A Navigator for **Digital Health Capability Models**

A User's Guide

digital square

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Contents

Abbreviations

CDC	United States Centers for Disease Control and Prevention
DH&I	Digital Health and Interoperability [working group]
DPPA	Digital Pandemic Preparedness Assessment
EDIT	Early Stage Digital Health Investment Tool
GDHI	Global Digital Health Index
HIS	health information system(s)
HMIS	health management information system
ICT	information and communications technology
IMM	Health Information System Interoperability Maturity Model [Toolkit]
IS4H	Information Systems for Health [Toolkit]
ITU	International Telecommunication Union
JSI	John Snow, Inc.
MOH	Ministry of Health
PAHO	Pan American Health Organization
SCIS	supply chain information system(s)
SCISMM	Supply Chain Information System Maturity Model
SCORE	Survey, Count, Optimize, Review, Enable
SDG	Sustainable Development Goal
SME	subject matter expert
SOCI	Stages of Continuous Improvement [Toolkit]
USAID	United States Agency for International Development
WHO	World Health Organization

Executive Summary

This document provides guidance on the use of maturity model-based tools, usually referred to as maturity models, to assess national-level digital health systems. The document provides: an overview of the value of using maturity models; an introduction to the six maturity models in the Navigator for Digital Health Capability Models; guidance on how to identify the tool that is the best-for-fit for a specific context's assessment goals; and details on how to use tools in combination with one another. The Navigator comprises two parts: (1) this User's Guide; and (2) a Microsoft Excel-based Decision Support Workbook that guides users to the best-for-fit tool or tools to meet the goals of their assessment needs. There is also an accompanying slide deck available containing an abridged version of the information in this document and an Excel-based appendix file that contains all the individual tool indicator mappings.

The Navigator should be used by health systems planners, implementors, evaluators, and funders to understand the value of using maturity model-based tools, and to (1) identify and use the most appropriate tool(s); and (2) leverage past maturity model-based assessments to improve digital heath capabilities.

1. Why Is the Navigator Needed and What Is It?

Responding to the need for a standardized way to assess country health sector digitalization

The Navigator for Digital Health Capability Models (referred to as the Navigator throughout this document) is a resource comprised of a guidance document (User's Guide) and a Microsoft Excel-based Decision Support Workbook that aims to enable digital health planners, implementers, evaluators, and funders to (1) identify and use the most appropriate maturity model-based tool(s); and (2) leverage past maturity model-based assessments to improve digital heath capabilities.

All tools included in the Navigator are multidimensional models that measure the capability of various attributes of digital health. Capability is used in relation to process, system, institution, and people. It is not limited to skills. Many of the tools included in the Navigator use the term *maturity model* to describe the tool's structure. Maturity models generally focus on one or more capabilities. For the Navigator, we mirror the language used by individual tools to describe their structure and components (e.g., the HIS Interoperability Maturity Toolkit uses the language "maturity model"). It should be noted that maturity may denote a singular expected outcome, which is not the case for every context that will use an assessment tool. Capability describes the power or ability to do something, without implying a specific end goal. For this reason, *capability* is used in the title of the Navigator.

The Navigator builds on the value of independent maturity model-based tools by providing guidance for their effective use. The Navigator adds value to the World Health Organization's (WHO) *Digital Implementation Investment Guide (WHO, 2020),* which recommends the use of maturity model-based tools in Phase 1 of digital implementation to assess the current state and the enabling environment. The Navigator helps stakeholders choose and use one or more maturity model-based tool(s) that are most appropriate to the specific context and the specific purpose of the assessment.

The Navigator comprises two components:

1. This **guidance document, or User's Guide,** provides an overview on the use of maturity model-based assessment tools; an introduction to the individual tools included in the Navigator; guidance on how to identify the best tool(s) to meet your assessment needs; and details on how to use tools in combination with one another.
2. An **Excel-based Decision Support Workbook** to (1) identify and use the most appropriate maturity model-based tool(s), and (2) leverage past maturity model-based assessments to inform new or planned assessments.

A Microsoft PowerPoint **slide deck** containing an abridged version of this User's Guide is also available and can be used for working with groups that may want to use the Excel-based Workbook but need additional information in the form of a presentation. Additionally, there is an Excel-based appendix to the Navigator which includes in-depth mapping of indicators between the six tools.

The Navigator includes six maturity model-based tools:

- Early Stage Digital Health Investment Tool (EDIT)
- Global Digital Health Index (GDHI)
- Health Information System Interoperability Maturity Model (IMM) Toolkit
- Information Systems for Health (IS4H) Toolkit
- Survey, Count, Optimize, Review, Enable (SCORE) Essential Interventions
- Health Information System Stages of Continuous Improvement (SOCI) Toolkit

Appendix A provides detailed information on each tool.

1.A. How Does the Navigator Fit into the Digital Health Ecosystem?

In a flourishing digital health ecosystem, maturity models have served a useful purpose in determining the "as is" status of a country or organization's system for health data, and for also defining the concrete attributes needed to advance that system's capabilities for digital health. The number of publicly available maturity model-based tools and toolkits provide important opportunities for countries and organizations to assess digital health systems; however, cumulatively, they may be confusing for prospective tool users who may be overwhelmed by the variety of tools and unsure of where to start (WHO, 2020; Liaw, Siaw-Teng, et al., Digital Square, 2021).

This Version 1.0 of the Navigator provides in-depth guidance on publicly available maturity model-based tools that are designed to holistically assess national-level digital health systems, which are agnostic to any one platform or subsystem of the health information system (HIS). The Navigator also provides links to maturity model-based tools that are designed for a specific subsystem, such as the supply chain information systems (SCIS), covered in more detail in section 5.C.

