

DRAFT

Regional Action Framework on Digital Health in the Western Pacific



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Abbreviations

AI	Artificial intelligence
EHRs	electronic health records
eID	electronic identifiers
ICT	information and communications technology
IT	information technology

Executive summary

Digital health increasingly plays a pivotal role in transforming health and health care. With emerging technologies, digital health has the potential to bridge care gaps, expand access, enable more personalized treatment, eliminate geographic barriers and change behaviours to improve health. The COVID-19 pandemic accelerated the acceptance and adoption of digital health solutions, especially for remote care disease management and surveillance.

This rapid expansion of digital health brought new challenges, particularly in governance, regulation and the ethical use of technology and partnerships. While digital health is developing at an unprecedented scale, its true potential is largely untapped in most settings in the Western Pacific Region. Even where it has been adopted, there is immense scope for strengthening.

The *Regional Action Framework on Digital Health in the Western Pacific* builds on the trends and current status of digital health in the Region to enable Member States to leverage digital health effectively by addressing emerging governance challenges, building people-centric digital health solutions and promoting a more inclusive approach in navigating the rapidly evolving digital health environment.

The Framework also builds on the *Regional Action Agenda on Harnessing e-Health for Improved Health Service Delivery in the Western Pacific*, endorsed by the Regional Committee in 2018. The Framework reflects the rapid and diverse development of digital health in the Region, especially in the context of the COVID-19 pandemic.

Five domains of digital health – namely governance, socio-technical infrastructure, financing and economics, digital health solutions and data – have been prioritized in the Framework. Each domain includes recommendations for essential and desirable actions for Member States and WHO to consider, based on their level of development in digital health. The Framework invites a whole-of-government and whole-of-society approach to stimulate the development of an innovative, people-centric and participatory digital health ecosystem, which delivers value through data and digital solutions to individuals and communities to achieve better access, quality and sustainability of health and health care.

The Framework also promotes the alignment of digital health with the broader digital transformation of societies, and consideration of the long-term impacts of digital health on future generations and the environment. It provides guidance for Member States in developing national digital health plans, while facilitating collaboration with WHO to advance national digital health strategies aligned with country needs and priorities.

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1. Introduction

1.1 Digital health landscape: diversity of challenges and opportunities

Digital health is the use of information and communications technology to manage illnesses and health risks and promote well-being. This includes the practices and know-how associated with the development and use of digital technologies to improve health. Digital health has the potential to drive transformative primary care, radically change health service delivery, support the reform of health systems and reshape the future of health.

Different digital health solutions in the Western Pacific Region are revolutionizing health care. Enhanced telemedicine services in remote settings in Mongolia and Pacific island countries and areas have increased access to specialized health services, negating the need for people to travel long distances and incur high costs. The adoption of electronic health records (EHRs) in countries such as Australia and Japan has improved the accuracy and efficiency of patient care by providing health-care providers with quick access to comprehensive patient histories.

Mobile health apps are becoming increasingly popular in the Region, giving individuals more control of their care through features such as medication reminders, fitness tracking and increased access to health information. Artificial intelligence (AI) and machine learning are being leveraged to make more accurate diagnoses, predict disease outbreaks and monitor public health trends, enabling faster response times and more effective interventions in countries such as China and Singapore. Remote monitoring technologies are enhancing aged care and chronic disease management in the Region, allowing for continuous tracking of vital signs and early detection of potential health issues, thereby reducing hospital admissions and improving quality of life.

While digital health can address disparities and imbalances in social determinants of health, leveraging digital technologies effectively in health necessitates a people-centric, whole-of-government approach that involves entire societies and concerted global and regional effort.

Since the 2018 adoption of the *Regional Action Agenda on Harnessing e-Health for Improved Health Service Delivery in the Western Pacific*,¹ the Western Pacific Region has witnessed rapid and large-scale development of digital health. The use of digital health technologies is growing exponentially, along with an increasing awareness of their potential to build better health systems. Their growth was further propelled by the COVID-19 pandemic, which spurred a demand for digital transformation.

The pandemic increased the adoption and acceptance of digital health systems, changing health-seeking and health-providing behaviours. This was most acutely seen in the areas of remote care and disease management, such as telemedicine, digital surveillance and other solutions to meet patients' needs. However, the rapid expansion of digital health has also brought new challenges, especially in governance, regulation and the ethical use of technology and partnerships.

In 2022, WHO Regional Office for the Western Pacific looked at the state of digital health across the 37 countries and areas of the Region. While reflecting the diversity of challenges and opportunities, the regional assessment showed that much work needs to be done. Countries and areas saw the most progress in governance, standards and interoperability, workforce capacity, and legislation policy and

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compliance. Despite this progress, however, no country showed full adoption and development in these areas. Equity, digital literacy and stakeholder engagement were the least developed, with data often not even available in these areas. The assessment showed the need for concentrated effort in these areas to ensure that digital health serves all and does not expand the health and digital divide. Infrastructure, digital health solutions and financing demonstrated partial adoption across the Region, leaving ample room for growth.

1.2 Continuously evolving digital health ecosystem

The complex and continuously evolving digital health ecosystem requires an understanding and navigation of an expanded set of actors, diverse health-care funding models, multiple layers of market fragmentation, advanced tools and applications, as well as new governance and data challenges. While each country needs to map its ecosystem, key common actors include: standard-development organizations; financers, donors and investors; health professionals; health-care providers; the technology sector including the world's largest information and communications technology (ICT) companies, health ICT companies and the telecommunications industry; pharmaceutical and medical device industries; and civil society and the media, including local communities, individuals as consumers, researchers and educators.

To ensure equity in digital health, engagement with civil society and communities is paramount. This group can be identified as community members, nongovernmental organizations, activists, patient advocacy groups and other stakeholders that collaborate to promote equitable access to digital health tools, address digital divides and inequity, and ensure digital health innovations are implemented ethically and responsibly across the whole of society. A table that illustrates government engagement across the ecosystem actors that can be promoted through different coordination instruments is attached as an appendix.

1.3 Rationale for the Regional Action Framework

Now is the time for countries and areas in the Western Pacific Region to leverage strategically designed digital health to address new trends, topics, future directions and the changing socio-technical landscape in the Region. Countries and areas in the Region should effectively leverage the advancements in digitalization to centre their digital health strategies and priorities on individuals.

