilot telehealth interventions in PNG	Active telehealth pilots across PNG	Number of telehealth pilots	Annually
Interoperability architecture			
EX1.2: Develop business processes for health information exchange	Business process workflows available for interoperability	Number of business process workflows developed	Annually
EX1.4: Develop data dictionaries for commonly shared data	Data dictionary published	Number of systems adapted to data dictionaries	Annually
EX1.5: Define minimum datasets for national systems and registries	MDS for key areas published	Number of systems adapted to MDS	Annually
EX2.1: Develop essential terminology registries	Terminology registries used in applications across PNG	% systems connected to terminology registries	Annually
EX2.3: Develop a facility registry	MFL developed and connected to systems	% systems connected to the MFL	Year 5
EX2.5: Develop national and provincial data warehouses	Routine health information systems are linked to a national data warehouse	Data warehouse established with at least selected routine health information systems connected.	Year 5
EX3.1: Setup a test server for the interoperability platform	Test server set up		Year 5

At the end of the strategic period, it is recommended to conduct a new DHMA. This assessment can be used to evaluate the current state of digital health infrastructure and practices, providing valuable insights that will inform the development of the next digital health strategy. Conducting a new DHMA will ensure that the subsequent strategy is based on up-to-date data and accurately reflects the evolving needs and capabilities of the health system.

6.2 Benefits realization

Ultimately, the Strategy aims to bring positive impact to five areas in PNG.

Fig. 14. Digital Health Theory of Change



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Annex 1: National and Provincial Digital Health Profiles (2023)

Digital Health Maturity Profile 2023
Papua New Guinea

COUNTRY PROFILE

Total population, 2023	% Rural population, 2022	Income Level	# of operational health facilities	# of hospitals
9.85 million[1]	86.4%[2]	Lower middle[2]	3,497[1]	33[1]

% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Fixed broadband connections (2021)	Mobile-cellular subscriptions (2021)	Population coverage, mobile network coverage
79%[1]	44%[1]	21,000[3]	4.82 million[3]	64%[3] 3G 50%[3] LTE/WiMax

Sources: 1. eNHIS 2023; 2. World Bank DataBank; 3. ITU, 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

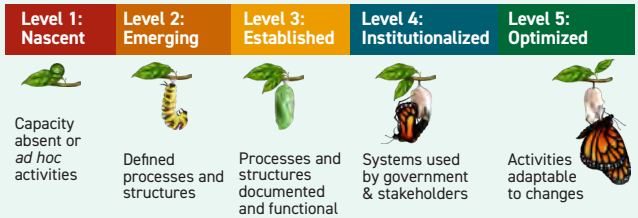
Purpose	Name	Type	Scale
Health management	eNHIS	Custom-built	All provinces
Hospital/clinical information	DHIS	Custom-built	All provinces
Public Health and Disease Surveillance	HPDB	License	All provinces
	e-TB module	Custom-built	Selected provinces
	DHIS-2	Open source	Planned introduction in provinces
	ODK	Open source	All provinces
Logistics management	mSupply	License	All provinces
	Pharmaceutical Registration System	Custom-built	Used at national level
Financial management	IFMS, Alesco Payroll	License	Most provinces
Laboratory Information Management System	Senait	Open Source	Selected provinces
Vaccine management	Cold-Cloud	License for cold-cloud	All provinces
Hospital management	Insta, ePMRS, TRIAS	License/Custom built	Limited functionality in selected hospitals
Clinical management	Picture archive & communication system (PACs)	License	Selected provinces
	Radiology information system (RIS)	Open source	Selected provinces

DIGITAL HEALTH MATURITY: OVERALL SCORE

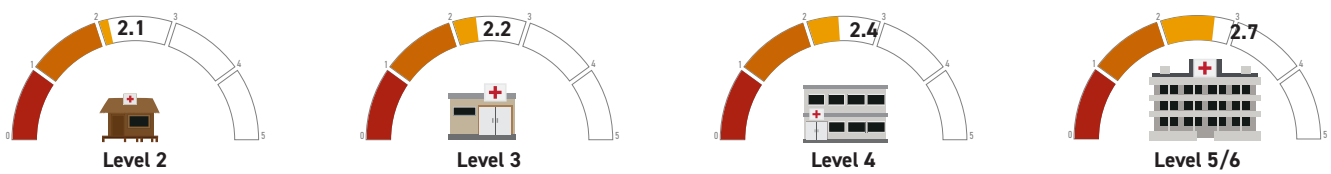
Level 2: Emerging Maturity

Digital transformation options are limited, will grow inequitably and may not be sustainable. Digital health is problem-driven. There is some coordination but no standardization.

Levels: the transitional states in a maturity model



SCORES BY HEALTH FACILITY LEVEL



SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.7
Functional hardware	2.5
Operation & maintenance	1.3
Maintenance capacity	2.2

Human Capacity (HC)

Leadership capacity	2.4
Health workforce	2.2
Pre-workforce development	1.3
Skills development	1.0

Data ecosystem (DE)

Data capturing practices	3.3
Data sources	3.9
Data collected	2.8
Data use	1.9
Data quality & improvement	2.1

Notable deficiency in human capacity means users lack necessary technical skills to adopt digital applications. Infrastructure is limited, posing challenges for management and maintenance of technologies. Data quality remains variable with low use.

Strengths

- Information systems in place to collect key data for planning, monitoring and improvements
- Standardized recording & reporting forms
- PHAs are establishing ICT teams
- Investments in alternate power supply equipment at all levels
- eNHIS tablets function and any issues are resolved quickly
- Enthusiasm among health workers

Gaps

- Outdated population data
- Poor data quality & use
- Low ICT & digital health literacy
- Unreliable internet connectivity and no communication equipment at lower level facilities
- Outdated or no hardware in health facilities
- No ICT maintenance plans

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

Governance & regulations (GR)

Governance structures	3.0
Stakeholder coordination	3.2
Policies, regulation & compliance	1.1

Strategy & investment (SI)

Digital Health Strategy	3.0
Operationalization	2.9
Short-term funding	1.3
Alternate funding	3.1

Interventions & applications (IA)

Use of applications	5.0
Human centred design	4.2
Sustainability	1.8

High maturity for interventions & apps due to nationally scaled eNHIS. Lack of a national digital health strategy means digital health decisions may deviate from national priorities & fragmentation of systems. Technologies deployed mostly result in short-term fixes.

Strengths

- Functional national eHealth governance bodies
- PHAs ready to follow NDoH digital health policies & plans
- Health facilities require PHA approval to implement digital health activities
- Nationally scaled eNHIS which is deemed user friendly and has strong maintenance support
- mSupply used by medical stores across country

Gaps

- Lack of national digital health strategy
- Limited national oversight of sub-national activities
- Low awareness of national digital health policies and plans
- No digital health investment roadmap
- No clear pathways to access funding for digital health
- Data entered in different devices and systems

SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.2
Documents & Processes	1.3
Technical Organization	1.3
Technical Components	2.7

Research & innovation (RI)

Knowledge management (KM)

Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not always aligned with national priorities. Digital health implementation is not guided by lessons from past experience.

Strengths

- Demand for interoperability
- Some standards are in place to support interoperability
- NDoH in discussion with DICT on government plans for interoperability
- Interest in research, skills for research exist in health facilities

Gaps

- Poor understanding of interoperability
- Many data standards and minimum datasets still need to be identified
- Digital technologies deployed are not always evidence based
- No publications or evaluations of existing national systems (eNHIS and mSupply)
- Lack of M&E plans for digital technologies

Digital Health Maturity Profile 2023
Central Province

PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
342,987[1]	125[1]	1[1]	88%[1]	15%[1]	No	No

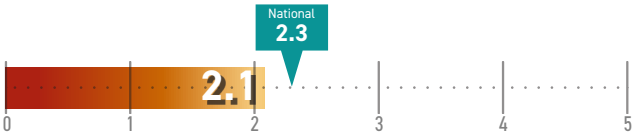
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Disease surveillance
eNHIS	mSupply	IFMS Alesco Payroll	HPDB

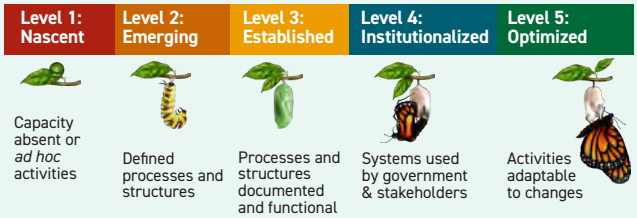
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

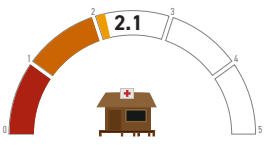


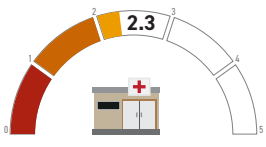
Digital health maturity is emerging, with a lower score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ICT literacy among health workers.

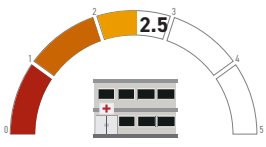
Levels: the transitional states in a maturity model

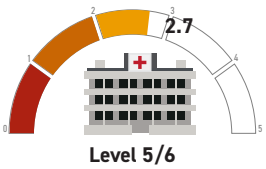


SCORES BY HEALTH FACILITY LEVEL









SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.7
Functional hardware	2.5
Operation & maintenance	1.3
Maintenance capacity	2.2

Human Capacity (HC)

Leadership capacity	1.0
Health workforce	2.2
Pre-workforce development	2.0
Skills development	1.0

Data ecosystem (DE)

Data capturing practices	3.3
Data sources	3.9
Data collected	2.8
Data use	1.9
Data quality & improvement	2.1

Low maturity across all blocks. Deficiencies in human capacity means low adoption & use of technologies and issues with maintenance. Attempts to scale may fail.