Key Terms

Table 1 provides select definitions for terms used in this User's Guide. A full glossary of key terms is provided in Appendix E.

Table 1. Key terms

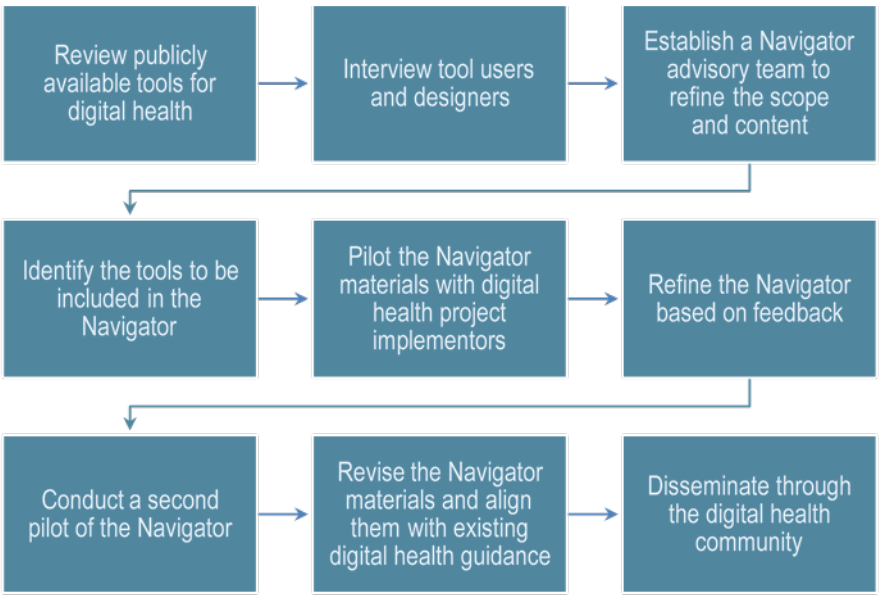
Term	Definition
Capability	Describes the power or ability to do something in a specific environment (Holsbeeke, Laura, et al., 2009).
Capability model	An evolutionary progress in the demonstration of a specific ability or in the accomplishment of a target from an initial to a desired or normally occurring end stage (Mettler, 2011).
Capacity	Describes what can be accomplished in a standardized, controlled environment (Holsbeeke, Laura, et al., 2009).
Digital health[1]	Digital health is the systematic application of information and communications technologies, computer science, and data to support informed decision making by individuals, the health workforce, and health systems to strengthen resilience to disease and improve health and wellness (WHO, 2020).
Health information system (HIS)	The HIS provides the underpinnings for decision making and has four key functions: data generation; compilation; analysis and synthesis; and communication and use. The HIS collects data from the health sector and other relevant sectors; analyses the data; ensures their overall quality, relevance, and timeliness; and converts data into information for health-related decision making (WHO, 2012).
Maturity model	A set of structured levels that describe organizational behaviors, practices, and processes that reliably and sustainably produce required outcomes. A maturity model measures the ability of an organization to continuously improve in specific dimensions until it reaches the desired level of maturity (Carvalho, 2016).
mHealth	The use of mobile and wireless technologies to support the achievement of health objectives (WHO, 2011).
Performance	Describes what a person actually does in his/her daily environment (Holsbeeke, Laura, et al., 2009).
Tool	An assessment that provides a score or result based on user input.
Toolkit	A tool and all the accompanying materials that support the tool, including a user's guide and assessment workbook.

[1] **A note on the term *digital health*:** The terms digital health, eHealth, mHealth, and HIS are often used interchangeably and their definitions may overlap. For the purposes of this document, *digital health* is used as the umbrella term, which encompasses all applications of information and communications technologies (ICT), such as electronic health records, mobile health technologies, and interoperable platforms to support the collection and use of health information. However, in the Excel-based Decision Support Workbook, more specific terms are used to specify the assessment goals and objectives related to *HIS, digital health,* and *interoperability of HIS.*

1.B. How Was the Navigator Developed?

The Navigator was developed by the Navigator technical team at the University of North Carolina (UNC) through an iterative and multistep process, as illustrated by the graphic below. Early steps were to identify the specific needs that the Navigator should meet and to outline the scope to determine what parameters would define the tools that are included.

Figure 1. Development of the Navigator



1.C. Who Should Use the Navigator?

The Navigator supports digital health planners, implementors, evaluators, and funders to identify the maturity model-based tool(s) that most closely align with their goal(s) for conducting an assessment. For example, the digital health planners or managers in a Ministry of Health (MOH) can use the Navigator to identify the best-for-fit assessment tool and to determine how findings from any past maturity model assessments can be leveraged, if applicable. For funders of digital health interventions, the Navigator offers an opportunity for more effective targeting of resources, by recommending the most appropriate assessment and diagnostic tool(s) to inform investments, along with guidance on how to draw from the results of any previous assessment conducted in the same setting.

The Navigator is specifically designed for personnel with some experience and knowledge in digital health and/or HIS. However, this User's Guide offers background information that those who are less familiar with the digital health scene should review thoroughly before using the Excel-based Decision Support Workbook.

1.D. When Should the Navigator Be Used?

The Navigator should be used by countries, organizations, and funders that are ready to make investments in strengthening digital health enterprises, including investments in the people who design, build, deploy, and maintain the systems. The Navigator can be used to:

- Inform strategic planning for digital health
- Identify priorities for digital health strategic investment
- Benchmark, monitor, and evaluate digital health investments and strategy implementation

An organization can use the Navigator's recommendations to identify appropriate tool(s) and to use relevant findings from past assessments as input for the design and planning of new assessments.