A regional approach is crucial in supporting countries and areas to harness digital health not only as an enabler but also as a catalyst for change in health systems and societies, towards a future characterized by people-centric health. A people-centric digital health ecosystem recognizes that well-functioning information technology (IT) infrastructure focuses on the health needs of the individual and is only as effective as the people operating it.

The *Regional Action Framework on Digital Health in the Western Pacific* invites a whole-of-government approach to spur the growth of an innovative and participatory digital health ecosystem, one that targets delivering value through data and digital solutions to individuals and communities to achieve better access, quality and sustainability of health and health care.

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2. Vision, strategic objectives and guiding principles

The vision for digital health in the Western Pacific Region calls for countries and areas to harness digital transformation for people-centric health and health care.

The *Regional Action Framework on Digital Health in the Western Pacific* establishes a cohesive regional way forward to advance digital health by serving two purposes: 1) to guide countries and areas in the Region in developing national digital health plans; and 2) to facilitate collaboration with WHO to advance national digital health strategies aligned with country priorities. This will ensure that the Organization supports strengthening health systems, improving health services and achieving better health outcomes.

The Regional Action Framework takes a people-centric approach to digital health, calling for a collaborative, multisectoral and transdisciplinary approach that accounts for the broader ecosystem in which individuals and institutions operate. Incorporated in this is the need to consider the long-term impact of actions today on future generations and promote individual and community rights to sustainable environments that can support well-being and health. This can be achieved by conceptualizing a desired future and ensuring that present actions are aligned to achieve that vision. Underlying this approach is the fundamental principle of health equity, allowing everyone to reach their full potential for health and well-being.

To facilitate this, the Regional Action Framework has three strategic objectives:

1. Enhanced digital health governance – Promote strong governance and foster a transparent and participatory culture with robust implementation mechanisms.
2. People-centric innovative technology – Drive the adoption and use of technology that is sound, scalable, sustainable and centred on people's needs and preferences.
3. Empowered and included actors – Promote shared ownership by all actors in the digital health ecosystem leading to inclusive transformation.

This Framework is adaptable and flexible. It does not promote a singular path to enabling digital health systems but rather suggests fundamental actions for Member States to consider, based on their level of development in digital health. As such, the guidance offered in the Framework should be considered in conjunction with other relevant frameworks/guidance.

The Regional Action Framework is guided by five principles:

Equity: Building equity as a cornerstone of all digital health interventions requires a participatory and inclusive approach to building and deploying systems and policies in digital health. This should include all actors in the digital health ecosystem, especially misrepresented or under-represented minorities, as well as populations usually are excluded by digital tools and interventions.

Open innovation: An environment of open innovation necessitates co-creation and horizontal partnerships among digital health actors and Member States to optimize digital health capacities, encourage knowledge-sharing, create momentum for change and effectively utilize comparative advantages to multiply the impact of digital health efforts at regional and national levels.

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Accountability: Building accountable digital health systems requires the ability to measure progress, monitor goals and ensure alignment between vision and strategy, set clear progress indicators and identify measures for course correction, if needed. It should contribute to improved health outcomes in a cost- effective manner. Transparency and accountability are critical in leveraging digital health to improve health for all and to promote societal trust.

Pragmatism: A pragmatic approach to digital health means considering future, real-world consequences of interventions. Actions must be grounded in the present-day facts, but also inspire people to think and act today to improve future possibilities. A pragmatic approach is people-centric to maximize the real-world benefits of digital health through multidimensional efforts that centre on local needs and participation.

Sustainability: Building resilient and sustainable health systems requires developing the capacity to respond, adapt and learn from the stresses and shocks that emerge as digital health is planned, implemented and reconfigured. Learning from experience and incorporating these lessons into the planning, funding and organization of future activities can help reinforce resilience.

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3. Action domains and recommendations

The *Regional Action Framework on Digital Health in the Western Pacific* addresses six challenges posed by the emerging socio-technical landscape:

1. The rapid pace of innovation and introduction of new products and applications, which require governments and policy-makers to assess emerging consequences for society at large.
2. Current technologies build on one another, which adds complexity to social and ethical issues that may require policy and regulatory responses.
3. Digital health cuts across multiple sectors and levels of government, increasing the need for organizational interoperability as health systems engage with new stakeholders and institutions.
4. The increasing influence of the technology sector and other private actors is shifting the distribution of power and resources in the health system, requiring governments to consider new measures to safeguard individual, collective and societal interests.
5. The need for the current generation to prioritize its legacy by ensuring it does not jeopardize the health and well-being of future generations, which must be factored into current decision-making.
6. The environmental costs of digital health measures must be calculated and considered in decision-making and planning, and the benefits digital technologies must be deployed to address new climate change-induced public health emergencies.

To address these challenges – and move towards the vision of countries and areas harnessing digital transformation to support the development of people-centric health and health care – the Framework identifies five digital health domains to consider:

1. Governance
2. Socio-technical Infrastructure
3. Financing and Economics
4. Digital Health Solutions
5. Data

While the Digital Health Solutions and Data domains are interdependent, they are treated separately in the Framework to allow a more granular focus, since each of the domains is not only directly related to the individual but also concerns the family and different social and professional groups, as well as the broader society. The remaining three domains – Governance, Financing and Economics, and Socio-technical Infrastructure – aim to capture the essential and desirable conditions required for the whole-of-government to create a thriving digital health ecosystem. Together this creates an ecosystem that can generate the requisite data and digital solutions to address the needs of existing and future health systems to provide high-quality health care. Fig. 1 presents a simple illustration of the Regional Action Framework, with greater detail in Table 1.