Strengths

- Laloki Hospital has landline and closed user group telephone communication
- Some health facilities have staff with basic-intermediate ICT skills
- Regular data quality checks are conducted by the PHA/specific programmes

Gaps

- Duplicated patient records
- No digital health training
- Limited data use
- Low ICT & digital health literacy
- Aside from eNHIS tablets, outdated hardware in health facilities
- No ICT maintenance plans

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

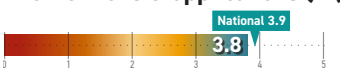
Governance & regulations (GR)

Governance structures	3.7
Stakeholder coordination	3.3
Policies, regulation & compliance	1.0

Strategy & investment (SI)

Digital Health Strategy	3.3
Operationalization	3.0
Short-term funding	1.0
Alternate funding	2.0

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.3
Sustainability	2.0

High maturity for interventions & apps due to nationally scaled eNHIS. No provincial digital health plan or governance body means implementation is not guided by local priorities and oversight is limited.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support
- Few issues and errors are experienced when entering data in information systems

Gaps

- No provincial digital health governance body or investment plan
- Limited national oversight of sub-national activities
- Low awareness among of national digital health policies and plans
- Transition plans not in place for deployed technologies
- No specific budget line for ICT/digital health
- Data entered in different devices and systems

SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.3
Documents & Processes	3.0
Technical Organization	1.0
Technical Components	3.0

Research & innovation (RI)

Knowledge management (KM)

Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

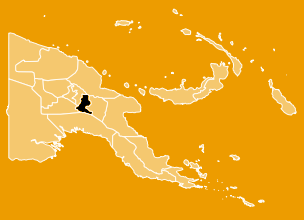
Strengths

- Demand for interoperability
- Some standards are in place to support interoperability
- ICD-10 coding applied to morbidities and mortalities
- Interested in research, skills for research exist in health facilities

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
Chimbu Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
398,007[1]	109[1]	1[1]	90%[1]	50%[1]	Yes	No

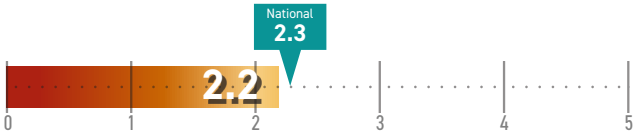
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Public health and disease surveillance	Adverse event reporting	Telemedicine
eNHIS	mSupply	Alesco Payroll	HPDB e-TB module (in eNHIS) Tupaia (malaria) Pediatric Hospital Reporting System	ODK	

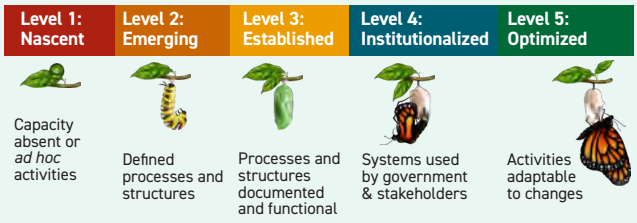
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

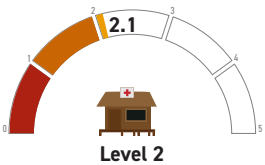


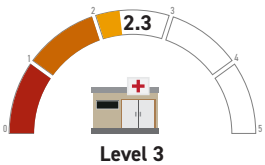
Digital health maturity is emerging, with a lower score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ICT literacy among health workers.

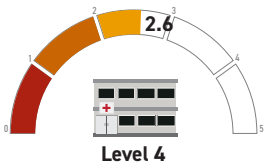
Levels: the transitional states in a maturity model

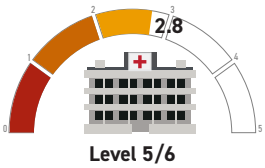


SCORES BY HEALTH FACILITY LEVEL









SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.6
Functional hardware	3.0
Data equipment	1.0
Operation & maintenance	1.7
Maintenance capacity	1.5

Human Capacity (HC)

Leadership capacity	2.0
Health workforce	1.9
Pre-workforce development	2.5
Skills development	1.0

Data ecosystem (DE)

Data capturing practices	3.3
Data sources	3.6
Data collected	2.9
Data use	2.7
Data quality & improvement	2.0

Low maturity across all blocks. Deficiencies in infrastructure and human capacity mean low adoption & use of technologies and issues with maintenance. Sustainable scale-up of systems across the province will be challenging.

Strengths

- PHA maintains a paper-based inventory of ICT assets
- PHA has two ICT officers
- Some health facilities have staff with basic-intermediate ICT skills
- Regular data quality checks are conducted by the PHA/specific programmes

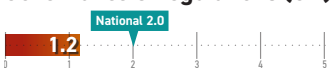
Gaps

- Duplicated patient records
- No digital health training
- Limited data use
- Low ICT & digital health literacy
- Aside from eNHIS tablets, outdated hardware in health facilities

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

Governance & regulations (GR)

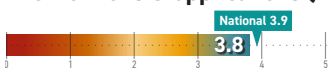


Governance structures	1.0
Stakeholder coordination	2.7
Policies, regulation & compliance	1.1

Strategy & investment (SI)

Digital Health Strategy	3.0
Operationalization	3.6
Short-term funding	3.0
Alternate funding	4.0

Interventions & applications (IA)



Use of applications	5.0
Human centred design	3.8
Sustainability	2.0

High maturity for interventions & apps due to nationally scaled eNHIS. No provincial digital health plan means implementation may not guided by local priorities and oversight is limited.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- ICT audit conducted with short- and long-term recommendations to improve ICT status in the province
- PHA established a project team to oversee implementation of ICT projects
- Funding secured for ICT activities
- eNHIS is deemed user friendly and has strong maintenace support
- Few issues and errors are experienced when entering data in information systems

Gaps

- Low awareness of national digital health policies and plans and governance bodies
- Transition plans not in place for deployed technologies
- Data entered in different devices and systems

SCORES FOR THE MODIFYING BLOCKS

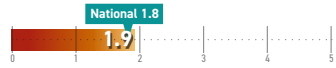
Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.0
Documents & Processes	1.0
Technical Organization	1.3
Technical Components	3.1

Research & innovation (RI)

Knowledge management (KM)



Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

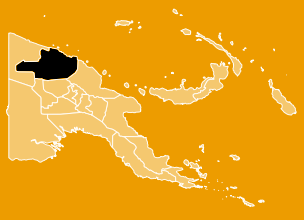
Strengths

- Demand for interoperability
- Some standards are in place to support interoperability
- Interest in research, skills for research exist in health facilities
- Surgical unit at provincial hospital maintains a clinical research database

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
East Sepik Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
703,569[1]	225[1]	1[1]	77%[1]	54%[1]	No	No

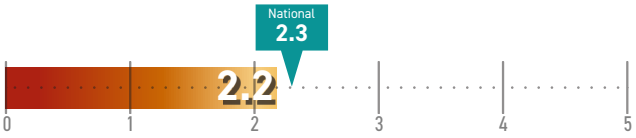
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Public health and disease surveillance	Adverse event reporting	Radiology Info System /Picture Archive Communication System
eNHIS	mSupply	IFMS Alesco Payroll	HPDB e-TB module (in eNHIS) Pediatric Hospital Reporting System	ODK	

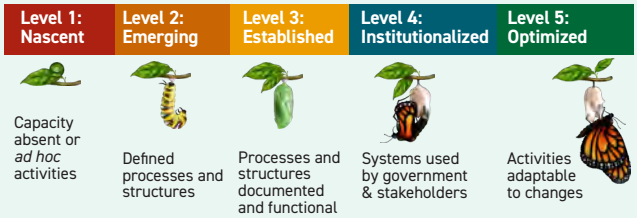
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

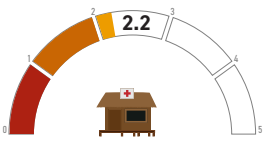


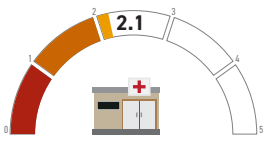
Digital health maturity is emerging, with a lower score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ICT literacy among health workers.

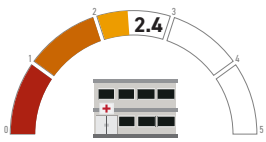
Levels: the transitional states in a maturity model

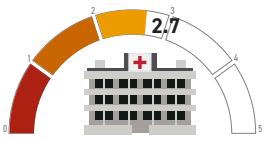


SCORES BY HEALTH FACILITY LEVEL









SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	3.0
Functional hardware	2.2
Data equipment	3.0
Operation & maintenance	1.6
Maintenance capacity	3.1

Human Capacity (HC)

Leadership capacity	2.5
Health workforce	2.1
Pre-workforce development	1.0
Skills development	1.0

Data ecosystem (DE)

Data capturing practices	3.4
Data sources	3.4
Data collected	2.3
Data use	2.1
Data quality & improvement	1.4

Low maturity across all blocks. Deficiencies in human capacity means low adoption & use of technologies and issues with maintenance. Inadequate hardware and connectivity mean that attempts to scale systems without external support will be challenging.