Donors can ask grantees to use the Navigator as part of an application process to optimize and align the development of new maturity model-based tools and to leverage the findings of any past assessments.

The digital health/eHealth or HIS leads at the MOH can ask implementing partners to use the Navigator before suggesting new assessments or tool development. HIS leads can also orient MOH staff at regional, district, and facility levels to use the Navigator to inform an assessment and strategic decisions.

WHO's *Digital Implementation Investment Guide*[2] organizes the process of planning and implementing an appropriate digital health enterprise into phases, the first of which is the use of maturity model-based tools to assess the current state and enabling environment of the digital health ecosystem.

[2] World Health Organization (WHO). (2020). Digital implementation investment guide (DIIG): Integrating digital interventions into health programmes. Geneva, Switzerland: WHO. Retrieved from https://www.who.int/publications/i/item/who-digital-implementation-investment-guide.

2. Why Use a Maturity Model-Based Assessment?

2.A. What Is a Maturity Model?

Maturity model refers to an evolutionary progress in the demonstration of a specific ability or in the accomplishment of a target from an initial to a desired or normally occurring end stage (Mettler, 2009). Maturity characteristics are defined for people, processes, technology, and institutional dimensions.

Maturity models have their roots in quality management and software process improvements. The quality management maturity grid describes the typical behavior exhibited by a firm at five levels of "maturity" for each of six aspects of quality management and the software improvement process. The Capability Maturity Model integrated for software identifies a cumulative set of "key process areas" that all need to be performed as the maturity level increases (Fraser, P., et al., 2002). The most well-known, Capability Maturity Model Integration (CMMI) (ISACA, 2021), has become the standard for measuring capabilities in the software development industry, which generally embraces standards quickly. The structure of this model has been reused for the development of other maturity models.

A maturity model, by itself, does not ensure organizational improvement. A maturity model is a measuring stick that defines indicators of progress. Maturity models often describe specific capabilities over several levels (typically 3-6), characterized by a descriptor for each level, such as initial, repeatable, defined, managed, and optimized. Such a model will usually include a generic description or summary of the characteristics of each level overall (Fraser, P., et al., 2002). Assessments based on maturity models can help an organization or country understand where it is on the path to maturity, and to visualize the future workforce, business processes, and technology capability required to achieve optimal function for purpose.

A **maturity model-based assessment tool or toolkit** supports the use of a maturity model to assess an organization or entity, with supporting documents, such as a user's guide and/or assessment worksheets to help determine scoring.

2.B. What Value Do Maturity Models Add to the Health System?

Strong health system performance, characterized by human resources for health, health finance, health governance, health information, medical products, and service delivery, is likely to result in better health outcomes (WHO, 2010). The ability of a health system to use health information for decision making is dependent on the capacity of its people, processes, systems, and organizations.

The global health community has created several tools that use a maturity model framework to characterize, assess, and support the advancement of the people, processes, systems, and organizational capabilities related to digital health to achieve a country's health goals. Identifying strengths and weaknesses is critical to inform strategic planning and for donors to understand—at technical and granular levels—where countries are in their digital health transformation journeys and to monitor progress of investments over time.

Maturity model-based assessment tools for digital health are useful to establish a systematic basis of measurement to (1) describe the current maturity level of digital health systems in terms of human resources, business processes, technology, and organizational capabilities; (2) facilitate users' ability to set goals for future levels of maturity; and (3) inform the development of improvement plans to realize the next maturity level for a stronger digital health system in a country to meet its public health targets.

A maturity model and its associated toolkits can help identify weaknesses, but it will not fix them. The results of a maturity model assessment may help generate an improvement plan but do not execute the plan. It is important to understand the role of a maturity model and to communicate that function to relevant stakeholders.

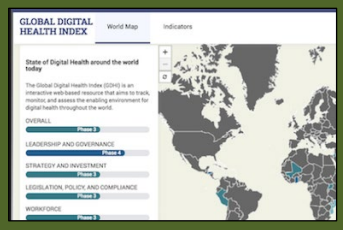
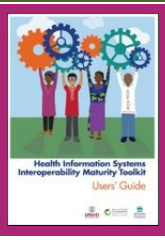
2.C. What Maturity Model-Based Tools Are Included in the Navigator?

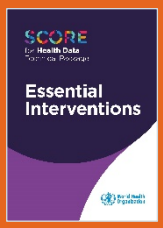
The Navigator includes tools that meet the following criteria:

- Focus at national-level capabilities
- Available to the public (global content goods)
- Tools have been tested in a real-world environment
- Accompanied by user's guidance and an assessment tool/workbook

Version 1.0 of this Navigator includes the six maturity model-based tools listed Table 2.

Table 2. Maturity model-based tools in the Navigator

	The Early Stage Digital Health Investment Tool (EDIT) is designed to assess a country's readiness to implement a digital solution(s). It is targeted to governments that want to better understand where they need to invest to be fully ready to successfully implement digital health, for funders that want to know how to best target their investments in a particular country, and to partners and implementers that want to align around a country's needs. The tool was developed by the Kati Collective in collaboration with the Bill & Melinda Gates Foundation, UNICEF, the U.S. Centers for Disease Control and Prevention (CDC), WHO, Gavi, PATH, Village Reach, and others.
	The Global Digital Health Index (GDHI) tracks, monitors, and evaluates the use of digital technology for health across countries. Capability levels are determined by country stakeholders and must be validated by MOH officials before being uploaded to the tool's interactive, web-based hub. Creation of the GDHI was a multi-stakeholder initiative supported by the Global Development Incubator with technical leadership provided by HealthEnabled and governed by a multiagency Steering Committee.
	The HIS Interoperability Maturity Model (IMM) Toolkit, as the name suggests, focuses on the key components needed for interoperability of HIS and lays out an organization's growth pathway through these components to move to exchanged systems. The toolkit was a joint product of MEASURE Evaluation and the Health Data Collaborative's Digital Health and Interoperability (DH&I) working group.