Fig. 1. The five domains of the Regional Action Framework on Digital Health in the Western Pacific

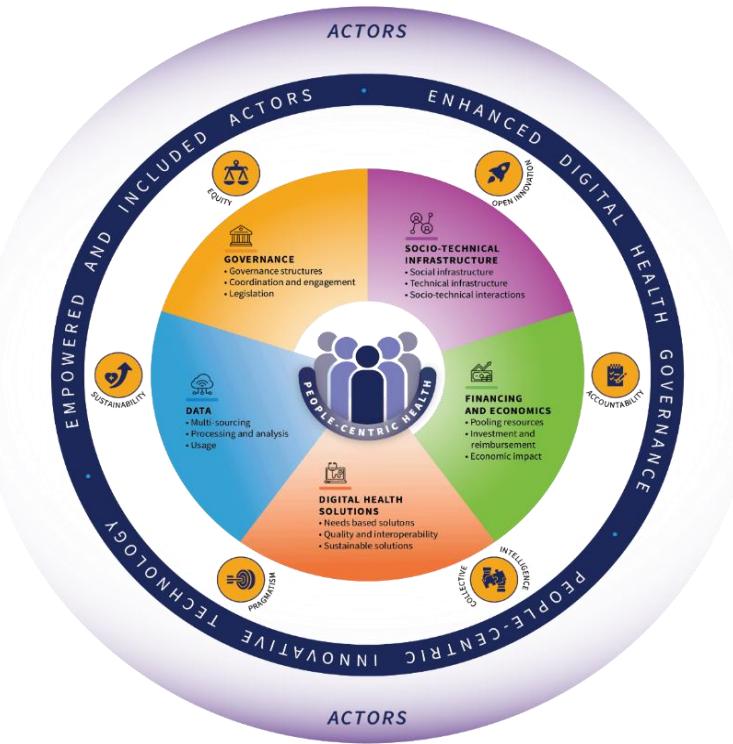


Table 1. The subdomains of the Regional Action Framework on Digital Health in the Western Pacific

<i>Domain</i>	<i>Subdomain</i>
<i>Governance</i>	Governance structures
	Coordination and engagement
	Legislation and other mechanisms
<i>Socio-technical Infrastructure</i>	Social infrastructure
	Technical infrastructure
	Socio-technical interactions
<i>Financing and Economics</i>	Pooling resources
	Investment and reimbursement
	Economic impact
<i>Digital Health Solutions</i>	Need-based solutions
	Quality and interoperability
	Sustainable solutions
<i>Data</i>	Multi-sourcing
	Processing and analysis
	Usage

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3.1 Governance

Digital health governance includes the formal and informal rules, processes and institutions through which public and private actors shape the decisions and expressions of interest on the use of digital technologies for health. Effective governance is crucial for countries to steer digital health towards decisions that benefit future generations by building transformative primary health-care systems and delivering people-centric health care through resilient health systems and communities.

These parameters of governance in digital health should be considered:

- a. Governance structures – the structures that oversee and coordinate governance functions in digital health across public and non-public institutions.
- b. Coordination and engagement – government engagement across the whole of government and the broader digital health ecosystem. This includes fostering new initiatives, coordinating efforts across actors, and promoting partnerships and individual participation to encourage interconnected planning, policy and outcomes.
- c. Legislation and other mechanisms – clear governance mechanisms – such as laws, regulations, policies and guidance – grounded in human rights. These include processes and procedures that protect individual, collective and social interests in digital health and health transformation while providing accountability and generating sustainable societal trust.

3.1.1. Governance structures

Building a thriving digital health ecosystem requires careful consideration of the institutional arrangements that govern all spheres of digital health. These include not just ministries of health but also committees or national agencies that ensure alignment of policies for general health, digital health technologies, societal transformation, industry, education and research, and innovation policies.

A national digital health agency is the foremost structure that advances the digital transformation of health and society. Based on a country's need, this agency may rest under the ministry of health, or a ministry of digital society/digital transformation that is dedicated to national digitalization efforts. The success of such an agency depends on adequate funding and legal, administrative and functional autonomy.

The national digital health agency should consider structured and dedicated resources for data governance. Good data governance that facilitates organizational interconnectedness, interoperability and data-sharing is critical to ensuring better integration of care and other health processes. In addition, an operational unit within the digital health agency that actualizes and operationalizes digital health is paramount. Such a unit would oversee daily activities pertaining to digital health, implementation of digital health programmes, and monitoring and evaluation of digital health interventions and strategies, as well as facilitate collaboration across the digital health ecosystem.

Key to enabling a strategic vision for digital health is the development of a national digital health strategy. This strategy can serve to mobilize stakeholders to co-create a vision and objectives that help focus resources, align activities and build capacity in the health-care system to learn from the past.

3.1.2 Coordination and engagement

Governments play a key role as triggers, facilitators and catalysts of the digital health ecosystem. Well-functioning digital health systems require governments to engage with a range of digital health actors, facilitating individual participation and promoting partnerships, including public–private partnerships. Systematic and well-planned government engagement of all relevant stakeholders enables the development, implementation and realization of a shared digital health vision and strategy at the national level. Consequently, such coordination and engagement with key actors influences areas of primary importance in digital health, including legislation, regulation, policy and process facilitation, feedback-generation and knowledge-sharing.

As a convenor, governments play a critical role in bringing together partners to fund and mobilize resources for digital health and to further digital health-related research and development, such as technical working groups that enable partnerships with external standard-development organizations. This, in turn, facilitates innovation and promotes regulatory compliance and the coordinated delivery of effective solutions. At the regional level, facilitating intra-government cooperation prevents duplication of efforts and harmonizes digital technology standards.

Concrete actions and guidance – such as joint statements, documents, regular policy and technical meetings – facilitate coordination by the ministry of health with the various parts of government to ensure ecosystem engagement and alignment. A table that illustrates government engagement across the ecosystem actors that can be promoted through different coordination instruments is attached as an appendix.

3.1.3 Legislation and other mechanisms

Governance mechanisms in digital health include existing laws and regulations, regulatory and government entities, and several legislative instruments. These mechanisms need to be coherently aligned for the effective, rights-based governance of digital health. Regulatory and government entities, which include courts or procedural processes, aid in the enforcement of rights and obligations in digital health towards building equitable, people-centric health systems. Legislative instruments that cover data protection, commercial activities, health care, cybersecurity and quality assurance for digital solutions are useful for laying the foundations for digital health service design and delivery. The choice of governance mechanisms and instruments to be leveraged varies based on the contexts and resources of countries and areas.

Laws and regulations are crucial for the effective governance of digital health systems. They identify opportunities to remove barriers, encourage and support enablers of digital health, and regularly monitor and adapt technological advances. Effective laws and regulations are those that are tailored to a country's digital health strategy, legal system and existing legal frameworks, sociocultural values, governance arrangements and other related factors. Underlying effective laws that uphold human rights are the ethics of digital transformation in which digitization prioritizes and serves individuals and communities.

Digital health has implications for several areas of law, including data governance and privacy, data sovereignty, cybersecurity, medical device regulation, intellectual property and health professional regulation, as well as medico-legal issues including negligence and consent, contracts, and safety and quality assurance. Simultaneously, governance mechanisms influence all aspects of digital health.