Strengths

- Provincial hospital has LAN network and server on site; picture archive communication system used is hosted at local data centre
- PHA has three IT officers
- Some health facilities have staff with basic-intermediate ICT skills

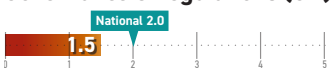
Gaps

- Insufficient staff in health facilities for data entry
- No digital health training
- Limited data use in health facilities, and inconsistent follow-up on quarterly review plans
- Low ICT & digital health literacy
- Aside from eNHIS tablets, outdated hardware in health facilities

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

Governance & regulations (GR)

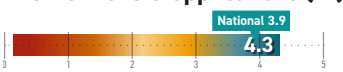


Governance structures	3.5
Stakeholder coordination	3.7
Policies, regulation & compliance	1.2

Strategy & investment (SI)

Digital Health Strategy	2.0
Operationalization	3.0
Short-term funding	1.3
Alternate funding	3.0

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.4
Sustainability	2.0

High maturity for interventions & apps due to nationally scaled eNHIS. No provincial digital health plan or governance body means implementation is not guided by local priorities and oversight is limited.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support
- Few issues and errors are experienced when entering data in information systems

Gaps

- No provincial digital health governance body or investment plan
- Low awareness among of national digital health policies and plans
- Transition plans not in place for deployed technologies
- Data entered in different devices and systems
- Health facility staff not consulted prior to deployment of systems

SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.0
Documents & Processes	1.5
Technical Organization	1.4
Technical Components	2.7

Research & innovation (RI)

Knowledge management (KM)

Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

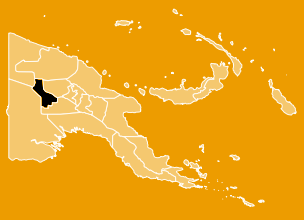
Strengths

- Demand for interoperability
- Some standards are in place to support interoperability
- WhatsApp groups created between PHA and health facilities to facilitate information sharing

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
Hela Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
320,773[1]	150[1]	1[1]	54%[1]	23%[1]	Yes	No

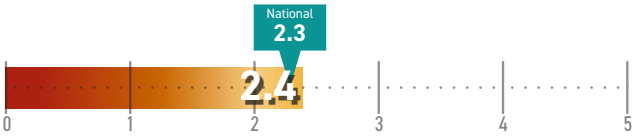
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Public Health and Disease Surveillance	Adverse event reporting
eNHIS	mSupply	Alesco Payroll	HPDB Pediatric Hospital Reporting System	ODK

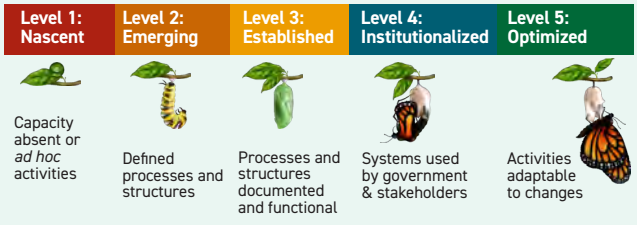
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

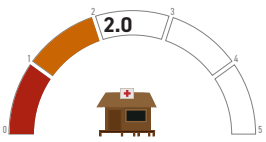


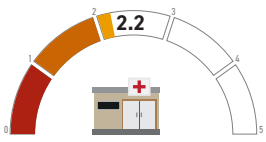
Digital health maturity is emerging, with a slightly higher score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ ICT literacy among health workers.

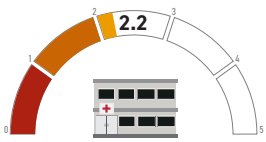
Levels: the transitional states in a maturity model

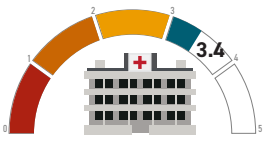


SCORES BY HEALTH FACILITY LEVEL









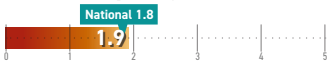
SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	3.1
Functional hardware	2.8
Data equipment	1.5
Operation & maintenance	1.1
Maintenance capacity	3.5

Human Capacity (HC)



Leadership capacity	3.0
Health workforce	2.0
Pre-workforce development	1.0
Skills development	1.5

Data ecosystem (DE)

Data capturing practices	3.1
Data sources	3.9
Data collected	2.6
Data use	2.6
Data quality & improvement	1.9

Higher maturity than the national level for infrastructure and human capacity. Deficiencies in human capacity means low adoption & use of technologies and issues with maintenance. Sustainable scale-up of systems across the province will be challenging.

Strengths

- PHA has an ICT equipment disposal policy and a data recovery plan in place
- PHA has two ICT officers
- Closed user group mobile plans in place to facilitate communication with health facilities
- Some health facilities have staff with basic-intermediate ICT skills
- PHA interest to develop a digital health training plan
- Regular data quality checks are conducted by the PHA/specific programmes

Gaps

- Limited data on deaths in the province
- No digital health training
- Limited data use
- Low ICT & digital health literacy
- Aside from eNHIS tablets, outdated hardware in health facilities
- PHA IT team not involved in providing support for systems deployed in the province

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

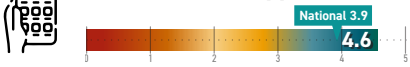
Governance & regulations (GR)

Governance structures	2.5
Stakeholder coordination	3.7
Policies, regulation & compliance	1.3

Strategy & investment (SI)

Digital Health Strategy	3.0
Operationalization	2.6
Short-term funding	2.5
Alternate funding	3.5

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.2
Sustainability	2.0

High maturity for interventions & applications due to nationally scaled eNHIS. Higher maturity for strategy & investment and interventions & applications compared to the national average. No provincial digital health plan or governance body means implementation is not guided by local priorities and oversight is limited.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support
- Digital health activities have been budgeted in provincial implementation plans

Gaps

- No provincial digital health governance body or investment plan
- Low awareness among of national digital health policies and plans
- Transition plans not in place for deployed technologies
- Data entered in different devices and systems

SCORES FOR THE MODIFYING BLOCKS

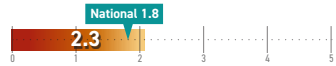
Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.0
Documents & Processes	1.3
Technical Organization	1.2
Technical Components	2.7

Research & innovation (RI)

Knowledge management (KM)



Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

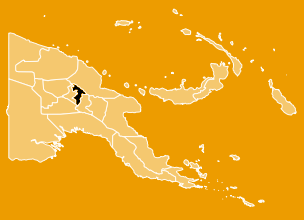
Strengths

- Demand and interest for interoperability
- Some standards are in place to support interoperability
- ICD-10 coding applied to morbidities and mortalities
- Interested in research, skills for research exist in health facilities

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
Jiwaka Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
375,440[1]	82[1]	1[1]	90%[1]	45%[1]	No	No

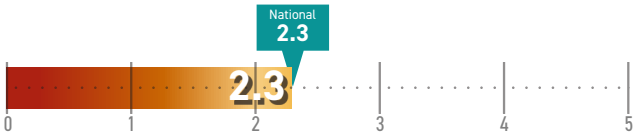
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Public Health and Disease Surveillance	Adverse event reporting	Radiology Info System /Picture Archive Communication System
eNHIS	mSupply	HPDB, e-TB module (in eNHIS)	ODK	

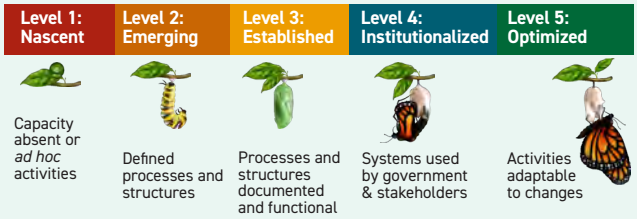
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity



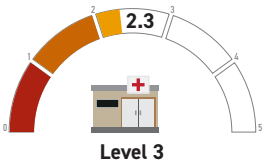
Digital health maturity is emerging, with a score equal to the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ICT literacy among health workers.

Levels: the transitional states in a maturity model

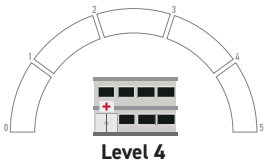


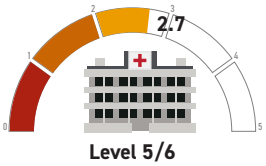
SCORES BY HEALTH FACILITY LEVEL

Level 2



Level 3


Level 4
Not assessed



Level 5/6

SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.4
Functional hardware	3.0
Data equipment	4.0
Operation & maintenance	2.7
Maintenance capacity	3.3

Low maturity across all blocks but scores for infrastructure and human capacity are higher than the national average.. Deficiencies in human capacity means low adoption & use of technologies and issues with maintenance. There will be challenges to sustainably scale systems across the province.