	The Health Information System Stages of Continuous Improvement (SOCI) Toolkit was collaboratively designed to help countries or organizations holistically assess, plan, and prioritize interventions and investments to strengthen an HIS by identifying current and goal status of key HIS components. The toolkit was jointly developed by MEASURE Evaluation, CDC, and the DH&I working group.
	The Information Systems for Health (IS4H) Toolkit focuses on key components of the national information system for health, including governance; strategies and plans; legislation and policy; financial sustainability; human resources; data management and quality processes; data analysis capabilities; business and clinical workflow; processes, project, and change management; and information technology platforms and infrastructure. This toolkit was developed by the Pan American Health Organization (PAHO), and the assessment and corresponding roadmap align with PAHO's renewed framework for information systems for health.
	The Survey, Count, Optimize, Review, Enable (SCORE) Essential Interventions document measures the status of a country's HIS and its suitability for use as a basis for country planning. The Essential Interventions document is part of the SCORE for Health Data Technical Package and is composed of five essential interventions with key elements to strengthen country health data and information systems and enable governments to track progress toward the health-related Sustainable Development Goals (SDGs) and national and subnational priorities. SCORE was developed by WHO.

Although the focus of Version 1.0 of this User's Guide is on national level maturity model tools, the Navigator acknowledges that there are several maturity models aimed at specific systems such as supply chains, community health information systems, etc., discipline specific maturity models such as the Artificial Intelligence (AI) in Health Maturity Assessment Tool (Novartis Foundation, 2021) (section 5.G) and digital ecosystem assessment (section 5.H). Though the Navigator is focused on the six tools discussed earlier, it explains how, at a higher level, USAID's Supply Chain Information System Maturity Model (SCISMM), a system specific maturity model, aligns with a national-level maturity model included in the Navigator (see Section 5C, System Specific Maturity Model). The purpose is to demonstrate alignment between two tools and emphasize that a detailed mapping of SCISMM with national-level maturity models or other similar maturity models is an important need and can be pursued in the future by interested stakeholders. Similarly, a detailed mapping of the indicators of the AI in Health Maturity Assessment with the tools included in the Navigator may be equally as useful.

3. Which Tool Best Fits My Goal?

The Navigator recommends several key steps to identify the best tool or tools to fit a specific goal and context. It is worth noting that any one of the tools included here, and other available tools, can be applied in a specific country or organizational context to yield useful results. However, by aligning the purpose of the tool with the goal of conducting an assessment, tool users stand to maximize the use of resources to yield the best return to inform a path forward for improvement. Please review the recommended steps below before using the Excel-based Decision Support Workbook.

3.A. Using the Navigator to Select an Assessment Tool

We recommend the following steps for using the Navigator to identify the most appropriate tool(s).

Step 1: Digital health leadership identifies the need for application of a maturity model-based tool. For more information on the utility of maturity model-based assessment tools, see the section above, "Why Use a Maturity Model-Based Assessment?"

The steps listed below align with the tool selection tab criteria in the Excel-based Decision Support Workbook.

Step 2: Identify the main goal (or goals) for conducting an assessment. The goal or goals of conducting an assessment will be the key basis for identifying the most appropriate assessment tool(s). The following is a list of goals that can be aligned with one or more tools included in the Navigator:

a. Assess and monitor digital health readiness to investment priorities.
b. Track, monitor, assess, and benchmark the effective use of digital health.
c. Develop a digital health (or eHealth) strategy.
d. Develop an HIS interoperability strategy.
e. Assess and improve HIS interoperability maturity.
f. Develop an HIS strategy.
g. Monitor and evaluate HIS process improvements.
h. Determine current and desired maturity levels to develop a roadmap for continuous HIS improvement.
i. Assess and strengthen country HIS and data to track progress toward the health-related SDGs.

Step 3: Determine what (if any) digital health assessments have been conducted in the past. More information on this is provided in the section below, "How Can Tools Be Used in Combination or Sequence?".

Step 4: Determine additional criteria for selecting a tool (if needed). Depending on the goal of conducting an assessment, users may need to determine additional criteria to narrow their choice of tools. Some assessment goals align with multiple tools, whereas some goals align most closely with only one tool. Additional criteria include:

- Assessment **methods** determine what time and resources are needed to carry out an assessment (multi-day workshops versus individual stakeholder meetings). Appendix C provides additional details on each tool's recommended methods.
- The **language(s)** that the assessments tools are available in may be a key determining factor.
- **Key areas** to be assessed may also narrow the best-for-fit tool.

Step 5: Review the recommended tool or tools to make a final determination. Review of the tools should include reviewing the assessment tool and any accompanying guidance, such as a user's guide and available reports from a previous assessment conducted using the tool. See Appendix G for detailed instructions on how to use the Excel workbook.

4. How Can Tools Be Used in Combination or Sequence?

When a maturity model-based assessment tool has already been used in a given setting, it will be valuable to draw from the results of that assessment. Any digital health assessments conducted in a setting in the past two years should be reviewed when planning a new assessment. Any of the six tools included in the Navigator that have been conducted in the previous two years can be drawn from to inform the results of a new assessment.