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Legislation and regulation affect digital health financing, solutions, data and infrastructure development. This creates a feedback loop between governance and digital health in which each affects and influences the other. To optimize digital health towards creating an accountable and innovative health system with human rights and equity at its centre, legislation must be balanced against the practical aspects that influence access and adoption of digital health. Table 2 contains recommendations for creating an effective digital health initiative.

Table 2. Recommendations for a successful digital health initiative

ESSENTIAL
Identify a ministry/entity to lead and coordinate a digital health strategy and governance, and other ministries/entities to collaborate.
Identify all actors in digital health from multiple sectors and clarify their roles and responsibilities in digital health.
Create, revise and regularly update a national digital health strategy through a co-creative and inclusive process that engages all actors in the digital health ecosystem.
Develop and/or strengthen digital health governance structures that provide oversight and are accountable, inclusive, pragmatic and rigorous.
Map, create or review existing laws, regulations and/or policies to promote equity and trust and to ensure the safe and appropriate use of digital technologies in health.
Establish clear policies, procedures and/or guidelines for data governance to maintain data quality, integrity and security.
DESIRABLE
Establish feedback mechanisms to regularly identify and reprioritize key issues based on input from multiple actors, which can serve as a basis for formulating and reviewing laws, regulations, policies and governance structures.
Strengthen the governance and regulatory environment to enable effective involvement of the private sector and civil society in digital health in keeping with national policies.
Develop a national regulatory framework for digital health solutions that: 1) promotes standards and mandates conformance to national and international interoperability guidelines; and 2) promotes individual participation in regulatory activity. It should include health technology assessments that evaluate information security, patient safety and value added to public health after solutions have been launched.
Develop standardized processes to ensure seamless exchange of data, which are integrated into health processes.

3.2 Socio-technical infrastructure

People and their beliefs, actions and the digital technologies they use to maintain and improve their health form the interconnected socio-technical infrastructure of digital health. An understanding of the interdependence between the social and technical aspects of digital health is necessary to capture the interdependence between humans and digital health solutions. This is key to the successful adoption and application of technology for the promotion of health, the provision of better care and ultimately towards healthier societies.

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These parameters of socio-technical infrastructure in digital health should be considered:

- a. Social infrastructure – All non-technical social elements, including individuals and communities that represent different roles, cultures, organizations, places and spaces that enable people to connect, create, support and act in a manner that best leverages digital health towards improved health and well-being.
- b. Technical infrastructure – All technical elements underlying digital health technologies and solutions. This includes not only the hardware, networks and communication technologies commonly used by health systems, but also the technical capacity of societies, including an individual's personal infrastructure, such as smartphones and wearable technologies.
- c. Socio-technical interactions – The interconnections between the human workforce and the technical infrastructure of digital health. To effectively leverage digital health across the health workforce and individuals and communities, the technical processes and communication structures must be secure, innovative and centred on the user.

3.2.1 Social infrastructure

Social infrastructure refers to the underlying social and community elements that influence the implementation, adoption and effectiveness of digital health technologies. It encompasses each individual in the health workforce, networks and relationships in the community, culture and behaviours, as well as perceptions, attitudes and skills that shape the environment in which technologies are deployed.

By themselves and as part of their communities, individuals are the users, co-creators and end beneficiaries of digital health. Ensuring digital and digital health literacy and awareness is critical in empowering individuals to trust and effectively use digital health systems.

The understanding and integration of cultural nuances – including individual and community behaviours, attitudes and perceptions – are essential to the design and adoption of inclusive digital health solutions. Public perception, attitudes and acceptance should be recognized to enable equity, accessibility and privacy through digital health.

A digitally transformed health workforce is critical to the success of digital health systems. This includes not just a workforce that is skilled and educated for adequate digital health adoption, but also one that is motivated by innovation, that actively participates in the generation of digital solutions, and that is able to iterate on processes and ways of working as brought on by digital technologies. The ICT workforce that supports digital health tools and solutions development, adoption and sustainability is crucial to the success of digital health. New health tools and solutions call for new skills and professional roles, such as specialists in AI and robotics, experts in bioengineering and digital nanoengineering, and the architects of the Internet of Medical Things. This requires cross-sectoral collaboration with non-health organizations and individuals to improve the digital competency level of health personnel and expand the scope of ICT workforce in the health sector.

To build a digitally savvy society that leverages digital health effectively, a whole-of-government approach that encourages open governance and promotes digital health is needed. This requires dedicated attention to change management, improved communication and the careful use of adequate methodologies.

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3.2.2 Technical infrastructure

The technical infrastructure of digital health includes hardware on shared and individual devices, along with the connecting networks. The connecting networks of digital health systems span multiple technologies from other sectors – telecommunications coverage, Internet availability, online payment services, unique electronic identifiers (eID), open data platforms – and personal computing infrastructure, for example smartphones, smartwatches and other wearables, and remote/home personal and health devices. As a result, the technical infrastructure for health comprises whole-of-digital-society infrastructure.

Individuals and their devices are an integral part of digital health infrastructure. Regulation, education and the proper framing of the increasingly individualistic nature of digital health technical infrastructure ensures personal safety and information security. Addressing disparities in personal infrastructure due to differing socioeconomic backgrounds is critical to addressing equity, transparency and access to digital health solutions.

While building futuristic technical infrastructure, it is important not to overlook classic infrastructure for health information technology. These comprise essential infrastructure, including data storage options (cloud or on-site storage), how much and what hardware to buy, and whether to use wired or wireless technologies to connect at each point of the health system. To be sustainable, this infrastructure should be implemented, secured and sustained technically and financially.

3.2.3 Socio-technical interactions

Recognizing the interconnectedness between technology and the social fabric of communities is critical to effectively leveraging people-centric digital health. Social determinants of health influence the integration of digital health solutions across diverse populations, requiring that the determinants be addressed to ensure that digital health solutions match individual needs and preferences.

Addressing the connections at various levels speaks to different, crucial socio-technical paradigms of a successful digital health system. Customizing technologies to empower individuals ensures that technologies match specific and unique personal health needs and preferences. Engaging communities in the design of technologies ensures that the needs and preferences of diverse populations are met. Aligning cultural and social norms on health to digital health technologies ensures that interventions are accepted and integrated into existing and improved individual health behaviours.

Trust in digital health technologies is closely tied to the enabling social infrastructure and mechanisms. Effective policies, regulations, evidence generation and community-awareness campaigns are essential for ensuring that all actors, including individuals, feel confident in sharing and using digital health solutions and health information.