Human Capacity (HC)

Leadership capacity	3.0
Health workforce	2.4
Pre-workforce development	1.0
Skills development	1.5

Strengths
- PHA and some health facilities maintain an ICT asset inventory
- Nazarene Hospital has wifi connectivity
- Catholic Church Health Services assist with maintenance of hardware
- Refresher trainings conducted on data reporting
- Data quality checks done (but often ad-hoc)

Data ecosystem (DE)

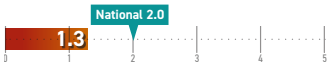
Data capturing practices	3.3
Data sources	4.3
Data collected	2.7
Data use	1.8
Data quality & improvement	2.4

Gaps
- Aside from eNHIS tablets, limited or outdated hardware in health facilities
- PHA has no local area network or server on site
- Limited ICT/digital health training opportunities
- Limited data analysis, middle managers don't have access to data
- Inaccurate population estimates

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

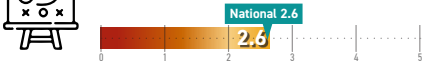
Governance & regulations (GR)



Governance structures	3.5
Stakeholder coordination	3.7
Policies, regulation & compliance	1.0

High maturity for interventions & apps due to nationally scaled eNHIS. No provincial digital health plan or governance body means implementation is not guided by local priorities and oversight is limited.

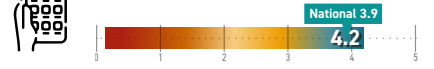
Strategy & investment (SI)



Digital Health Strategy	3.5
Operationalization	2.3
Short-term funding	1.3
Alternate funding	3.5

Strengths
- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support
- ICT activities funded through Corporate Services and Executive Branch

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.2
Sustainability	1.0

Gaps
- No provincial digital health governance body or investment plan
- Low awareness of national digital health policies and plans
- Transition plans not in place for deployed technologies
- Data entered in different devices and systems

SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.3
Documents & Processes	1.5
Technical Organization	1.1
Technical Components	2.4

Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

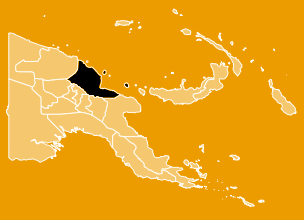
Research & innovation (RI)

Strengths
- Demand for interoperability
- Some standards are in place to support interoperability
- ICD-10 coding applied to morbidities and
- mortalities
- Interested in research, skills for research exist in health facilities
- WhatsApp groups created between PHA and health facilities to facilitate information sharing

Knowledge management (KM)

Gaps
- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
Madang Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
792,362[1]	280[1]	1[1]	58%[1]	38%[1]	No	No

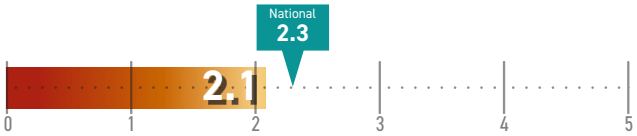
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Public Health and Disease Surveillance	Material/ Asset Mgmt	Radiology Info System/ Picture Archive Communication System
eNHIS	mSupply	IFMS Alesco Payroll	HPDB e-TB module (in eNHIS) Pediatric Hospital Reporting System	Cold Cloud	

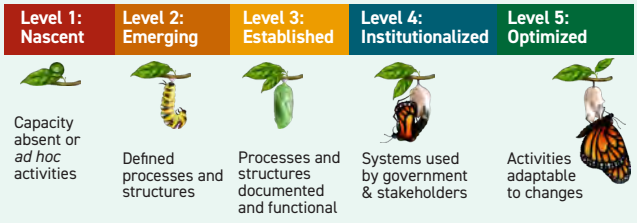
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

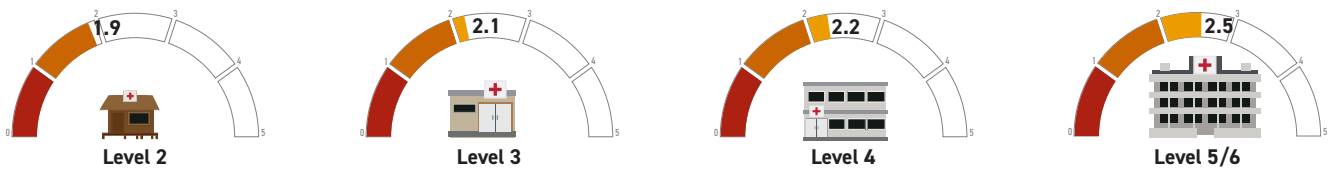


Digital health maturity is emerging, with a lower score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ICT literacy among health workers.

Levels: the transitional states in a maturity model



SCORES BY HEALTH FACILITY LEVEL



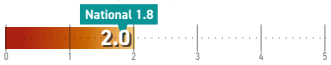
SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.5
Functional hardware	2.6
Data equipment	3.0
Operation & maintenance	1.0
Maintenance capacity	2.6

Human Capacity (HC)



Leadership capacity	2.5
Health workforce	2.0
Pre-workforce development	1.0
Skills development	1.0

Data ecosystem (DE)

Data capturing practices	3.6
Data sources	3.1
Data collected	2.8
Data use	2.3
Data quality & improvement	1.8

Low maturity across all blocks. Deficiencies in human capacity and infrastructure mean low adoption & use of technologies and issues with maintenance. Attempts to sustainably scale systems across the province will be challenging.

Strengths

- Provincial Hospital has servers to store clinical data
- Functional computers available at hospitals and health centres assessed
- Some health facilities have staff with basic-intermediate ICT skills
- Regular data quality checks are conducted by the PHA/specific programmes

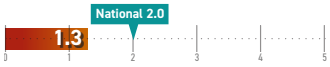
Gaps

- No digital health training
- Limited data use
- Health facilities do not have internet connectivity
- Low ICT & digital health literacy
- No ICT maintenance plans

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

Governance & regulations (GR)

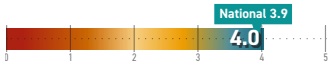


Governance structures	3.8
Stakeholder coordination	3.3
Policies, regulation & compliance	1.0

Strategy & investment (SI)

Digital Health Strategy	3.3
Operationalization	2.5
Short-term funding	1.3
Alternate funding	3.0

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.0
Sustainability	3.0

High maturity for interventions & apps due to nationally scaled eNHIS. No provincial digital health plan or governance body means implementation is not guided by local priorities and oversight is limited.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support
- Few issues and errors are experienced when entering data in information systems

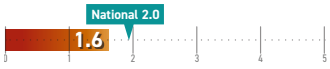
Gaps

- No provincial digital health governance body or investment pla
- Low awareness of national digital health policies and plans
- Technology support dependent on external sources
- Transition plans not in place for deployed technologies
- No specific budget line for ICT/digital health
- Data entered in different devices and systems

SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

Interoperability (IoP)



Leadership & competency	1.0
Documents & Processes	1.0
Technical Organization	1.3
Technical Components	2.6

Research & innovation (RI)

Knowledge management (KM)

Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

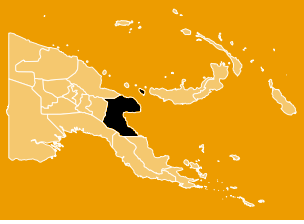
Strengths

- Demand for interoperability
- Some standards are in place to support interoperabilit
- Interested in research, skills for research exist in health facilities
- PHA website development underway
- WhatsApp groups established to share information with health workers

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
Morobe Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
998,835[1]	383[1]	2[1]	76%[1]	59%[1]	No	No

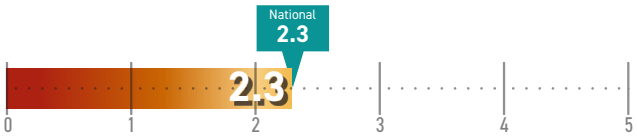
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Public Health and Disease Surveillance	Material/ Asset Mgmt	Adverse event reporting	Radiology Info System /Picture Archive Communication System
eNHIS	mSupply	IFMS Alesco Payroll	HPDB Tupaia (malaria) Pediatric Hospital Reporting System	Cold Cloud KumulSoft/Asset Mgmt	ODK	

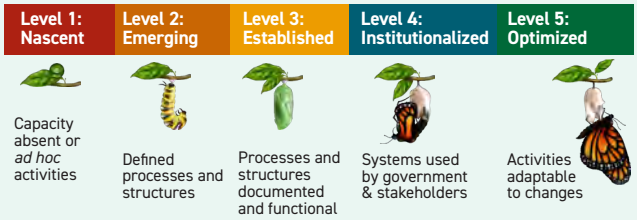
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

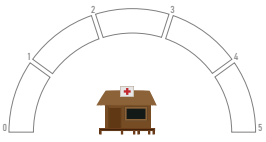


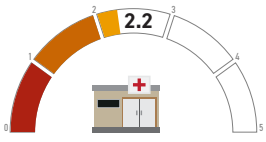
Digital health maturity is emerging, with a maturity score matching the national average. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ ICT literacy among health workers.

Levels: the transitional states in a maturity model

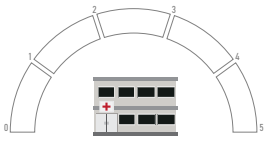


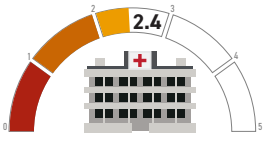
SCORES BY HEALTH FACILITY LEVEL


Level 2
Not assessed



Level 3


Level 4
Not assessed



Level 5/6

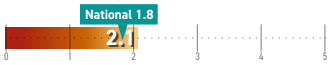
SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	3.0
Functional hardware	2.8
Data equipment	1.5
Operation & maintenance	1.4
Maintenance capacity	2.7

Human Capacity (HC)



Leadership capacity	2.5
Health workforce	2.2
Pre-workforce development	1.0
Skills development	1.0

Data ecosystem (DE)

Data capturing practices	2.0
Data sources	4.6
Data collected	2.6
Data use	2.6
Data quality & improvement	2.5

Low to medium across all blocks. Deficiencies in human capacity means low adoption & use of technologies and issues with maintenance. Sustainable scale-up of systems across the province will be challenging.