When using the Excel-based Decision Support Workbook, users will be prompted to indicate whether any of the six tools in the Navigator have been used in that setting in the past two years. This selection will yield a comparison between the recommended (new) tool and the previously used tools.

4.A. Comparing Across the Tools

It should be noted that although all tools in the Navigator assess various aspects of digital health, each tool is unique in its architecture (how it organizes and asks questions about various aspects of digital health). For example, one tool may include digital health budgeting under a section on governance whereas another tool may include budgeting under a management section. Some tools are organized by "domains" and "components," and the levels or stages of maturity are defined differently in each tool. Therefore, direct comparisons of results and scoring cannot be made in tool results.

However, there is overlap between what the tools measure and, therefore, it is useful to draw from the results of previous assessments. The work has included an in-depth mapping of the most granular or the lowest architecture level (e.g., subcomponent is the lowest architecture level for the HIS SOCI) across each tool included in the Navigator to identify where there is direct or partial overlap between what the tools are measuring. The capability statements across the maturity continuum in each tool are tied to the lowest architecture level. Each tool refers to the lowest architecture level using different terms, as shown in Table 3. For the Navigator, we compared tools at their lowest architecture level for which capability maturity is described for different maturity levels. Please see the Excel-based Indicator Mapping Appendix for a detailed mapping of individual tool indicators.

Table 3. Individual tool architecture

Tool	Top architecture level	Intermediate architecture level	Lowest architecture level
EDIT	Building block	Sub-category	Indicator
GDHI	Indicator category	Indicator	Description
IMM	Domain	Subdomain	Subdomain description
IS4H	Strategic goal	Component	Description
SCORE	Indicator	Key element	Intervention
SOCI	Domain	Component	Subcomponent and description

If a tool has been used in the previous two years, the Navigator's Excel-based Decision Support Workbook will produce a new output tab showing how the recommended tool maps to the tool used previously. Any indicators in which there is overlap will be identified in the table. See the sample output in Table 4, which compares areas of measurement from the GDHI with the EDIT.

Table 4. Sample output from the Excel-based Decision Support Workbook

Based on your main assessment goal [and additional criteria], the Early Stage Digital Health Investment (EDIT) tool is the recommended tool.				
Given that you have used the Global Digital Health Index (GDHI) in the past, the Navigator recommends reviewing the data for the following indicators from the GDHI assessment to (1) determine its relevance and applicability to your main assessment goal, and (2) to inform the new or planned EDIT assessment. Please see the Indicator Mapping tab for more on the coding system used here.				
EDIT code	**EDIT indicator description**	**GDHI code**	**GDHI indicator**	**GDHI indicator description**
T.A.1.c	Mechanisms for information sharing within the health system	G.E.1	Indicator 13 – National digital health architecture and/or health information exchange	Is there a national digital health (eHealth) architectural framework and/or health information exchange (HIE) established?
T.A.2.a	Maturity of public sector digital health professional careers	G.D.4	Indicator 12 – Maturity of public sector digital health professional careers	Are there public sector professional titles and career paths in digital health?

Please note that previous assessment results should be reviewed and referenced when completing a new assessment, and not drawn from without considering whether changes need to be made. Levels of maturity and scoring will also vary between assessments; therefore, the numeric score may vary from tool to tool.

5. What about System-Specific Maturity Models?

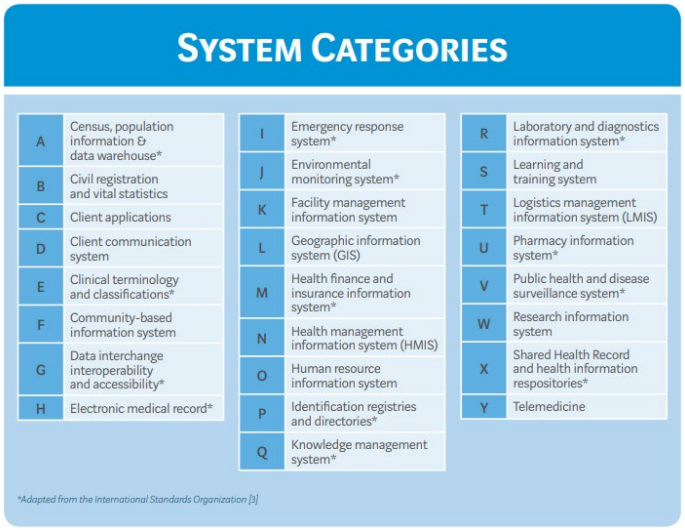
The Navigator provides an overview of the use of maturity model-based tools for digital health systems. In addition to the six tools included in the Navigator, there are maturity model-based tools designed to assess specific information subsystems that can provide detailed and specific assessment criteria, indicators, and steps for improvement to support specific subsystems (Figure 2). Such tools can be used in combination with the tools in the Navigator, which take a broader lens to assessing systems for digital health. The determination about when to use system-specific tools will depend on the specific goals of a country or organization.

This section provides an overview of system-specific tools and describes considerations for using such tools in combination. This section also provides higher-level guidance for three system-specific tools—the SCIS Maturity Model, the Digital Pandemic Preparedness (DDP) Assessment tool, and the AI in Health Maturity Assessment tool—highlighting emerging maturity model-based tools and opportunities for future mapping of tools indicators that build on the Navigator Version 1.0. Rather than being system-specific, USAID's Digital Ecosystem Country Assessment (DECA) (Section 6) is an example of a tool which encompasses the digital ecosystem. To illustrate the value of the Navigator for developing customized maturity assessment tools, an example from the World Bank has been included in Section 7. The World Bank utilized nine different tools and strategy documents to build a custom "hybrid" assessment tool for their purposes.

