Set of Maturity Model Basic Recommendations: Information Systems for Health

|DIGITAL TRANSFORMATION TOOLKIT

TECHNICAL TOOLS

9

PAHO

Pan American Health Organization

World Health Organization

REGIONAL OFFICE FOR THE **Americas**

Information Systems for Health Toolkit

Set of Maturity Model Basic Recommendations: Information Systems for Health
IS4H‑MMBR 1.0

Acknowledgments

Department of Evidence and Intelligence for Action in Health
Pan American Health Organization - World Health Organization

Set of IS4H MM basic recommendations

From level 1 to Level 2

Data Management and Information Technologies (DMIT)

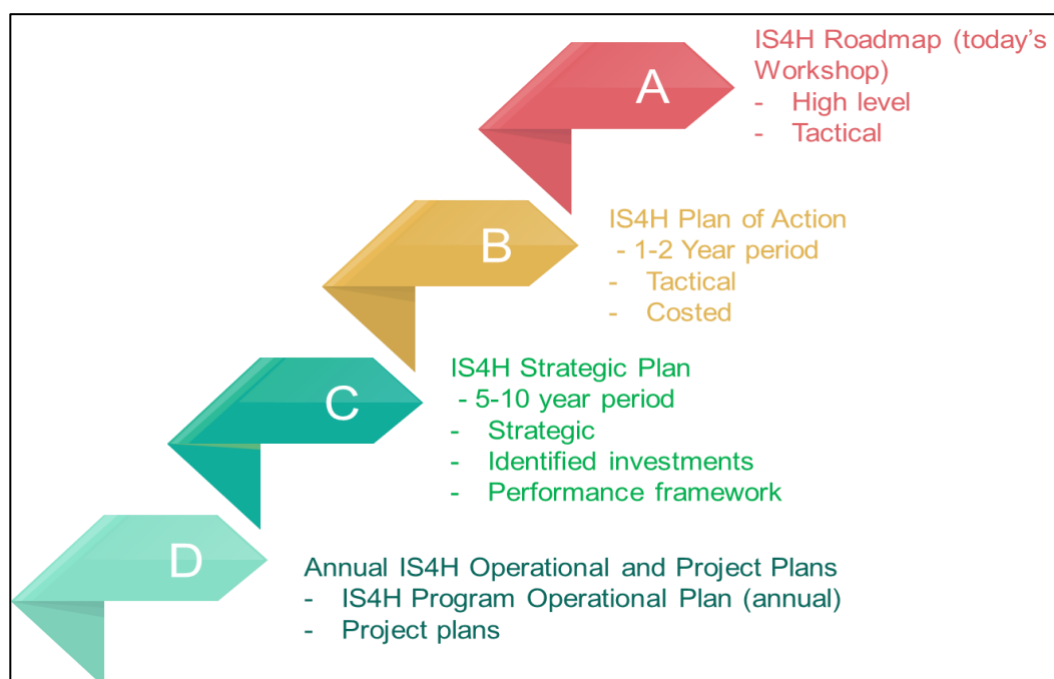| Component	Recommendations

DATA SOURCES	• Identify key health data sources from which is critical to obtain routine data and information, this must include:
	  ○ New data sources
	  ○ Data sources randomly collected
	  ○ Data sources routinely collected
	• Document and mandate standards for indicator definitions and key data elements.

INFORMATION PRODUCTS	• Develop the conceptual architecture for a national health information exchange platform.
	  ○ Business architecture (roles, responsibilities and functions)
	  ○ Define the electronic collection method from all data sources identified
	  ○ Strengthen data collection through automated process
	  ○ Conduct data prioritization and mapping exercise
	• Identify and prioritize information requirements (health indicators; health system performance indicators)
	  ○ Include information reporting requirements (indicators, data sets) in Service Level Agreements (e.g. hospital, NGOs, etc.).
	• Start the development of a data sharing framework (what information is shared? with whom? Under which agreements or authority?).
	  ○ Establish a data flow map for starting sharing information products with stakeholders and health facilities

IT INFRASTRUCTURE	• Conduct an ICT in health readiness assessment for the Ministry of Health and the health facilities of key delivery partners • Initiate a rapid high-level due diligence assessment of National Information Health System (with regions) to determine a possible integral implementation
DATA GOVERNANCE	• Start the development of a Data governance framework (see IS4H Governance Framework). ○ Map present and future data flows • Start the development of a national data management policy.

STANDARDS FOR QUALITY AND INTEROPERABILITY	• Adopt a data quality framework.