Strengths

- PHA has distributed mobile phones to health facilities
- Angau Hospital has internet connectivity and over 50 computers
- ICT training opportunities available in Lae
- Some urban clinics develop annual reports and share with partners
- Regular data quality checks are conducted and PHA provides feedback on reported data

Gaps

- No digital health training plans
- Limited data use
- Low ICT & digital health literacy
- No ICT maintenance plans
- Hospital servers were previously attacked by ransomware

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

Governance & regulations (GR)

Governance structures	1.0
Stakeholder coordination	2.3
Policies, regulation & compliance	1.0

Strategy & investment (SI)

Digital Health Strategy	2.3
Operationalization	3.0
Short-term funding	2.5
Alternate funding	3.0

Interventions & applications (IA)

Use of applications	5.0
Human centred design	4.1
Sustainability	1.0

High maturity for interventions & apps due to nationally scaled eNHIS. No provincial digital health plan or governance body means implementation is not guided by local priorities and oversight is limited.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support
- PHA has plans to establish an ICT Committee
- PHA has established ICT projects which are funded

Gaps

- No provincial digital health governance body or investment plan
- Low awareness of national digital health policies and plans
- Transition plans not in place for deployed technologies
- Data entered in different devices and systems

SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.3
Documents & Processes	1.3
Technical Organization	1.0
Technical Components	3.0

Research & innovation (RI)

Knowledge management (KM)

Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

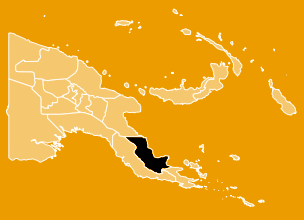
Strengths

- Demand for interoperability
- ICD-10 coding applied to morbidities and mortalities
- Interest in research, skills for research exist in health facilities

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
Oro Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
256,544[1]	104[1]	1[1]	67%[1]	0%[1]	No	No

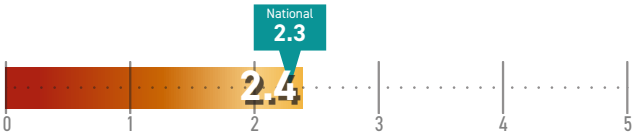
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Public Health and Disease Surveillance	Material/ Asset Mgmt
eNHIS	mSupply	IFMS Alesco Payroll	HPDB Pediatric Hospital Reporting System	Cold Cloud

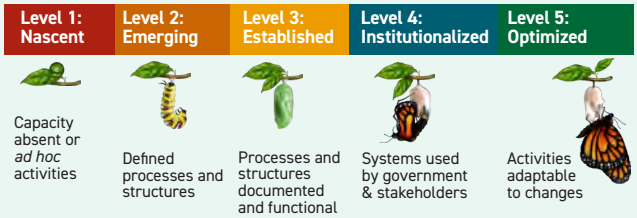
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

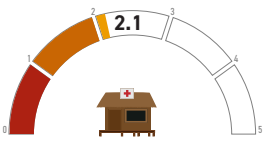


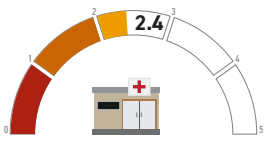
Digital health maturity is emerging, with a slightly higher score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ ICT literacy among health workers.

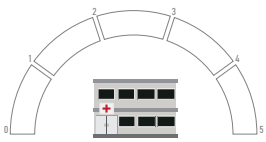
Levels: the transitional states in a maturity model

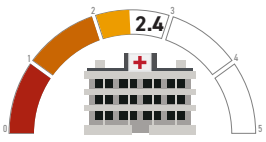


SCORES BY HEALTH FACILITY LEVEL









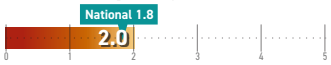
SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	3.5
Functional hardware	2.8
Operation & maintenance	2.7
Maintenance capacity	3.2

Human Capacity (HC)



Leadership capacity	3.0
Health workforce	2.1
Pre-workforce development	1.0
Skills development	1.5

Data ecosystem (DE)

Data capturing practices	3.7
Data sources	3.9
Data collected	3.2
Data use	3.6
Data quality & improvement	2.5

Higher maturity across all blocks compared to the national level, with the lowest maturity seen in human capacity. Deficiencies in human capacity means low adoption & use of technologies and issues with maintenance. Provincial capacity to manage systems will be challenging without improvements in human capacity.

Strengths

- Closed user group mobile phone plans for communication between health facilities
- PHA has plans for servers and local data storage
- Some health facilities have staff with basic-intermediate ICT skills
- PHA interest to develop a digital health training plan
- Regular data quality checks are conducted by the PHA/specific programmes
- Feedback provided by PHA to health facilities on reported data to improve performance

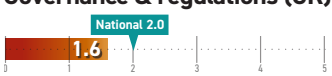
Gaps

- Limited data on deaths in the province
- No digital health training
- Limited data use
- Low ICT & digital health literacy
- Aside from eNHIS tablets, outdated hardware in health facilities
- PHA IT team not involved in providing support for systems deployed in the province

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

Governance & regulations (GR)

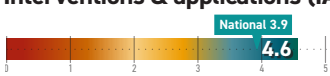


Governance structures	3.5
Stakeholder coordination	3.0
Policies, regulation & compliance	1.2

Strategy & investment (SI)

Digital Health Strategy	
Operationalization	2.3
Short-term funding	2.3
Alternate funding	1.0

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.6
Sustainability	

High maturity for interventions & applications due to nationally scaled eNHIS. No provincial digital health plan or governance body means implementation is not guided by local priorities and oversight is limited.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support

Gaps

- No provincial digital health governance body or investment plan
- Spending on digital health activities done on an ad-hoc basis
- Low awareness among of national digital health policies and plans
- Transition plans not in place for deployed technologies
- No specific budget line for ICT/digital health

SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.0
Documents & Processes	1.3
Technical Organization	1.2
Technical Components	2.7

Research & innovation (RI)

Knowledge management (KM)

Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

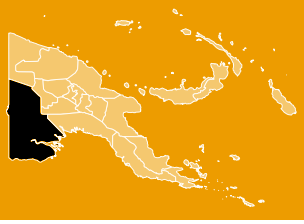
Strengths

- Demand and interest for interoperability
- Some standards are in place to support interoperability
- WhatsApp groups established to share key documents and references with stakeholders in the province

Gaps

- Poor understanding of interoperability
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
Western Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
329,018[1]	195[1]	4[1]	82%[1]	71%[1]	No	No

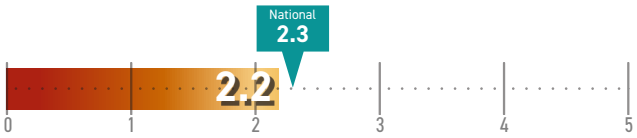
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Public Health and Disease Surveillance	Material/ Asset Mgmt	Adverse event reporting
eNHIS	mSupply	Alesco Payroll	HPDB e-TB module (in eNHIS) Tupaia (malaria) Pediatric Hospital Reporting System	KumulSoft/Asset Mgmt	ODK

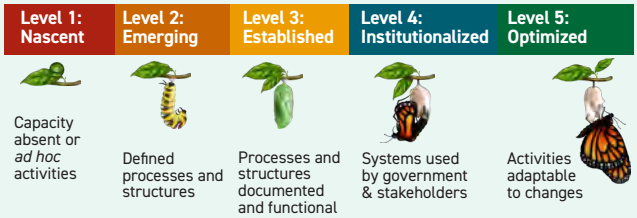
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

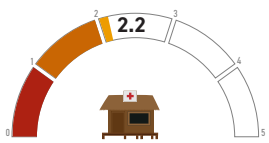


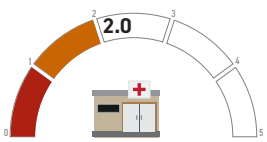
Digital health maturity is emerging, with a lower score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ICT literacy among health workers.

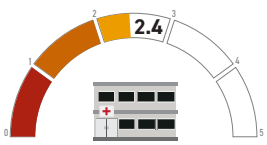
Levels: the transitional states in a maturity model

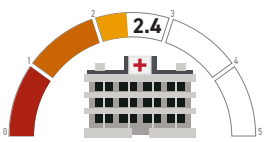


SCORES BY HEALTH FACILITY LEVEL









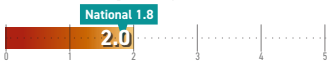
SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.5
Functional hardware	2.6
Data equipment	1.5
Operation & maintenance	1.7
Maintenance capacity	3.1

Human Capacity (HC)



Leadership capacity	2.5
Health workforce	2.1
Pre-workforce development	1.0
Skills development	1.0

Data ecosystem (DE)

Data capturing practices	2.5
Data sources	3.6
Data collected	2.3
Data use	2.0
Data quality & improvement	1.7

Low maturity across all blocks. Deficiencies in human capacity means low adoption & use of technologies and issues with maintenance. Low maturity for data ecosystem means data collection may be burdensome for health workers and doesn't serve planning needs.