5.A. What Do We Mean by Specific Digital Health Systems?

A specific information system or HIS subsystem is a system that collects, stores, analyzes, and uses data specific to one public health or disease area. Subsystems include community health data systems, HIV, malaria, logistics, and SCIS. These systems may operate as siloed entities, or they may be interoperable with other information systems in a digital health ecosystem.

Figure 2. System categories[3]



[3] Source: WHO. (2018). Classification of digital health interventions v1.0. Retrieved from https://www.who.int/reproductivehealth/publications/mhealth/classification-digital-health-interventions/en/

Tools designed for specific subsystems can support countries and organizations in achieving their health systems goals by strengthening those specific information systems. Using a maturity model-based assessment allows for the identification of capabilities, gaps, and specific next steps for improvement.

5.B. How Does the Navigator Support the Use of System-Specific Maturity Models?

This section provides details about individual system-specific tools, and how they align and can be considered for use in combination with the other tools listed in the Navigator.

5.C. SCIS Maturity Model (SCISMM)

The SCISMM is a maturity model to assess a public health SCIS, created by the USAID Global Health Supply Chain Procurement and Supply Management (GHSC-PSM) project.

The public health supply chain intersects with multiple areas of the health system, including health programs, manufacturers, and clients. SCIS are foundational in supporting the efficient flow of physical commodities from manufacturers to patients. SCIS are essential to facilitating strategic and tactical objectives, including planning, control, and decision making. Table 5 describes how the SCIS fits into HIS subsystems.

The most recent version of the SCISMM was reviewed by the DH&I Maturity Model Small Working Group and was updated to align with maturity model-based tools that had been designed for a broader assessment of systems for digital health, notably the IMM and SOCI. (More information about the process is available here.) Version 2.0 of the SCISMM includes five levels of maturity for which sub-capabilities are mapped to assess and inform improvements in the SCIS. The fifth level of the SCISMM was added to allow for a level 0/1, or a baseline, where organizations may have some components of a defined maturity, but not all components needed to achieve level 1.

Table 5. HIS subsystems

HIS subsystem	Related national information systems that include systems for managing data on community health, health financing, logistics, and more (RHINO, 2021).
Public health supply chain	The network of supply chain partners catering to public health institutions and services. These partners mainly include manufacturers, governments, donors, procurers, shippers, and country warehouses and health facilities managed by governments. Public health supply chains may not include private pharmacies and clinics.
Supply chain information system	Systems, including operational/transactional—such as warehouse management, order management, planning, etc.—and foundational, such as master data management. These systems facilitate planning and coordination of physical movement, storage, and dispensing of commodities from manufacturers to shippers, to country warehouses, to health facilities, and ultimately to patients/end users.

Figure 3. SCISMM maturity scale[4]

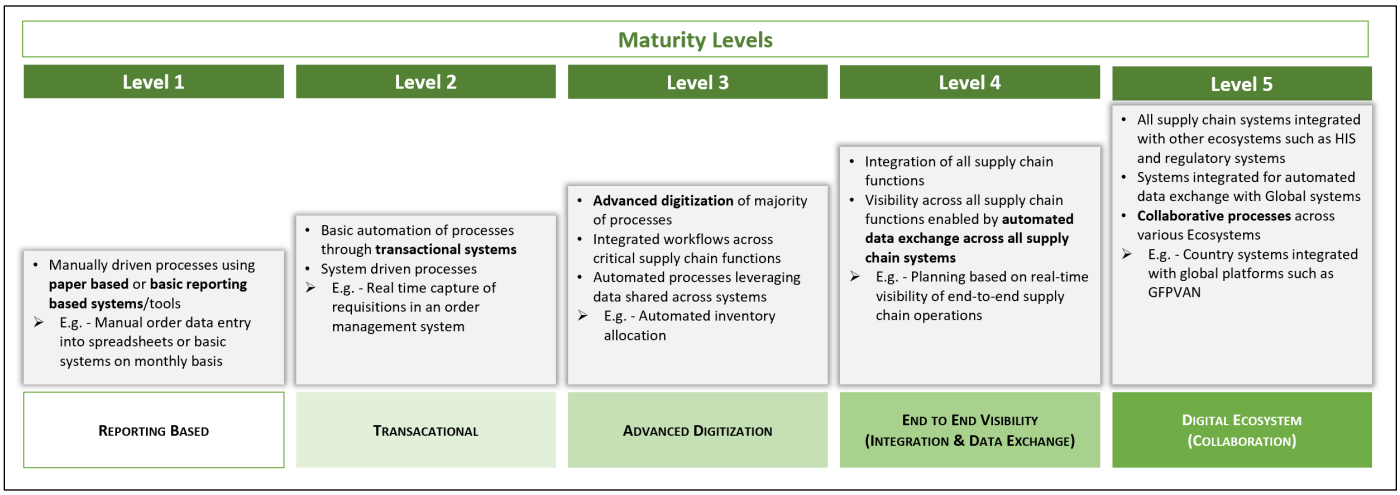


Table 6 provides an overview of SCISMM: its purpose, audience, assessment process, scoring methodology, use of the assessment results, number of levels/stages, attributes, required resources, and the list of countries where an assessment has been conducted.