Management and Governance (MAGO)

LEADERSHIP AND COORDINATION	• Start the establishment of a formal multi-sectoral IS4H Strategic Governance and Technical Advisory Structure. o Identify the key individual national health authorities (MOH, reginal health authorities, health facilities) o Identify the key decisions that need to be coordinated by the IS4H Strategic Governance and Technical Advisory Structure.
STRATEGIC AND OPERATIONAL PLANS	• Use the recommendation from this assessment to develop a National IS4H Plan of Action with short to medium-term costing and resource requirements: o Create Roadmap & Budget to achieve IS4H Future State o Identify National Health System Strategic Plans in which IS4H could be addressed o Identify individual units/departments/facilities operational plans where to include components of IS4H o Develop a roadmap for addressing IS4H into National and individual operational and strategic plans
ORGANISATIONAL STRUCTURE AND FUNCTIONS	• Start a process for rationalizing accountability, roles and responsibilities for IS4H functions o Identify actual IS4H-related functions performing through the PAHO IS4H Functional Assessment Tool and Methodology. o Identify critical needs/gaps on IS4H implementation-related functions o Develop a roadmap for capacity building / realignment to rationalize functions and decision-making o Appoint IS4H Program Lead and short-term project team. o Define organizational functions for o Information Technology Management o Information Management and Analysis o Health Informatics o Knowledge and Performance Management

	o Conduct IS4H Functional Assessment in order to identify essential IS4H functions that must be performed in the country • Invest in technical support for the development and implementation of a change management strategy in support of IS4H capacity building.
HUMAN RESOURCES	• Develop a medium to long-term organizational structure and human resource strategy o Identify/document human resource constraints for planning, implementing, and managing IS4H through applying the PAHO IS4H Functional Assessment Methodology. o Develop a roadmap for addressing Human Resources IS4H needsEstablish with adequate stakeholders a strategic plan for ensure the existence of academic undergraduate education capacity in country. o Add change management and project management skills/functions to IS4H implementation team (short-term) and program team (longer-term)
FINANTIAL RESOURCES	• Identify the IS4H activities from in individual unit/program that need to be incorporated annual budgets of national health authorities. • Identify the financial resources requirements to effectively sustain IS4H with the correspondent operational budget where to be included
MULTISECTORAL COLLABORATION	• Start a process of enabling multisectoral collaboration for IS4H o Identify other public sector stakeholder that are key for specific health information and service needs. o Develop engagement activities to enable collaboration among sectors o Develop a roadmap for multisectoral collaboration establishment.
LEGISLATION POLICY AND COMPLIANCE	• Conduct analysis and remediate gaps in legal/regulatory framework focusing on: o Protection of personal health information (privacy) o Mandatory reportable diseases and conditions
NATIONAL AND INTERNATIONAL AGREEMENTS	• Create a health agreements commission to start the process of accomplishment of national and international health agreements

	• Identify National and International health agreements actually in place
	• Identify National and International health agreements that are not being addressed
	• Identify individual unit/program that should be involved with the in place and future agreements.
	• Develop a road map for addressing in place a future agreements needs

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- IS4H Strategic Plan Development Approach

Knowledge Management and Sharing (KMSH)

KNOWLEDGE PROCESSES	• Implement basic knowledge management mechanisms within MOH to initiate knowledge sharing (e.g. lessons learned, communities of practices). o Identify, based on knowledge management needs, which existent methodologies would be integrated for knowledge management and sharing
KNOWLEDGE ARCHITECTURE	• Start implementing organizational learning culture

	o Identify individual unit/program that could be KM champions among the organization o Develop a road map to be a learning organization
NETWORKS	• Identify and participate in regional and sub-regional IS4H communities of practice (e.g. RELACSIS, IS4H Technical Advisory Group).
ACADEMIA/SCIENTIFIC COMMUNITY	• Identify and establish a road map for the establishment of formal national, regional and sub-regional relationships with academic/research institutions. o Identify which academia and research health institutions are in country o Select and establish contact with those academia and research health institutions from which relation should benefit public health issues o Discuss collaboration issues with academia and research health institutions
STRATEGIC COMMUNICATIONS	• Strengthen the use of communication mechanisms within MOH to begin relations with public and stakeholders (dynamic website, social networks) • Start the development of a Communication Strategy
SOCIAL PARTICIPATION	• Start a process for social engagements in public health through social media and formal roles on governance bodies and advisory groups

Innovation (INNO)

KEY CONCEPTS	• Develop a capacity building road map for staff knowledge strengthening on IS4H knowledge • Develop a training road map for staff digital literacy
TOOLS	• Run Maturity Model of the National EHR System: Country and maturity level report with recommendations