Strengths

- PHA keeps an inventory of ICT equipment at PHA and Daru Hospital, and there are plans to develop an asset register
- Funding for ICT equipment received from private partners
- Data quality checks are done
- Private institute in Kiunga offers ICT courses
- Health facilities maintain HR records

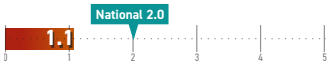
Gaps

- Duplicated patient record
- PHA does not have on-site server
- Aside from eNHIS tablets, outdated hardware and no internet connectivity in lower level health facilities
- Low ICT & digital health literacy in PHA and health facilities
- Challenges with capturing deaths outside of health facilities
- Limited feedback provided on data reported & low data use

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

Governance & regulations (GR)

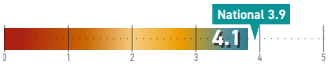


Governance structures	1.0
Stakeholder coordination	2.7
Policies, regulation & compliance	1.0

Strategy & investment (SI)

Digital Health Strategy	2.3
Operationalization	3.0
Short-term funding	1.0
Alternate funding	3.0

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.2
Sustainability	1.0

High maturity for interventions & apps due to nationally scaled eNHIS. No provincial digital health plan or governance body means implementation is not guided by local priorities and oversight is limited.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support
- Few issues and errors are experienced when entering data in information systems

Gaps

- No provincial digital health governance body or investment plan
- Low awareness among of national digital health policies and plans
- Transition plans not in place for deployed technologies
- No specific budget line for ICT/digital health
- Data entered in different devices and systems
- ICT support provided by external sources for the specific systems deployed

SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.0
Documents & Processes	1.2
Technical Organization	1.0
Technical Components	2.9

Research & innovation (RI)

Knowledge management (KM)

Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

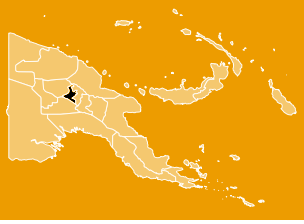
Strengths

- Demand for interoperability
- Some standards are in place to support interoperability
- ICD-10 coding applied to morbidities and mortalities
- Interested in research, skills for research exist in health facilities

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
Western Highlands Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
478,208[1]	99[1]	3[1]	81%[1]	92%[1]	Yes	Yes

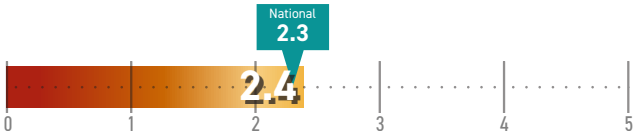
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Public Health and Disease Surveillance	Hospital Mgmt Info System	Material/ Asset Mgmt	Radiology Info System /Picture Archive Communication System
eNHIS	mSupply	Alesco Payroll	HPDB e-TB module (in eNHIS)	ePMRMS	KumulSoft/Asset Mgmt	

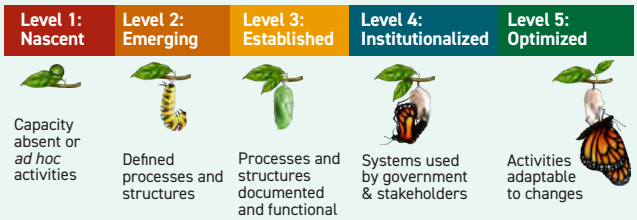
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

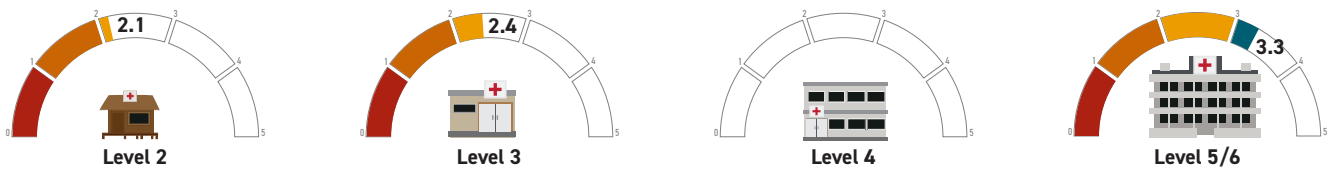


Digital health maturity is emerging, with a slightly higher score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There remain challenges within the province to manage and sustain digital technologies deployed, with low digital health/ ICT literacy among health workers.

Levels: the transitional states in a maturity model



SCORES BY HEALTH FACILITY LEVEL



SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.8
Functional hardware	2.6
Data equipment	3.5
Operation & maintenance	2.3
Maintenance capacity	3.1

Human Capacity (HC)

Leadership capacity	3.5
Health workforce	2.2
Pre-workforce development	1.0
Skills development	1.3

Data ecosystem (DE)

Data capturing practices	3.3
Data sources	3.7
Data collected	2.8
Data use	3.3
Data quality & improvement	2.2

Low maturity across all blocks, with slightly higher maturity for infrastructure and human capacity compared to the national average score. Deficiencies in human capacity means low adoption & use of technologies and issues with maintenance. Scaling systems across the province will be challenging without further investments in infrastructure and human capacity.

Strengths

- PHA ICT team can provide training to new staff at PHA
- Closed user group mobile plans facilitates communication between health facilities
- PHA has video conferencing equipment
- Mount Hagen hospital uses and electronic Patient Medical Record Management System (ePMRMS)
- Some health facilities have staff with basic-intermediate ICT skills

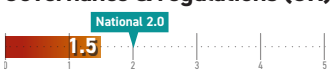
Gaps

- Staff in level 2 and 3 health facilities have limited ICT skills & no digital health literacy, with limited opportunities for training
- Limited or no internet connectivity in level 2 and 3 health facilities
- Aside from eNHIS tablets, outdated hardware in health facilities
- Limited data use in health facilities

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

Governance & regulations (GR)

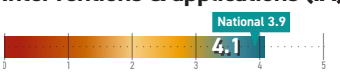


Governance structures	2.8
Stakeholder coordination	3.7
Policies, regulation & compliance	1.3

Strategy & investment (SI)

Digital Health Strategy	3.3
Operationalization	3.6
Short-term funding	2.5
Alternate funding	3.5

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.1
Sustainability	2.0

High maturity for interventions & apps due to nationally scaled eNHIS. There is interest and investment in ICT technologies and digital health. However, the lack of awareness of ICT and digital health plans and policies in health facilities poses challenges for compliance. There is likely to be fragmentation and siloed development of systems.

Strengths

- PHA has an ICT/Digital Health Plan and ICT Coordinating Committee
- PHA allocates funding for ICT/digital health activities
- eNHIS is deemed user friendly and has strong maintenace support
- Few issues and errors are experienced when entering data in information systems
- Electronic Patient Medical Record Management System is being used successfully in Mount Hagen

Gaps

- Low awareness among of national ICT/digital health policies and plans
- Transition plans not in place for deployed technologie
- Data entered in different devices and systems
- Health facility staff not consulted prior to deployment of technologies or engaged during development

SCORES FOR THE MODIFYING BLOCKS

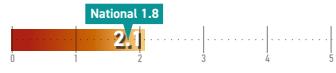
Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.0
Documents & Processes	1.3
Technical Organization	1.8
Technical Components	3.7

Research & innovation (RI)

Knowledge management (KM)



Underdevelopment across all modifying blocks could result in inefficiencies, high costs and minimal service delivery improvements. Systems don't yet exchange data. Digital health implementation is not guided by lessons from past experience.

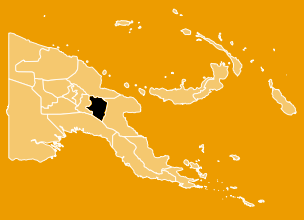
Strengths

- Demand for interoperability
- Some standards are in place to support interoperability
- ICD-10 coding applied to morbidities and mortalities
- Interested in research, skills for research exist in health facilities
- Electronic Patient Medical Record Management System assigns unique patient ID
- Awareness raising of the electronic Patient Medical Record Management System

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
Eastern Highlands Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
769,998[1]	139[1]	1[1]	85%[1]	50%[1]	No	Yes

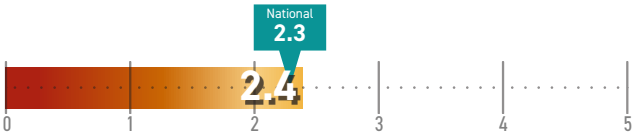
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Material/ Asset Mgmt	Public Health and Disease Surveillance	Lab System	Radiology Info System /Picture Archive Communication System
eNHIS	mSupply	IFMS Alesco Payroll	Cold Cloud	HPDB Pediatric Hospital Reporting System	Senaite	

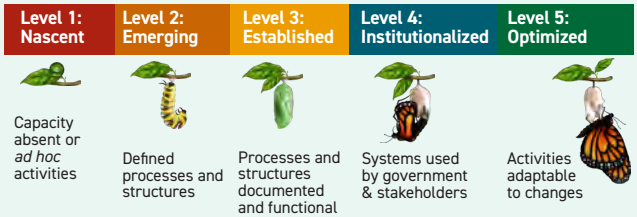
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

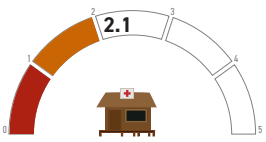


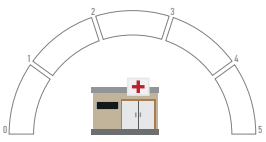
Digital health maturity is emerging, with a slightly higher score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ ICT literacy among health workers.