Table 6. Overview of the SCISMM

Purpose	SCISMM is a maturity model to assess health supply chain information system(s) capabilities. The assessment helps identify gaps and areas that need improvement. The tool categorizes SCIS based on the Supply Chain Operations Reference model and further defines each maturity using the American Productivity & Quality Center (APQC) process framework.
Audience	Planners (governments in low- and middle-income countries//MOHs), funders, implementers
Process	SCISMM can be used in the following ways, or it can be used in a combination of these approaches below: • Individual self-assessments completed by supply chain stakeholders (warehousing, procurement, etc.) then reviewed together in a facilitated process with all stakeholders and subject matter experts (SME) to finalize the assessments. Individual assessments per SCIS area would typically take one to two days. Group review could be done during a half-day workshop; or • Workshop approach with all SCIS stakeholders available to discuss and provide feedback during a two- to three-day workshop. For either approach, feedback on SCIS capabilities should be obtained through interviews with respective stakeholders. Site visits by SMEs and SCISMM facilitators are highly recommended to ensure the accuracy of feedback.
Notes on methodology	Scoring uses averages within sub-capabilities to derive a spider/radar graph and maturity level-based graph.

[4] Retrieved from https://www.ghsupplychain.org/index.php/supply-chain-information-systems-maturity-reference-model-v2

Uses of the results	Identify SCIS areas of strength and gaps, and areas that offer opportunities for improvements. Help prioritize areas of SCIS improvement to better plan resource allocation. Provide a framework of key SCIS capabilities that can inform stakeholders during information system procurement activities.
Number of levels/stages	Five levels of maturity
Attributes	Eight main supply chain information system capabilities; each maturity has sub-capabilities defined within them for assessments
Resources needed	Availability of key SCIS area stakeholders/experts/users
Client countries as of 2021	Guinea, Nepal, Pakistan, Rwanda

5.D. SCISMM's Focus on the Health System

SCIS play an important role in a country's overall HIS. SCIS are the backbone for managing and coordinating the physical, information, and process flow, from planning to the consumption of commodities. Lack of an effective SCIS may result in commodities and data moving at a slower pace, impeding decision making, and ultimately impacting the ability of the health system to serve clients.

Table 7 provides an overview of what falls under SCIS capabilities, including forecasting and planning, data management, warehouse management systems, and more. The SCIS maturity model describes capabilities in the eight areas shown, across five levels of maturity. SCISMM users complete an assessment of each area and determine next steps for advancing their SCIS.

Table 7. SCIS capabilities

Forecasting & Planning System	Order Management System	Supplier & Contract Management System	Data Exchange & Management
• Demand planning • Supply planning • Plan distribution	• Requisitioning • Requisition approval • Inventory visibility • Requisition fulfillment • Order visibility	• Sourcing & contracting strategies • Tender management • Contract authoring • Supplier information management	• Data exchange • Product master data management • Facility master data management • Supplier master data management

Procurement System	Warehouse Management System	Transportation Management System	Track and Trace
• Procurement processing • Fulfillment visibility	• Inbound processing • Inventory management • Outbound processing	• Route management • Transportation execution • Freight audit and payment	• Commodity tracking • Commodity tracing • Authentication/ verification

The SCISMM measures the maturity of supply chain-specific capabilities described in the model and recommends using the HIS SOCI tool to assess, identify gaps, and develop improvement plans for the national HIS maturity and to understand how overall HIS maturity may impact SCIS capabilities (Table 8).

Table 8. Maturity model-based tools mapped to HIS domains

HIS domain	Maturity model to consider
HIS leadership and governance	HIS Stages of Continuous Improvement
HIS management and workforce	HIS Stages of Continuous Improvement
HIS ICT and infrastructure	HIS Stages of Continuous Improvement
HIS standards and interoperability	HIS Stages of Continuous Improvement HIS Interoperability Maturity Model
HIS data quality and use	HIS Stages of Continuous Improvement

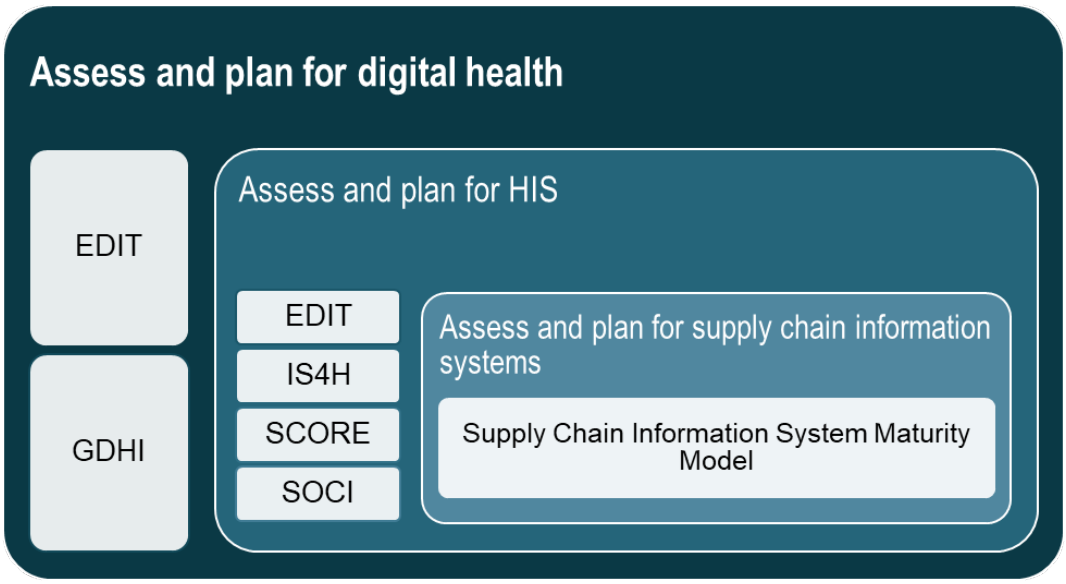
Please refer to the Navigator's Excel-based Decision Support Workbook for more information about selecting a more general HIS or the digital health assessment tool that best meets your needs.