	- Identify health analysis tools requirements to enable data analysis and the development of information products/key indicators (see DMIT Recommendations above) - Analyze existing health analysis tools in place - Identify gaps in health analysis - Identify learning opportunities - Develop a roadmap for routine data analysis and data storage
HEALTH ANALYSIS FOR DECISION MAKING	- Start the implementation of a health analysis for decision making roadmap/strategy - Identify data that needs to be available for reports and health status outcomes generation - Identify health analysis focus needs for decision-making - Map data flows needs to support decision-making - Map data availability needs
DIGITAL HEALTH	- Conduct a Digital Health assessment, to identify: - Tools implementation needs - Digital Health roadmap considering focus movements: - digitizing manual processes - improve operational efficiencies - transform models of care, - improve patient safety and quality of care, - supporting population health approaches. - facilitate targeted communications to individuals - stimulate demand for services/access to health information - improve decision support mechanisms /telemedicine. - enables population health management - rapid response to disease incidents and public health emergencies
eGOVERNMENT	Ensure health sector is fully engaged in e-Gov planning and initiatives.
OPEN GOVERNMENT	Sensitize stakeholders on the benefits of open data
PREPAREDNESS AND RESSILIENCE	Create a preparedness commission to improve response and resilience actions:

	o Identify multisectoral health stakeholders o Identify basic approaches for critical areas to ensure business continuity in the case of disaster o Identify key data sets to be available to support disaster response o Develop a roadmap to ensure a growing up improvement in the area

From level 2 to Level 3

Data Management and Information Technologies (DMIT)

DATA SOURCES	• Identify the information needs for key MoH stakeholders (e.g. MoH leadership, program leads, planners, etc.) and other stakeholders (health facility administrators and clinicians) and
	    o Include information reporting requirements (indicators, data sets) in Service Level Agreements (e.g. hospital, NGOs, etc.).
	• Identify key health data sources from which is critical to obtain routine data and information, this must include:
	    o New data sources
	    o Data sources randomly collected
	    o Data sources routinely collected
	• Document and mandate standards for indicator definitions and key data elements.
	• Establish a shared scheduled for data collection according technical and political needs
	• Conduct an exercise to develop and implement a shared scheduled for:
	    o data collection according technical and political needs
	    o real time availability of data to support decision-making

INFORMATION PRODUCTS	• Develop the conceptual architecture for a national health information exchange platform.
	    o Business architecture (roles, responsibilities and functions)
	    o Define the electronic collection method from all data sources identified
	    o Strengthen data collection through automated process
	    o Conduct data prioritization and mapping exercise

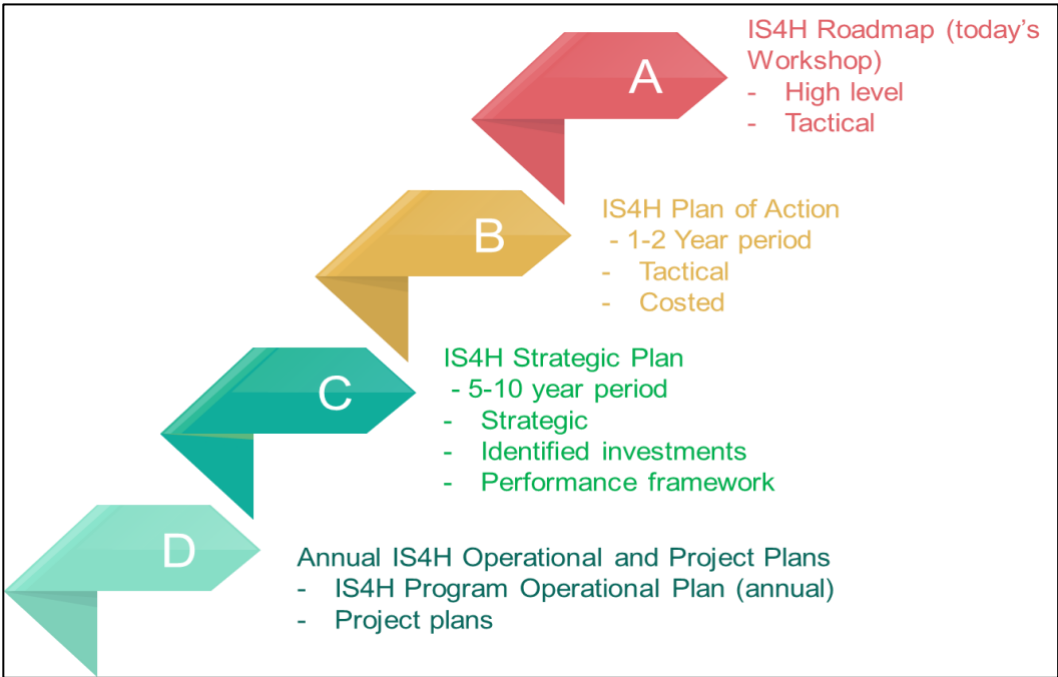|	

	• Identify and prioritize information requirements (health indicators; health system performance indicators)
	   o Include information reporting requirements (indicators, data sets) in Service Level Agreements (e.g. hospital, NGOs, etc.).
	• Start the development of a data sharing framework (what information is shared? with whom? Under which agreements or authority?).
	   o Establish a data flow map for starting sharing information products with stakeholders and health facilities

IT INFRASTRUCTURE	• Conduct an ICT in health readiness assessment for the Ministry of Health and the health facilities of key delivery partners • Based on the conceptual architecture for the national health information exchange platform, develop the technical architecture and phasing strategy. • Strength national IT infrastructure (work stations, networks, local facility infrastructure, government data center, support services). • Initiate a rapid high-level due diligence assessment of National Information Health System (with regions) to determine a possible integral implementation
DATA GOVERNANCE	• Implement a data governance framework aligned with the overall IS4H governance framework. • Develop and implement national data management policy.