At the crossroads of technical and social infrastructure is the ICT-related workforce and the health workforce. To effectively capitalize on digital health services, it is critical to have individuals or teams with blended knowledge and skills in health, technologies and organizational models. Fruitful working collaborations between the health and technology workforce are crucial to the success of digital health, and recommendations can be found in Table 3.

Table 3. Recommendations on the socio-technical aspects of a successful digital health initiative

ESSENTIAL
Improve digital health literacy for individuals and communities, along with leadership capacity to engage with digital health initiatives, ensuring transparent dialogue on sensitive topics and building trust.
Identify required digital health skills and have programmes to build sustainable capacity in digital health in the health workforce.
Acquire, retain and upskill an adequate IT workforce through partnerships and promote specialized education in digital health for IT professionals.
Expand Internet access and IT infrastructure in health facilities, homes and communities through joint government efforts and private sector engagement to bridge the digital divide.
Develop adequate, sustainable ICT infrastructure that enables the secure exchange of health data, including standards for enabled electronic health records, health information exchange platforms and key unique electronic identifiers (eID).
Foster a culture of trust and transparency in digital health-related processes and solutions, through community engagement in design and implementation, customizing solutions to align with socio-cultural norms.
DESIRABLE
Define new or revise existing roles, responsibilities and compensation of the health workforce to perform effectively in a digitally transformed, people-centric health system. This includes defining the digital health-related tasks in functional roles.
Prioritize evidence generation by supporting a research and development agenda, along with country sharing on technologies that further interoperability, privacy and security in digital health.

3.3 Financing and Economics

While financing for digital health falls under the broad purview of health financing, investments in digital health require a strategic and unified approach for countries to build people-centric, resilient digital health systems that address current and future health concerns. The government, as the primary coordinator and facilitator of health systems, stands in a unique position to guide the sustainable financing of such integrated digital health systems, both through resourcing and investing in digital health solutions and underlying structures. Simultaneously, digital health is growing quickly and expending tremendous financial resources, promoting economic activity and value, acting as a driver of economic development. As a rapidly growing industry, digital health is generating significant employment opportunities in the Western Pacific Region.

While limited evidence exists on digital health financing, current and future strategic financing for digital health is critical to effectively leverage digital health systems.

These parameters under financing and economics should be considered:

- a. Pooling resources – how societies obtain, pool and channel resources necessary for digital health investments and maintenance.

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- b. Investment and reimbursement – how governments can promote societal investments in digital health, prioritizing core infrastructure and services while drawing on private and innovative financing for advanced digital solutions.
- c. Economic impact – digital health as a part of the health and digital industry that generates employment, has a large growth potential and economic impact and requires cross-governmental synergies.

3.3.1 Pooling resources

Resourcing for digital health calls for a blended finance model in which governments pool resources from several sources. These sources can span the existing health financing system and external sources of funding, based on a country's needs.

Countries that do not rely on external donors for digital health financing typically use a mix of strategies. They allocate funds from national budgets, engage in public–private partnerships, encourage private sector investments and utilize health insurance contributions. Some countries also integrate digital health funding into social health insurance programmes, allocate tax revenues and/or seek philanthropic contributions. The approach varies based on each country's economic structure, health-care system and policy priorities.

Countries that rely on external donors for digital health financing often draw on support provided by international aid agencies, donor organizations and bilateral government arrangements. While this partnership contributes to crucial funding for digital health initiatives, these countries may look for ways to enhance financial sustainability for core and long-term digital health investments. Exploring diverse funding sources, fostering public–private partnerships and developing domestic financing mechanisms can empower these nations to advance and sustain their digital health efforts, fostering resilience and self-sufficiency.

Aligning diverse sources for funding is key to strategically building digital health. Ideally, a coordinating body or implementation unit would refer donors to the national strategy on digital health or to opportunities that support digital transformation in health in a cohesive manner. The Principles of Donor Alignment Funding for Digital Health² offers guidance and explains the necessity of alignment. Donor coordination groups and pooled funding mechanisms can be leveraged to reduce the proliferation of fragmented digital health projects, duplication of resources and data silos.³

3.3.2 Investment and reimbursement

Cohesive and strategic investments into digital health are key to building a sustainable digital health system. A national digital health strategy can be used as guidance to determine investment into digital health. Capital expenditures for digital health should prioritize essential investments to establish, enhance and sustain infrastructure, recognizing the unique needs of both high- and limited-resource countries. In digitally advanced countries, priorities encompass advanced hardware, interoperable systems, innovative technologies such as artificial intelligence and machine learning, robust cybersecurity measures, and establishing research and development initiatives to maintain technological leadership. In less digitally advanced countries, the focus is on building basic digital health infrastructure with basic hardware, affordable servers, network connectivity and power supply solutions adapted to resource constraints.

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Recurring expenditures in digitally advanced countries involve maintaining and upgrading systems, ensuring interoperability, and providing ongoing training and support for health-care professionals. Additionally, investments in data security, privacy measures, and continuous research and development are crucial for staying at the forefront of digital health technology. In less-developed settings, the focus is on cost-effective solutions, including basic infrastructure maintenance, sustainable connectivity and community engagement. Training programmes, especially for community health workers, and affordable data management and storage solutions are prioritized, with an emphasis on mobile health initiatives tailored to limited resources available. Both contexts require continuous evaluation and adaptation to ensure the sustainability and effectiveness of digital health strategies.

Digital health investments require diverse reimbursement approaches, with health ministries establishing criteria for alternative payment models. Prioritizing payments that incentivize improvements in the quality of health over cost-cutting is crucial, considering digital health requires an initial investment before generating any savings. Alternate models, such as reimbursing patients for using digital health applications, allows for flexibility in investments. Governments can opt for various reimbursement archetypes: reimbursing according to the digital health solution's benefits; creating centralized pathways of reimbursements for medical devices or therapeutic functions; or using diverse models across health-care levels. Striking a balance between stability and adjustment is vital for efficient contracts. National directories can guide reimbursement for digital health apps covered by national and state insurance, fostering consensus on reimbursement approaches for core solutions. Pricing negotiations should ideally involve discussions between committees and digital health solution manufacturers, promoting consensus and enabling cross-geographical health-care accessibility.

In addition to disrupting payment models, digital health is disrupting regular procurement processes. Procurement of digital health requires knowledge and skills of both digital health and innovative contracting. Various methods can be used to support the procurement process, such as business cases, social return on investment analysis, societal cost–benefit analysis and cost-effectiveness analysis. Countries should consider supporting such evidence generation as part of the core infrastructure of digital health, one that enables and encourages strategic investments in digital health from a variety of sources.