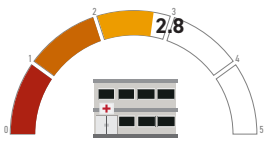
Levels: the transitional states in a maturity model

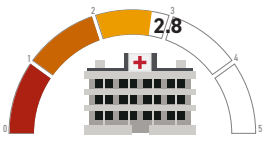


SCORES BY HEALTH FACILITY LEVEL









SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.8
Functional hardware	3.0
Data equipment	4.0
Operation & maintenance	1.9
Maintenance capacity	2.3

Human Capacity (HC)

Leadership capacity	3.0
Health workforce	2.0
Pre-workforce development	1.0
Skills development	1.0

Data ecosystem (DE)

Data capturing practices	3.6
Data sources	4.1
Data collected	3.0
Data use	2.9
Data quality & improvement	2.6

Higher maturity for all blocks compared to national scores, with the lowest for human capacity. Deficiencies in human capacity mean low adoption & use of technologies and issues with maintenance. Sustainable scale-up of systems across the province will be challenging.

Strengths

- Kainantu Hospital has developed a dashboard to present data for decision-making
- Some health facilities have staff with basic-intermediate ICT skills
- Regular data quality checks are conducted by the PHA/specific programmes

Gaps

- Duplicated patient records
- No digital health training
- Limited data use
- Low ICT & digital health literacy
- Aside from eNHIS tablets, outdated hardware in health facilities
- No ICT maintenance plans

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

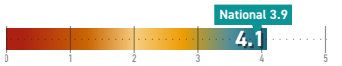
Governance & regulations (GR)

Governance structures	3.5
Stakeholder coordination	3.7
Policies, regulation & compliance	1.0

Strategy & investment (SI)

Digital Health Strategy	3.5
Operationalization	2.3
Short-term funding	2.7
Alternate funding	3.5

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.2
Sustainability	1.0

High maturity for interventions & apps due to nationally scaled eNHIS. No provincial digital health plan means implementation is not guided by local priorities and oversight is limited. Very low awareness of national level policies and plans results presents challenges for compliance.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support
- Few issues and errors are experienced when entering data in information systems

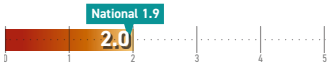
Gaps

- No provincial digital health governance body or investment plan
- Low awareness among of national digital health policies and plans
- Health facility staff not consulted prior to deployment of systems
- No specific budget line for ICT/digital health
- Data entered in different devices and systems
- Technology support for deployed systems is externally sourced

SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

Interoperability (IoP)



Leadership & competency	2.0
Documents & Processes	1.3
Technical Organization	1.6
Technical Components	2.9

Research & innovation (RI)

Knowledge management (KM)

Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

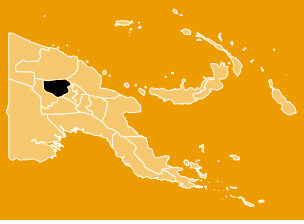
Strengths

- Demand for interoperability
- Some standards are in place to support interoperability
- ICD-10 coding applied to morbidities and mortalities
- Interested in research, skills for research exist in health facilities

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
Enga Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
514,174[1]	184[1]	5[1]	90%[1]	70%[1]	No	No

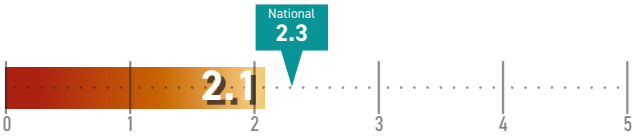
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Hospital Mgmt Info System	Public Health and Disease Surveillance
eNHIS	mSupply	Alesco Payroll	Trias	HPDB Pediatric Hospital Reporting System

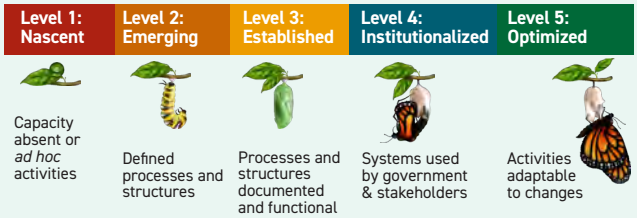
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

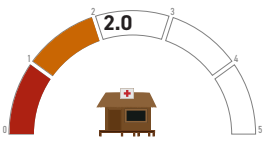


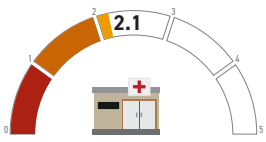
Digital health maturity is emerging, with a lower score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ICT literacy among health workers.

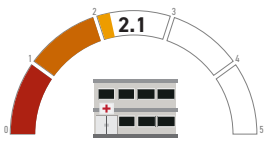
Levels: the transitional states in a maturity model

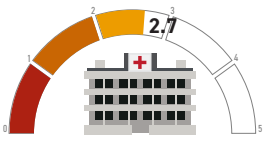


SCORES BY HEALTH FACILITY LEVEL









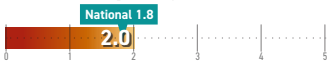
SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.4
Functional hardware	2.5
Data equipment	2.0
Operation & maintenance	1.6
Maintenance capacity	2.6

Human Capacity (HC)



Leadership capacity	1.0
Health workforce	2.2
Pre-workforce development	1.0
Skills development	1.3

Data ecosystem (DE)

Data capturing practices	3.0
Data sources	3.0
Data collected	2.4
Data use	2.8
Data quality & improvement	1.9

Low maturity across all blocks. Deficiencies in human capacity means low adoption & use of technologies and issues with maintenance. Attempts to sustainably scale systems across the province will be challenging.

Strengths

- Provincial Hospital has wifi connection and a server available
- Basic computer training available at TVET school
- Some health facilities have staff with basic ICT skills

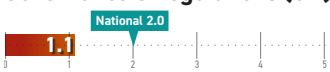
Gaps

- Duplicated patient records
- No digital health training
- Limited data use
- Low ICT & digital health literacy
- Aside from eNHIS tablets, outdated hardware in health facilities
- No ICT maintenance plans

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

Governance & regulations (GR)

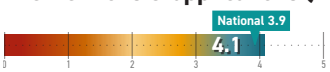


Governance structures	1.3
Stakeholder coordination	2.7
Policies, regulation & compliance	1.0

Strategy & investment (SI)

Digital Health Strategy	2.3
Operationalization	3.7
Short-term funding	1.5
Alternate funding	1.5

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.2
Sustainability	2.0

High maturity for interventions & apps due to nationally scaled eNHIS. No provincial digital health investment plan or governance body means implementation is not guided by local priorities and oversight is limited.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- PHA has developed an ICT plan but it is not yet budgeted
- PHA has an ICT project team
- New hospital has an ICT committee
- eNHIS is deemed user friendly and has strong maintenace support
- Few issues and errors are experienced when entering data in information systems

Gaps

- No provincial digital health governance body or investment plan
- Low awareness of national digital health policies and plans
- Transition plans not in place for deployed technologies
- Data entered in different devices and systems

SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.0
Documents & Processes	1.2
Technical Organization	1.0
Technical Components	1.8

Research & innovation (RI)

Knowledge management (KM)

Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

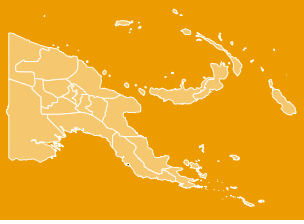
Strengths

- Demand for interoperability
- WhatsApp groups to facilitate information sharing among health workers
- Interest in research, skills for research exist in health facilities

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
National Capital District



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
486,726[1]	27[1]	1[1]	100%[1]	47%[1]	No	No

Sources: 1. eNHIS 2023

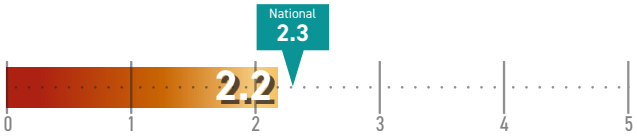
ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Radiology Info System /Picture Archive Communication System	Public Health and Disease Surveillance
eNHIS	mSupply	IFMS		HPDB e-TB module (in eNHIS) Pediatric Hospital Reporting System

Hospital Mgmt Info System	Lab System	Adverse event reporting
Insta	Senaite	ODK

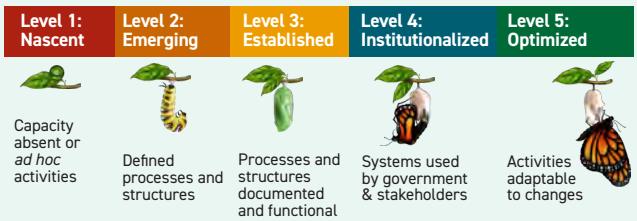
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

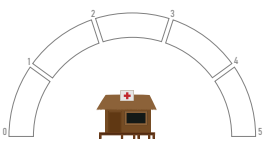


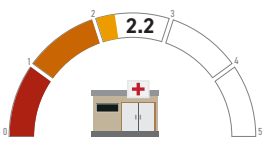
Digital health maturity is emerging, with a lower score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ ICT literacy among health workers.