STANDARDS FOR QUALITY AND INTEROPERABILITY	• Development and implement a national data quality framework.
	• Implement a formal plan for standards adoption that includes:
	   o Critical and specific data sources standardized
	   o Standards applicated in new data sources
	   o Continue de adoption of standards for data sources in the short, mid and long term.

Management and Governance (MAGO)

LEADERSHIP AND COORDINATION	• Establish a formal multi-sectoral IS4H Strategic Governance and Technical Advisory Structure.
	   o Identify the key individual national health authorities (MOH, reginal health authorities, health facilities)
	   o Identify the key decisions that need to be coordinated by the IS4H Strategic Governance and Technical Advisory Structure.

STRATEGIC AND OPERATIONAL PLANS	• Use the recommendation from this assessment to develop a National IS4H Plan of Action with short to medium-term costing and resource requirements:
	  ○ Create Roadmap & Budget to achieve IS4H Future State
	  ○ Identify National Health System Strategic Plans in which IS4H could be addressed
	  ○ Identify individual units/departments/facilities operational plans where to include components of IS4H
	  ○ Develop a roadmap for addressing IS4H into National and individual operational and strategic plans
	  ○ Key Performance Indicators to track capabilities and progress.

ORGANISATIONAL STRUCTURE AND FUNCTIONS	• Start a process for rationalizing accountability, roles and responsibilities for IS4H functions
	  ○ Identify actual IS4H-related functions performing
	  ○ Identify critical needs/gaps on IS4H implementation-related functions
	  ○ Develop a roadmap for capacity building / realignment to rationalize functions and decision-making
	  ○ Appoint IS4H Program Lead and short-term project team.
	  ○ Define organizational functions for
	    ▪ *Information Technology Management*
	    ▪ *Information Management and Analysis*
	    ▪ *Health Informatics*
	    ▪ *Knowledge and Performance Management*
	• Invest in technical support for the development and implementation of a change management strategy in support of IS4H capacity building.

HUMAN RESOURCES	• Develop a medium to long-term organizational structure and human resource strategy
	  ○ Identify/document human resource constraints for planning, implementing, and managing IS4H through applying the PAHO IS4H Functional Assessment Methodology.
	  ○ Develop a roadmap for addressing Human Resources IS4H needsEstablish with adequate stakeholders a strategic plan for ensure the existence of academic undergraduate education capacity in country.
	  ○ Add change management and project management skills/functions to IS4H implementation team (short-term) and program team (longer-term)

	• Establish with adequate stakeholders a strategic plan for ensure the existence of academic undergraduate education capacity in country. • Add change management and project management skills/functions to IS4H implementation team (short-term) and program team (longer-term)
FINANTIAL RESOURCES	• Develop costing for implementing the IS4H Plan of Action. ○ Identify available resources and initiate resource mobilization activities where there are funding gaps. • Identify the IS4H activities from in individual unit/program that need to be incorporated in annual budgets of national health authorities.
MULTISECTORAL COLLABORATION	• Start a process of enabling multisectoral collaboration for IS4H ○ Identify other public sector stakeholder that are key for specific health information and service needs. ○ Develop engagement activities to enable collaboration among sectors ○ Develop a roadmap for multisectoral collaboration establishment.

LEGISLATION POLICY AND COMPLIANCE	• Conduct analysis and remediate gaps in legal/regulatory framework focusing on:
	 ○ Protection of personal health information (privacy)
	 ○ Use of EHR
	• Start a process for addressing ethical use and protection of health data within a general data protection legal framework.
	 ○ Conduct analysis and remediate gaps in legal/regulatory framework focusing on:
	  ▪ Protection of personal health information (privacy)
	  ▪ Security
	  ▪ Secondary use
	  ▪ Mandatory reportable diseases and conditions
	• Start a process to develop/update legislation/regulation to enable the effective use of electronic medical records.
	 ○ Identify existing guidelines or process for the use of medical records and develop, based in best practices, formal policies for governing the effective use of electronic medical records.

NATIONAL AND INTERNATIONAL AGREEMENTS	• Create a health agreements commission to start the process of accomplishment of national and international health agreements ○ Identify existing National and International health agreements

	o Identify National and International health agreements that are not being addressed o Identify individual unit/program that should be involved with the in place and future agreements.