3.3.3 Economic impact

Digital health is booming, spanning both the public and private sectors across the Western Pacific Region. The industry is an important avenue for employment and income generation. In an effective people-centric health system, its economic potential must be effectively balanced against the public nature of health care, a key area for government action.

As a driver of economic growth, the development and sale of hardware and software products hold profit and economic growth potential in larger and smaller nations alike. Similarly, health data sourcing and sharing among private, public and academic institutions can also hold economic value.

Digital health also enables savings across the health system and broader society. By streamlining operations and increasing the efficiency of health-care processes, digital health tools directly reduce costs and contribute to savings for the health system. By digitizing processes and automating repetitive tasks, health-care systems can save both time and money. However, they also provide significant quality

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and safety benefits, which are meaningful to health-care providers and patients but difficult to quantify in terms of costs.

Economic evaluation frameworks that set standardized analytic principles and evaluate the value proposition of various components of the digital health industry enable the scaling up of effective interventions and industries. The lack of such frameworks can limit decisions on policy, programming and appropriate scale up of digital health interventions⁽⁷⁾ and lead to investments that do not provide the desired health outcomes or financial incentives and rewards. To determine the economic contribution of digital health tools, teams that combine the expertise of ministries of health, science and technology and economics or trade are necessary to provide a strategic, holistic perspective that looks at digital health tools from more than a cost perspective. This implies that accepting an industrial and market enablement stream is a necessary part of an advanced national digital health strategy, while accounting for the risk level associated with different digital health investments.

Table 4 contains recommendations on the economic aspects of a successful digital health initiative.

Table 4. Recommendations on the economic aspects of a successful digital health initiative

ESSENTIAL
Foster cooperation and collaboration between a Member State ministries of health and other relevant ministries to further resource pooling, investment and efforts in maximizing economic impact and nurturing the digital health ecosystem.
Develop a costed blueprint that prioritizes sustainable financing for the core components of digital health and guides implementation priorities.
Map funding resource availability across various actors and ensure national alignment of financing with the national digital health strategy.
Develop and improve financing systems for costing, budgeting and payment of priority digital health interventions through an evidence-informed and whole-of-system approach.
DESIRABLE
Include appropriate cost-effective digital health interventions into the essential service package, while addressing the challenges with quality, financial protection and equity in service access.
Conduct economic evaluations to understand the cost-effectiveness including the broader social impact of solutions with an aim to review the financing of digital health for adequacy, efficiency, equity, sustainability and accountability. This process should consider evidence-based inclusion on the indirect savings accrued by improvements in quality of care, health-care experience and reduced health expenditure and costs.
Facilitate and encourage private investment in digital health that contributes to the achievement of equitable, high-quality and affordable (digital) health-care services.

3.4 Digital Health Solutions

A range of digital tools and applications that enable the digital transformation of health constitute digital health solutions. These solutions serve as a bridge, connecting every facet of health care. Underlying the

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optimization of these solutions and their connectivity potential is the development process and the environment and standards for interoperability. To ensure the adoption and use of solutions by the many actors in the digital health ecosystem, participatory processes that allow for tailoring solutions are critical.

These parameters under Digital Health Solutions should be considered:

- a. Need-based solutions – Prioritize and plan government efforts to address health needs through new and innovative digital health solutions.
- b. Quality and interoperability – Appropriate development, including testing and sandboxing, is key to ensuring adherence to standards and achieving interoperability. It is necessary to establish the conditions, offer guidance and nurture the development of standards-based highly interoperable digital health solutions for quality and interoperable solutions.
- c. Sustainable solutions – Inclusive processes, which represent all actors, are important to ensure the successful rollout of solutions that provide systemic benefits. Solutions should be managed in an appropriate and sustainable manner to ensure system-wide sustainability.

3.4.1 Need-based solutions

Digital health comprises a spectrum of tools and solutions that vary in applicability based on context. Some solutions allow for efficient collection, storage, management and analysis of data, and integrate a wide range of data sources. Solutions such as telehealth and remote monitoring tools can increase access to health services. Some solutions, such as artificial intelligence and so-called Big Data, assist and improve clinical diagnosis and treatment, as well as support rapid population screening and smart governance in health. At the population health level, digital health solutions improve population health management by facilitating the analysis of data to identify health trends, risk factors, and opportunities for interventions and preventive care strategies. Finally, these solutions also provide access to platforms, thereby supporting continuous education and training.

Aligning, planning and prioritizing solutions as part of a national digital health strategy that complements the national health-care strategy is key to choosing sustainable and effective digital health solutions. The first step in building sustainable solutions is setting clear objectives and setting priorities for the development and implementation of core applications. Core applications are those that are fundamental in advancing digital transformation in health and are based on individual, health system and population health needs.

For digital health solutions to effectively serve a population's health needs, solutions must be strategically planned and prioritized based on a country's current and future health priorities and urgent gaps, and on the needs and concerns of health professionals. Solutions should not be based on the latest technology available or market demands.

3.4.2 Quality and interoperability

Ensuring the quality of digital health applications is critical to building a sustainable digital health system. Quality that is guaranteed through standards, testing and quality-assurance processes ensures that applications are reliable, accessible and can be evaluated and scaled.

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Creating testing environments or sandboxes is important in the development of digital health solutions. It allows developers and innovators to run trials of tools and applications in a safe space to confirm their utility and compliance with regulations. Testing helps mitigate the risks of new products and ensures safeguards for digital health tools and applications marketed.

For digital health solutions to be optimized in health systems, they should be interoperable. Interoperability enables seamless exchange, improved data integration and better use of health data between different systems, applications and stakeholders. To enable interoperability, formally adopted standards consisting of established criteria, guidelines or specifications that help promote interoperability, quality assurance, patient safety and privacy, data security, innovation and regulatory conformance are imperative. Open-source standards for data collection and exchange help support open-source products that allow for greater interoperability. Supporting such an open-source environment for development promotes reutilization of development tools and digital products, allowing for a more cost-effective approach to solution development.

3.4.3 Sustainable solutions

Sustainable digital health solutions are those that address both current and future health needs. Ensuring the sustainability of digital health solutions requires user acceptance, universal access and scalability to be cornerstones of the implementation and rollout of solutions. Sustainable and scalable solutions are important contributors for cost-efficiency and savings in health systems.