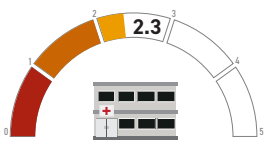
Levels: the transitional states in a maturity model

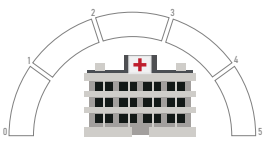


SCORES BY HEALTH FACILITY LEVEL









SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.8
Functional hardware	2.9
Data equipment	2.5
Operation & maintenance	1.6
Maintenance capacity	3.7

Human Capacity (HC)

Leadership capacity	1.0
Health workforce	2.0
Pre-workforce development	1.0
Skills development	1.5

Data ecosystem (DE)

Data capturing practices	2.9
Data sources	3.2
Data collected	3.1
Data use	1.9
Data quality & improvement	1.9

Low maturity across all blocks, but higher maturity than the national average for infrastructure. Deficiencies in human capacity means low adoption & use of technologies and issues with maintenance. Data use is low limiting benefits from collecting data digitally.

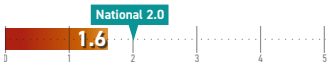
Strengths
- Health facilities have electricity
- Health workforce data are available at the PHA
- Patient files are well maintained at health facilities
- Health facilities have staff with basic-intermediate ICT skills
- Data quality checks done on eNHIS data

Gaps
- Duplicated patient records
- No digital health training
- Limited data use
- Low ICT & digital health literacy
- Aside from eNHIS tablets, outdated hardware in health facilities

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

Governance & regulations (GR)

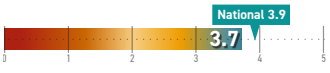


Governance structures	3.8
Stakeholder coordination	3.0
Policies, regulation & compliance	1.0

Strategy & investment (SI)

Digital Health Strategy	3.5
Operationalization	3.0
Short-term funding	
Alternate funding	2.0

Interventions & applications (IA)



Use of applications	5.0
Human centred design	3.7
Sustainability	2.0

High maturity for interventions & applications due to nationally scaled eNHIS. Higher maturity for strategy & investment coapplicationsed to the national average. vNo provincial digital health plan or governance body means implementation is not guided by local priorities and oversight is limited.

Strengths
- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support
- Digital health activities have been budgeted in provincial implementation plans
- Public-private partnerships are in place and has included support for digital health activities

Gaps
- No provincial digital health governance body or investment plan
- Low awareness of national digital health policies and plans
- Transition plans not in place for deployed technologies
- Data entered in different devices and systems

SCORES FOR THE MODIFYING BLOCKS

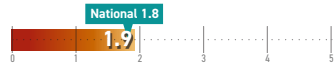
Alter the outcomes or effects of digital health investments

Interoperability (IoP)

Leadership & competency	1.3
Documents & Processes	1.0
Technical Organization	1.0
Technical Components	2.2

Research & innovation (RI)

Knowledge management (KM)

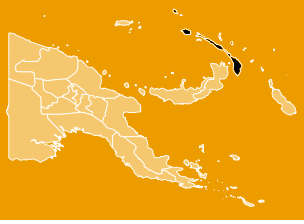


Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

Strengths
- Demand for interoperability
- Some standards are in place to support interoperability
- ICD-10 coding applied to morbidities and mortalities
- Interested in research, skills for research exist in health facilities

Gaps
- Little understanding and skills in interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health

Digital Health Maturity Profile 2023
New Ireland Province



PROVINCE PROFILE

Total population, 2023	# of operational health facilities	# of hospitals	% of health facilities with a power source, 2022	% of health facilities with a radio or telephone, 2022	Provincial digital health/ICT plan	Provincial ICT Committee
231,151[1]	101[1]	2[1]	80%[1]	60%[1]	No	No

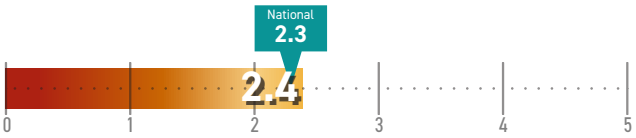
Sources: 1. eNHIS 2023

ELECTRONIC HEALTH INFORMATION SYSTEMS LANDSCAPE

Health Mgmt Info System	Logistics Mgmt Info System	Financial Management	Public Health and Disease Surveillance	Adverse event reporting	Radiology Info System/ Picture Archive Communication System
eNHIS	mSupply	IFMS Alesco Payroll	HPDB Tupaia (malaria) Pediatric Hospital Reporting System	ODK	

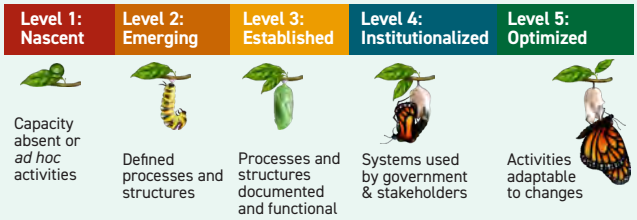
DIGITAL HEALTH MATURITY: OVERALL SCORE

Level 2: Emerging Maturity

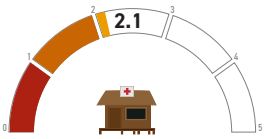


Digital health maturity is emerging, with a slightly higher score than the national score. Digital health applications are problem driven. There is some coordination but no standardization. There is little capacity within the province to manage and sustain digital technologies deployed, with low digital health/ ICT literacy among health workers.

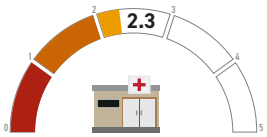
Levels: the transitional states in a maturity model



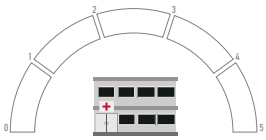
SCORES BY HEALTH FACILITY LEVEL



Level 2



Level 3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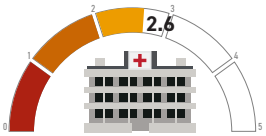


Level 5/6

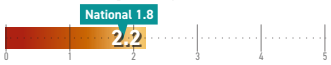
SCORES FOR THE FOUNDATIONAL BLOCKS

Minimum requirements to implement digital technologies

Infrastructure (IF)

Basic utilities	2.5
Functional hardware	2.8
Data equipment	1.5
Operation & maintenance	1.1
Maintenance capacity	3.8

Human Capacity (HC)



Leadership capacity	2.5
Health workforce	2.1
Pre-workforce development	1.0
Skills development	1.0

Data ecosystem (DE)

Data capturing practices	3.1
Data sources	3.7
Data collected	2.9
Data use	2.7
Data quality & improvement	2.0

Low maturity across all blocks. Deficiencies in infrastructure and human capacity mean low adoption & use of technologies and issues with maintenance. Attempts to sustainably scale systems across the province will be challenging.

Strengths

- PHA has plans for cloud storage and on-site server
- Some health facilities have staff with basic-intermediate ICT skills
- Regular data quality checks are conducted by the PHA/specific programmes
- PHA does reviews of financial data and regular updates to HR data

Gaps

- Duplicated patient records
- PHA needs support to develop job descriptions for ICT positions
- Limited data use
- Low ICT & digital health literacy
- Aside from eNHIS tablets, outdated hardware in level 2 and 3 health facilities
- No ICT maintenance plans

SCORES FOR THE CATALYTIC BLOCKS

Accelerate digital health implementation uniformly

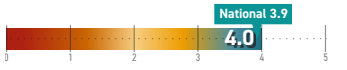
Governance & regulations (GR)

Governance structures	1.5
Stakeholder coordination	2.0
Policies, regulation & compliance	1.0

Strategy & investment (SI)

Digital Health Strategy	1.7
Operationalization	3.3
Short-term funding	2.0
Alternate funding	3.5

Interventions & applications (IA)



Use of applications	5.0
Human centred design	4.1
Sustainability	1.0

High maturity for interventions & apps due to nationally scaled eNHIS. No provincial digital health plan or governance body means implementation is not guided by local priorities and oversight is limited.

Strengths

- PHA ready to follow NDoH digital health policies & plans
- Strong interest in ICT/digital health
- eNHIS is deemed user friendly and has strong maintenace support
- Few issues and errors are experienced when entering data in information systems

Gaps

- No provincial digital health governance body or investment plan
- Low awareness of national digital health policies and plans and governance bodies
- Transition plans not in place for deployed technologies
- No specific budget line for ICT/digital health
- Data entered in different devices and systems

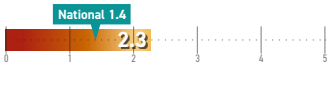
SCORES FOR THE MODIFYING BLOCKS

Alter the outcomes or effects of digital health investments

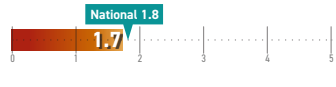
Interoperability (IoP)

Leadership & competency	1.0
Documents & Processes	1.5
Technical Organization	1.0
Technical Components	3.3

Research & innovation (RI)



Knowledge management (KM)



Underdevelopment across all modifying blocks means inefficiencies, high costs and minimal service delivery improvements. Systems don't exchange data. Investments are not aligned with national or provincial priorities. Digital health implementation is not guided by lessons from past experience.

Strengths

- Demand for interoperability
- Some standards are in place to support interoperability
- Interested in research, skills for research exist in health facilities
- PHA website under development

Gaps

- Poor understanding of interoperability
- Limited sharing of data products within the province
- Limited sharing of experience in or lessons learned from implementing digital health technologies
- Limited capacity for research and no research/ evaluations of digital health