IS4H Strategic Plan Development Approach

Knowledge Management and Sharing (KMSH)

KNOWLEDGE PROCESSES	• Establish policies and procedures, as well as formal methodologies to achieve an effective exchange of data, information and knowledge within and among institutions throughout the country that handle health data: o Identify all the basic knowledge management mechanism and processes (*Preservation of the institutional memory; Open access/open source; Research for health; Repositories; Information access; Editorial or publishing ; Mentoring; Travel reports; Meeting reports; Communities of practice; Lessons learned; Critical Information sharing and managing; Virtual meetings; Social networking*) that are currently in place, randomly accessible and updated.

	• Establish communities of practices for the development of formal policies based in the best practices of processes in place ○ Develop a roadmap for implementation of policies developed • Define and implement an official institutional taxonomy for the classification of documents • Start the development of a KM strategy, that allows to generate awareness of the importance of making decisions based on up-to-date, safe and reliable data; • Incorporate the use of metrics to quantitatively measure organizational knowledge management processes and capacities
KNOWLEDGE ARCHITECTURE	• Establish a KM advisory group to asses MoH in: ○ The critical KM infrastructure needed to be a learning organization ○ Identify Knowledge management projects launched or in launching process ○ Advise on which KM projects could be of National interest to be supported by health authorities and replicated ○ Identify skills that could be integrated into MoH training programs 　▪ *Use of scientific information for health-related decision making* 　▪ *Knowledge production* 　▪ *Knowledge management & sharing* 　▪ *Knowledge access* 　▪ *Use and evaluation of information technologies in order to support health priorities* • Start the development of a methodology/process/policy to facilitate public access to contents resulting from research activities financed primarily by public funds
NETWORKS	• Establish mechanisms (forum, knowledge sharing website, listserves, etc) for sharing knowledge given and received from international forums and networks. • Incorporate the participation in national and international networks as part of the post descriptions of critical staff.

ACADEMIA/SCIENTIFIC COMMUNITY	• Identify and establish a road map for the establishment of formal national, regional and sub-regional relationships with academic/research institutions.
	    ○ Identify which academia and research health institutions are in country
	    ○ Select and establish contact with those academia and research health institutions from which relation should benefit public health issues
	    ○ Discuss collaboration issues with academia and research health institutions

STRATEGIC COMMUNICATIONS	• Develop an MoH Communication Strategy MoH to strengthen engagement and communication with the public and other key stakeholders (dynamic website, social networks). • Strengthen communication flow by implementing a feedback routine to the local level with key information needed. • Implement a strategy for measurement of strategic communication impact

SOCIAL PARTICIPATION	• Start a process for social engagements in public health through social media and formal roles on governance bodies and advisory groups
	    ○ Identify the possible mechanisms for communication with the public that could be incorporated by the MoH (One way (websites, advertising, etc.), Specific commemorative activities (campaigns), Surveys, Focus groups, Social networks and website interaction, Participation in governance bodies, Participation in advisory groups)
	    ○ Identify critical public and private sector stakeholders to strengthen MoH efforts on incorporate community

Innovation (INNO)

KEY CONCEPTS	• Implement a capacity building road map for staff knowledge strengthening on IS4H knowledge • Implement a training program road map for staff digital literacy
TOOLS	• Conduct an exercise on health analysis tools implementation ○ Analyze existing health analysis tools in place

	- Identify gaps in health analysis - Identify learning opportunities - Develop a roadmap for routine data analysis and data storage • Start the process of implementation of a Data warehouse (DWH) within the organization
HEALTH ANALYSIS FOR DECISION MAKING	• Start the implementation of a health analysis for decision making roadmap/strategy - Identify data that needs to be available for reports and health status outcomes generation - Identify health analysis focus needs for decision-making - Map data flows needs to support decision-making - Map data availability needs • Start the development of a capacity building plan to strengthen health analysis through the application of different approaches - Identify knowledge, skills and human resources required to support health analysis for decision making. *Descriptive (summary) analysis* *Inferential statistics* *Data visualization and exploratory data analysis* *Public health modeling* *Data science: Predictive analysis based on machine learning, deep learning neural networks; clustering, anomaly, association rule mining, prediction* • Develop an investment plan.
DIGITAL HEALTH	• Develop a digital health strategy that identifies: - Tools implementation needs - Digital Health roadmap considering: - Digitizing manual processes - Improving operational efficiencies - Transforming models of care, - Improve patient safety and quality of care, - Facilitating targeted communications to individuals - Stimulating demand for services/access to health information - Improve decision support mechanisms /telemedicine. - Enabling population health management - Rapid response to disease incidents and public health emergencies • Digital Health roadmap considering focus movements:

	- o digitizing manual processes - o improve operational efficiencies - o transform models of care, - o improve patient safety and quality of care, - o supporting population health approaches. - o facilitate targeted communications to individuals - o stimulate demand for services/access to health information - o improve decision support mechanisms /telemedicine. - o enables population health management - o rapid response to disease incidents and public health emergencies - Conduct an assessment on National Health Information System implementation - Start the process of development of a telemedicine network in the entire country
eGOVERNMENT	- Ensure health sector is fully engaged in e-Gov planning and initiatives. - Ensure the focus for the health sector is on strengthening administrative process like procurement, budget, etc. Also including IT infrastructure - Start the integration of health specific public portals or health e-service with the national e-government platform
OPEN GOVERNMENT	- Sensitize stakeholders on the benefits of open data - Update MoH training programs incorporating Open Government skills - Start the development of an Open Data Policy - Revise the organizational policies to start the integration of the principles of openness
PREPAREDNESS AND RESSILIENCE	- Create a preparedness commission to improve response and resilience actions: - o Identify multisectoral health stakeholders - o Identify basic approaches for critical areas to ensure business continuity in the case of disaster - o Identify key data sets to be available to support disaster response

	o Develop a roadmap to ensure a growing up improvement in the area

From level 3 to Level 4

Data Management and Information Technologies (DMIT)

DATA SOURCES	• Implement routine schedule to obtain key health data and information from identified sources.
	• Standardize indicators and key data elements.
	• Implement shared scheduled for:
	    o data collection according technical and political needs
	    o real time availability of data to support decision-making

INFORMATION PRODUCTS	• Define a national health information architecture, documenting information flows, data catalog and availability of technological infrastructure;
	    o Establish a data flow map for sharing information products with stakeholders and health facilities
	        ▪ Define and develop information products based on the stakeholders specific needs
	        ▪ Establish and implement distribution mechanisms
	    o Develop a road map considering short, medium- and long-term actions for implementing the data sharing framework
	        ▪ Routine for production of information products

IT INFRASTRUCTURE	• Continue to invest in achieving as much interoperability as possible in health information platforms, including integrated national data repositories from multiple data sources, including sub-national ones. o It is recommended to run an ICT in health readiness assessment for the whole ministry of health and health facilities to highlight the specific investments needs • Implement a whole interoperability process among IT infrastructure (hardware and software)
DATA GOVERNANCE	• Implement a Data Governance framework at the national level that ensures continuous improvement to monitor and invest in data quality;

	• Develop a plan and implement processes to strengthen alignment of standards, data quality frameworks and data management practices across all stakeholders

STANDARDS FOR QUALITY AND INTEROPERABILITY	• Implement a formal plan for standards adoption that includes:
	   o Critical and specific data sources standardized
	   o Standards applicated in new data sources
	   o Continue de adoption of standards for data sources in the short, mid and long term.
	• Document the national health information architecture
	• Apply a national identifier for integrating health data from all sources

Management and Governance (MAGO)

LEADERSHIP AND COORDINATION	• Establish a formal multi-sectoral IS4H Strategic Governance and Technical Advisory Structure.
	   o Integrated by key individual national health authorities (MOH, reginal health authorities, health facilities)
	   o Defined ToR including:
	     ▪ Key decisions that need to be coordinated by the IS4H Strategic Governance and Technical Advisory Structure.
	     ▪ Roles and responsibilities of members
	     ▪ Plan of action – Roadmap of key activities and results
	     ▪ Auto evaluation plan

STRATEGIC AND OPERATIONAL PLANS	• Implement an IS4H Plan of Action with short to medium-term costing and resource requirements
	   o Addressed IS4H in all National Health System Strategic Plans
	   o Included components of IS4H in individual units/departments/facilities operational plans
	   o Roadmap – plan of action for implementation
	   o IS4H Guiding Principles incorporated

ORGANISATIONAL STRUCTURE AND FUNCTIONS	• Implement an organizational structure with accountability, roles and responsibilities for IS4H functions.
	   o Strengthen IS4H Program Lead and project team roles and responsibilities.
	   o Strengthen organizational functions for

	▪ *Information Technology Management* ▪ *Information Management and Analysis* ▪ *Health Informatics* ▪ *Knowledge and Performance Management* • Close critical needs/gaps on IS4H implementation-related functions ○ Continue strengthen capacity building on IS4H to improve decision-making • Review / implement change management strategy supported by third party organization

HUMAN RESOURCES	• Implement a medium to long-term organizational structure and human resource strategy.
	    ○ Secure human resource for planning, implementing, managing and sustaining IS4H
	    ○ Implement a Human Resources IS4H needs and strengthen skills plan
	        ▪ Training
	        ▪ Workshops
	        ▪ Conferences
	    ○ Incorporate IS4H skills in education, training plans in place

FINANTIAL RESOURCES	• Implement an IS4H investment framework at the national level, to ensure IS4H strategic plan sustainability

MULTISECTORAL COLLABORATION	• Formalize relationships with multisectoral actors, including the private sectors:
	    ○ Specify roles and responsibilities for specific health information and service needs.
	    ○ Start a process of enabling multisectoral collaboration for IS4H
	    ○ Identify other stakeholder that are key for specific health information and service needs.
	    ○ Develop engagement activities to enable collaboration among sectors
	    ○ Develop a roadmap for multisectoral collaboration establishment.