Digital health plans should include a sustainability vision for digital health solutions. This vision should regularly evaluate the alignment of solutions with a country's digital health and national health plans, with a focus on updating and revising applications and tools, and guiding the replacement and phasing out of solutions that are no longer relevant or do not ensure equitable access.

To ensure the long-term sustainability of digital health, solutions should be flexible, so that innovation can be iterated into the management cycle of solutions. Using evidence-based practices in the development and evaluation of solutions, and securing sustained, long-term funding based on the impact on health outcomes ensures the longevity of solutions that address present and future health needs.

The identification and development of technology, tools, applications and solutions should also support gender equality, equity and human rights. Such an approach ensures that digital health solutions serve the needs of all communities and do not exacerbate existing biases and issues of health-care access.

Table 5 provides recommendations for a sustainable digital health initiative.

Table 5. Recommendations on the sustainability of a successful digital health initiative

ESSENTIAL
Prioritize development and revision, including funding and policy attention, of digital health solutions that have been prioritized and are fundamental in the national digital health strategy.
Ensure that solutions are aligned with the latest national health strategies, including national digital health strategy, and the national digital strategy.
Ensure participation of users as co-creators in the early stage of design and development, and in the implementation of digital health solutions.
Prioritize interoperability and data security by adopting health-care and digital health standards, preferably existing internationally recognized standards, and develop clear guidelines on technical specifications, data formats and communication protocols.
Promote the use of digital public goods, when appropriate, to help achieve health for all.
DESIRABLE
Promote and participate in collaborative networks to jointly develop and adopt global knowledge products and solutions for digital health, including creation and adoption of digital public goods.
Ensure an open innovation approach that fosters a creative, flexible and collaborative environment that incentivizes the development, implementation and use of digital health solutions.

3.5 Data

Digital health has brought on significant changes in data capture, processing, analysis and use. The changes have resulted from the proliferation of real-time, multi-source data from health systems, relevant non-health areas, and individual wearables and remote tools. This evolution demands advanced storage and processing capabilities, as well as standardized data formats and mechanisms for seamless data exchange. Data quality control across the whole data life cycle is important to ensure trust in digital technologies while guaranteeing performance. New, integrated and advanced analysis techniques using machine learning, AI and predictive analytics should be leveraged where applicable. Data privacy and security backed by ethical considerations and stringent regulations are crucial. Furthermore, health data usage by individuals, front-line implementors, societies and institutions, and decision-makers is critical to effectively leverage data generated by digital health systems.

These three mutually reinforcing and complementary parameters should be considered for data to play a transformative role within digital health systems:

- a. Multi-sourcing – Data relevant to people-centric health is now immense and originates from multiple sources in different formats beyond just the health sector. It also includes data that is captured directly from individuals through wearables and reported by people themselves.
- b. Processing and analysis – Quality control of the data management life cycle is key to fluid data flows and Big Data pooling, enabling data analysis for multiple purposes. Simultaneously, data generation and processing form a feedback loop with digital solutions in which each can be improved by the other.

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- c. Usage – Relates to how individuals, health-care providers, decision-makers and other players can use data better, which in turn promotes further advances in digital health adoption. This includes encouraging and supporting the use of health data at individual, national and international levels.

3.5.1 Multi-sourcing

Data in digital health is marked by new, increased and diverse sources. Traditional health data, such as electronic health records, are complemented by a wealth of non-health data. Information from social media, environmental sensors, population mobilization and demographic databases contribute to a more comprehensive understanding of individual and population health. Real-time data streams, emphasizing continuous monitoring, extend beyond clinical parameters to encompass broader aspects of daily life, fostering a holistic view of health.

Individual empowerment and trust in digital health systems promotes the active contribution and management of both health and non-health data by individuals. This active engagement leads to a more informed and engaged population, influencing the landscape of available health and non-health data sourcing, exchange and sharing. This can be further improved through mechanisms and processes that prevent data abuse, ensure security and address privacy concerns.

3.5.2 Processing and analysis

The data life cycle includes the collection, storage, processing and analysis of data. While digital health generates more data from diverse sources, it enables newer, faster and enhanced means to collect this data. This, in turn, requires enhanced storage, processing and analysis techniques, which further contribute to data collection, thereby closing the life-cycle loop. Data quality across its life cycle contributes to the reliability, accuracy and completeness of data, directly impacting the performance, effectiveness and safety of digital health technologies. Robust quality-control measures are vital to address inaccuracies and biases and ensure the integrity of health information. Inaccurate or incomplete data can lead to flawed clinical insights that impact treatment decisions or even health outcomes. As technologies advance and ethical standards evolve, stringent quality-control practices are essential for safeguarding patient confidentiality and privacy.

Adequate data storage solutions are essential to accommodate the vast volumes of diverse health-related data generated. Real-time data processing^{*} that transforms raw data to a usable format is critical to data being leveraged by all actors in the digital health ecosystem. Digital solutions, such as cloud-based storage platforms and automated data-cleaning algorithms, offer scalable and streamlined approaches for better data processing.

A people-centric health approach requires advanced data analysis methodologies and a flexible algorithm set-up that allows for customization. The new frontier for data analysis in digital health goes beyond the conventional examination of medical health records. It involves the integration of lifestyle choices, behavioural patterns and the social determinants of health. This enables better health interventions and promotion, along with enhanced predictions of health risks and potential outcomes.

* Data processing comprises data entry, cleaning, validation, verification and transformation to make data more clear, accurate, usable and useful, according to the WHO *Data Management Competency Framework*.

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AI, machine learning and other advanced digital solutions can support advanced data analysis, but also require improved capacities to harness these tools while building on existing capacities and data analysis tools.

3.5.3 Usage

Individuals can actively participate in their health and care decision-making by harnessing the diverse and real-time health data available to them. Individuals can optimize the use of health data in their daily lives through wearable devices, health apps and personal health records. These technologies empower individuals to track various health metrics, monitor chronic conditions and set fitness goals, fostering a proactive approach to well-being.

Health workers can optimize their routine work by harnessing health data through digital solutions. Electronic health records offer comprehensive patient insights, aiding informed clinical decisions. Integration of health information systems facilitates seamless data exchange for coordinated care, while analytics tools identify trends and risks, enabling proactive interventions. Remote monitoring and telehealth solutions enhance real-time patient monitoring and follow-up care. Embracing digital platforms streamlines administrative tasks and communication, promoting people-centred and efficient health-care services.