LEGISLATION POLICY AND COMPLIANCE	• Address and implement ethical use and protection of health data within a general data protection legal framework focused on:
	    ▪ Protection of personal health information (privacy)
	    ▪ Security
	    ▪ Secondary use
	    ▪ Mandatory reportable diseases and conditions

	• Implement new/updated legislation/regulation enabling the effective use of electronic medical records.
NATIONAL AND INTERNATIONAL AGREEMENTS	• Formalize/ maintain national and international health agreements with an effective use of resources

Knowledge Management and Sharing (KMSH)

KNOWLEDGE PROCESSES	• Formally integrate Knowledge Management and sharing processes into:
	    o business processes,
	    o job descriptions,
	    o organizational functions
	• Use metrics to quantitatively measure organizational knowledge management processes and capacities and improve performance.

KNOWLEDGE ARCHITECTURE	• Establish a knowledge management framework at the national level, integrating health organizations and stakeholders, including actual and new methodologies/processes/policies for KMSH

NETWORKS	• Formally integrate international forums and networks participation into the organizational structure and practices
	    o Roles and responsibilities integrated in post descriptions
	    o Resources and compensation programs

ACADEMIA/SCIENTIFIC COMMUNITY	• Establish formal national, regional and sub-regional relationships with academic/research institutions for supporting projects and programs with specific studies.

STRATEGIC COMMUNICATIONS	• Implement a Public Health Communication Strategy:
	    o Identification of different audiences and purposes
	    o Customized messages
	• Establish a routine for strategic communication impact measurements and evaluation for:
	    o Communication strategy adjustment
	    o Communications actions and activities update

SOCIAL PARTICIPATION	• Continue strengthening and maintaining social engagements by formalizing their participation in public health through social media and formal roles on governance bodies and advisory groups

Innovation (INNO)

KEY CONCEPTS	• Continue strengthening staff knowledge on IS4H knowledge • Continue strengthening staff digital literacy

TOOLS	• Formally implement health analysis tools at the national level
	    ○ Close gaps in health analysis
	    ○ Implement learning program
	    ○ Implement routine data analysis and data storage
	• Implement a Data warehouse (DWH) within the organization
	• Start incorporating new approaches for non-traditional databases
	Develop and launch online data platform

HEALTH ANALYSIS FOR DECISION MAKING	• Implement a health analysis for decision making roadmap/strategy
	    ○ Addressing data availability needs for reports and health status outcomes generation
	    ○ Focusing health analysis needs for decision-making
	    ○ Mapping data flows to support decision-making
	• Continue strengthening staff through capacity building plan applying different approaches for health analysis, considering resources; tools and partnerships.
	    ○ *Descriptive (summary) analysis*
	    ○ *Inferential statistics*
	    ○ *Data visualization and exploratory data analysis*
	    ○ *Public health modeling*
	    ○ *Data science: Predictive analysis based on machine learning, deep learning neural networks; clustering, anomaly, association rule mining, prediction*

DIGITAL HEALTH	• Move towards the use of digital health tools to facilitate targeted communications to individuals, stimulating demand for services/access to health information.

	• Strengthen digital health interventions to target them to give health workers immediate access to improve decision support mechanisms /telemedicine. • Implement/strengthen a telemedicine network in the entire country
eGOVERNMENT	• Ensure the focus for eGovernment on the health sector is on transforming transactions between government and the public, businesses, or other organizations in health (e.g. online appointment booking, patient portals, e-referral, health card registration, etc.).
OPEN GOVERNMENT	• Implement an Open Data Policy at the national level focused on the availability of data for national and international stakeholders • Integrate the principles of openness within organizational policies
PREPAREDNESS AND RESSILIENCE	• Implement improvement on Information Systems for Health to ensure that during disasters can support essential health system functions.

From level 4 to Level 5

Data Management and Information Technologies (DMIT)

DATA SOURCES	• Implement a holistic data integration and availability process for analysis to support decision making including:
	  o Large data sets from multiple sources
	  o Data from multiple type of sources (unstructured)

INFORMATION PRODUCTS	• Develop and implement a process of integrating unstructured data into the national health information architecture.
	  ▪ Define and develop information products based on the stakeholder's specific needs
	  ▪ Establish and implement analysis mechanisms

IT INFRASTRUCTURE	• Continue to invest in achieving as much interoperability as possible in health information platforms, including integrated national data repositories from multiple data sources, including sub-national ones.

	• Implement a whole interoperability process among IT infrastructure (hardware and software)
DATA GOVERNANCE	• To strengthen National Data Governance framework: ○ Assess actual policies, procedures and best practices application and their impact on data quality ○ Establish formal data governance mechanisms among national stakeholders ○ Maintain and improve your data quality processes.
STANDARDS FOR QUALITY AND INTEROPERABILITY	Health information systems are interoperable, enabled by a national infrastructure that uses current standards, technologies, and architectures. • Reinforce the National infrastructure with current standards, technologies and architecture to ensure the maximum IS4H interoperability.

Management and Governance (MAGO)

LEADERSHIP AND COORDINATION	• Strengthen the multi-sectoral IS4H Strategic Governance and Technical Advisory Structure. ○ Establish transparency governance mechanisms such as: ▪ Public IS4H portal ▪ Periodic members reelection ○ Represented by multi-sectoral partners with alignment of roles, responsibilities and functions.
STRATEGIC AND OPERATIONAL PLANS	• Implement an IS4H Plan of Action with short to medium-term costing and resource requirements ○ Addressed IS4H in all National Health System Strategic Plans ○ Included components of IS4H in individual units/departments/facilities operational plans ○ Roadmap – plan of action for implementation ○ IS4H Guiding Principles incorporated
ORGANISATIONAL STRUCTURE AND FUNCTIONS	• Align the IS4H functions across national stakeholders. • Establish an integration process of IS4H functions across national stakeholders that allows performance and resources optimization, added value of health outcomes and more investment.
HUMAN RESOURCES	• Develop and start the implementation of a national Human Resources IS4H strategy:

	o To build HR competencies in IS4H expertise level o Including national and international training institutions o Ensure the availability in the mid-long term of local capacity on IS4H
FINANTIAL RESOURCES	• Implement an IS4H investment framework at the national level, to ensure IS4H strategic plan sustainability

LEGISLATION POLICY AND COMPLIANCE	• Fully implement ethical use and protection of health data within a general data protection legal framework focused on:
	   ▪ Protection of personal health information (privacy)
	   ▪ Security
	   ▪ Secondary use
	   ▪ Mandatory reportable diseases and conditions
	• Implement new/updated legislation/regulation to fully enable the use of information and technology to improve health outcomes and the performance of the health system while protecting individuals and populations and is responsive to emerging innovations.

NATIONAL AND INTERNATIONAL AGREEMENTS	• Establish an ethical use of information framework for enhancing free and secure information and data flow among national and international partners.

Knowledge Management and Sharing (KMSH)

KNOWLEDGE PROCESSES	• Formally integrate Knowledge Management and sharing processes, tools and technologies to ensure the free-flow of knowledge throughout the organization
KNOWLEDGE ARCHITECTURE	• Improve knowledge management framework at the national level, integrating health organizations and stakeholders, to ensure total integration with technology and content architecture.
NETWORKS	• Establish formal institutional mechanisms to enrich the organization with new/renovated knowledge as a result from networks participation. o Develop knowledge activities to encourage organizational community around knowledge.

ACADEMIA/SCIENTIFIC COMMUNITY	• Establish formal national, regional and sub-regional relationships with academic/research institutions for supporting specific projects or studies, supporting decision-making and programs evaluation..
STRATEGIC COMMUNICATIONS	• Establish a culture change management to move forward the integration of real time advanced analytics in the strategic communications management.
SOCIAL PARTICIPATION	• Continue strengthening and maintaining social engagements by incorporating their formal inputs and participation as evidence for decision making.

Innovation (INNO)

KEY CONCEPTS	• Establish a mechanism to formally incorporate IS4H Key concepts in all level practices among organization. • Identify evaluation and assessment methods to measure the impact of this application at the institutional level

TOOLS	• Expand formally secure access to health analysis tools and platforms for different users:
	    ○ policy makers,
	    ○ managers,
	    ○ clinicians, and
	    ○ public stakeholders
	• Ensure that new approaches for non-traditional databases are routinely considered by leadership and technical staff.

HEALTH ANALYSIS FOR DECISION MAKING	• Implement real time health analysis methods and processes for decision making on:
	    ○ clinical,
	    ○ management and
	    ○ policy
	• Implement a process to ensure that decision-making is data driven

DIGITAL HEALTH	• Move towards the use of digital health tools to:

	o enable population health management and the rapid response to disease incidents and public health emergencies. o Empower citizenship to manage their own health o Facilitate health workers real time access to data and tools for their better decision-making
eGOVERNMENT	• Move forward a fully integration of health sector on the e-government initiatives and platforms.
OPEN GOVERNMENT	• Implement a process to make data fully available for analysis among national and international stakeholders and public. • Apply the principles of openness within organizational policies
PREPAREDNESS AND RESSILIENCE	• Implement improvement on Information Systems for Health to ensure fully operational IS4H during and after emergencies and disasters.