Decision-makers at various levels of health facilities and government agencies can make more informed and strategic decisions by optimizing their use of digital health data. Non-health sectors that support digital health stand to gain significantly by incorporating health data into routine work. The integration of health data across these decision-making levels and non-health sector collaboration can lead to a more interconnected and coherent approach to societal well-being, fostering innovation and improved quality of life and health.

Table 6 includes recommendations for proper data handling in a successful digital health initiative.

Table 6. Recommendations on data handling in a successful digital health initiative

ESSENTIAL
Designate an entity responsible for data access, security and quality control across various levels of the health system, including cross-border exchanges.
Develop a reliable health data catalogue from health and non-health sources to establish data as a public good and promote the ethical standards for data use. Develop mechanisms for sourcing and integrating data, such as data-sharing arrangements.
Define roles, responsibilities and requisite competencies of the health and public health-related ICT workforce with regard to data generation, processing, analysis and utilization. At the institutional level, capacity-building should be informed by a data management competency plan.
Ensure compliance with data governance mechanisms for data quality, integrity, security and confidentiality. This includes conducting data audits, defining levels of data access and sharing data through standards-based digital health solutions and architecture.
Leverage selected technologies and solutions that optimize for better, faster, more reliable and secure use of data in decision-making for health delivery and promotion and to improve the health system.

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DESIRABLE
Develop capacity and policies to leverage technologies for Big Data analyses, including advanced algorithms, machine learning, AI and smart computations.
Build an environment of trust that enables health data-sharing through government policy, such as certification programmes, and digital identification, authentication and authorization mechanisms.
Promote the ethical use of data, including consent management, anonymization, privacy- preserving technologies and methodologies, and transparency in data practices, including explainable AI methodologies that increase trust in advanced technologies.

4. Monitoring and evaluation

This Regional Action Framework clearly outlines recommendations for all countries and areas in the Western Pacific Region and the WHO Secretariat to further advance the digital transformation in health. A set of clear indicators, measurement mechanisms, and tools and platforms are required to systematically measure the progress of the Region's 37 countries and areas and to evaluate the role of the Secretariat in its support function.

- *Monitoring progress of digital transformation of countries and areas in the Western Pacific Region:* Tools and platforms that track a formally adopted set of indicators are encouraged for countries and areas to systematically monitor national progress. While tools and platforms to track national progress have emerged, those that align with internationally recognized indicators are recommended.
- *Monitoring and evaluation plan for the Regional Action Framework:* A robust monitoring-and-evaluation mechanism would help assess the effectiveness of the Regional Action Framework, identify areas for improvement and ensure that the Framework meets its goals and objectives. This plan would be developed and implemented in consultation with Member States and include a value-measurement model to measure progress against recommendations. (The monitoring-and-evaluation plan would be jointly developed in Member State consultations.)

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Appendix. Examples of how governments can engage with various digital health ecosystem actors

Actor	Modes of government engagement with each actor
Standard development organizations	<p>Contribute technical knowledge from public administration and identify interoperability and other standard needs.</p> <p>Align strategy, regulatory and operational activity to the most advanced digital health standards, promoting national Standard-development organizations activities aligned with international communities.</p>
Financers/donors/investors	<p>Ease bureaucracy, while establishing transparent rules for investing, financing, financial partnerships, donor funding – even in non-public contexts – to avoid corruption, market distortion, unbalanced development and non-interoperable solutions.</p> <p>Ensure sustained investments in the fundamental components of digital health such as infrastructure, connectivity and security.</p>
Health professionals	<p>Invite for strategic planning in areas such as telehealth, AI-based clinical decision support and large data-enabled clinical research.</p> <p>Stimulate discussions and capacity-building towards innovative nursing and other medical professional practices.</p> <p>Workforce capacity-building and job transformation initiatives need to be ensured through orchestrated national and instructional efforts.</p> <p>Establish and capacitate new roles such as chief medical nursing or pharmacist officer.</p>
Health-care providers	<p>Coordinate strategic digital health intervention investments and incentives.</p> <p>Provide education, increase awareness-raising activities and share best practices in four key areas: procurement, interoperability, cybersecurity leadership and innovation.</p> <p>Auditing, inspection and capacity-building efforts should ensure unmet needs are identified and there is a plan to mitigate and solve them before the installation of digital health solutions.</p> <p>Promote collaboration among health-care providers for digital-based integrative care and between health-care providers and technology companies as this is crucial for integrating digital health solutions into existing health-care workflows.</p>
Technology sector and communications industry	<p>Establish clear rules, specifications and other operational requirements, along with fair, fast and transparent public procurement.</p> <p>Promote capacity-building, including sponsorship of joint initiatives, for example “connectathons”, to equip industry with the requisite knowledge and skills to create and maintain interoperable systems.</p> <p>Advocate for reforms to tariffs to ensure access to connectivity as one of the tenets of equity in digital health.</p>

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	Explore innovative ways to leverage connectivity for advanced telehealth solutions.
Pharmaceutical and device industry	Ensure companies in these industries have regulated access to health data they need to develop new products and services, while also using health data to regulate and conduct post-market surveillance services for safety, effectiveness, and cost.
Civil society	Create opportunities for discourse, learning, strategic discussions and feedback on new regulation and services.
	Establish public–private partnerships, transparency and security processes, and funding for civil society digital health promotion, advocacy, education, literacy and oversight activities.
	Collect feedback from health-care professionals and industry, including underprivileged and marginalized people, to ensure the effectiveness and efficiency of digital health installation.
	Involve patient and advocacy groups in the development and deployment of digital health solutions and solicit patient feedback and co-creation in developing solutions.
	Engage in digital health literacy efforts and digital inclusion programmes in geographies where needed
Media	Use media (innovatively) to create channels for disseminating messages regarding digital health and to counter disinformation and misinformation.
	Engage media in digital, health and digital health literacy efforts.
Researchers	Invest in research with public institutions, advance grants, and support translational and entrepreneurial programs
	Sponsor innovative consortiums of researchers and other actors to tackle difficult challenges in digital health, aligned with digital strategies and with an international and regional outlook.
	Involve research centres and medical scientific communities to identify data and digital tool needs, creating data spaces that enable advanced data-intensive medical science.
Education and training	Contribute to assess health and IT workforce training and education needs, and define educational frameworks by adopting and adapting from internationally recognized guidance materials.

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