The SCISMM is designed specifically to assess and guide next steps for strengthening SCIS.

5.E. How Do System-Specific Assessment Tools Align with the Overall Digital Health System?

Countries and organizations focused on overall digital health transformation may benefit from first using a maturity model-based tool that is not specific to a particular subsystem to assess the "as is" status of systems for digital health. For countries that have identified priority areas for strengthening specific subsystems, a tool designed specifically to assess that subsystem may be a good choice to use independently or following an overall digital health assessment.

Figure 4. Choosing an assessment based on organizational priorities



5.F. Digital Pandemic Preparedness Assessment (DPPA) Tool

The Navigator can be used with the Digital Pandemic Preparedness Assessment (DPPA) Tool, which focuses on a country's digital systems readiness for pandemic preparedness and response.[5] The DPPA Tool aims to provide a systematic methodology to meet country-identified health needs with digital health tools that integrate with countries' existing digital ecosystem, while modernizing their overall pandemic preparedness, response, and vaccination roll-out planning and execution. It integrates and builds on data from the USAID-funded Map & Match research and EDIT developed by the Kati Collective. The DPPA Tool and the Navigator tools draw from the EDIT framework and can be used synergistically. The DPPA Tool focuses on a country's digital systems readiness for pandemic preparedness and response, whereas the Navigator can be used to look at broader country HIS capabilities, including ongoing health system strengthening beyond the context of pandemic preparedness and response.

5.G. AI in Health Maturity Assessment Tool[6]

To make the roadmap toward AI maturity in health actionable, the Novartis Foundation has translated it into a freely available and user-friendly online AI in Health Maturity assessment tool available at http://ai.novartisfoundation.org/. The tool helps countries assess their readiness to deploy AI in health, and pinpoints areas that need further strengthening to realize the full potential of these new technologies. It will support more countries in being able to tap into the successes of AI in health, many of which are already being seen.

[5] Retrieved from https://digitalsquare.org/resourcesrepository/dppa
[6] See: https://ai.novartisfoundation.org/

6. Digital Ecosystem Country Assessment (DECA)[7]

USAID's Digital Ecosystem Country Assessment (DECA) informs the development, design, and implementation of USAID's strategies, processes, projects, and activities. The assessment evaluates the three pillars of a country's digital ecosystem: Digital Infrastructure and Adoption; Digital Society, Rights, and Governance; and Digital Economy. By taking a holistic view of ecosystem challenges and U.S. engagements and investments in-country, a DECA can facilitate interagency collaboration and private-sector engagement to strengthen the digital ecosystem. The resulting report identifies areas of opportunity and risk for Mission-funded programming.

7. World Bank's Digital Health Assessment Toolkit

The World Bank created its own Digital Health Assessment Toolkit by utilizing nine different tools and strategy documents. It has been included as an illustrative example of how the Navigator can be used to build a customized assessment tool. Using the Navigator, users can decide which domains, subdomains, and associated capability statements are relevant to their purpose. For more information about how the World Bank created its toolkit, a table has been included below.

Table 9. World Bank Hybrid Digital Health Assessment Toolkit

Overview: To reduce fragmentation and meet the needs of client countries, the World Bank created a digital health assessment toolkit that combines the assessment components from these digital health assessment tools (Global Digital Health Index, University of Chicago Data Framework, MEASURE Evaluation HIS Framework, USAID Digital Health Investment Review Tool, Global Observatory of eHealth, Broadband Commission, WHO/ITU eHealth Strategy Toolkit, IS4H Maturity Assessment tool, and University of Oxford Cybersecurity Capacity Maturity Mode). As such, this toolkit is a hybrid version of existing assessment tools and brings them together under a three-part focus on "AAAE": Digital Health **A**pplications, Information and System **A**rchitecture, **A**nalytics, and Digital **E**nvironment or Ecosystem. The toolkit is comprised of a digital health landscape profile tool, a questionnaire for in-depth interviews, and a Digital Health Maturity Scoring Tool. The Digital Health Maturity Scoring Tool assesses the entire digital health ecosystem by means of a set of indicators and scores per indicator, and results in a spider diagram that can be used as a basis for developing recommendations and phasing to improve the system.
Goal: Provide a digital health maturity score along five dimensions of digital health maturity as: (1) a basis for developing a prioritized and phased action plan for digital health improvements; and (2) to track temporal change.
Creator(s): World Bank, with inputs from development partners, technical experts, and client countries
Intended users: MOHs and their partners

[7] See https://www.usaid.gov/digital-development/DECA/Colombia

Areas of assessment: The assessment tool consists of indicators mapped to the four dimensions that form the basis of the toolkit:

1) Digital Environment: The indicators assess digital health from a macro perspective and national approach and strategies.
2) Architecture & Data: The indicators assess topics related with infrastructure, IT enterprise, health information systems, interoperability, data quality, privacy, standards, data architecture, and use of data.
3) Applications: The indicators assess digital health from a digital health intervention perspective, also including AI when applicable. In addition, it reviews acceptability and satisfaction of clients.
4) Analytics: The indicators assess data analysis, the utilization of advanced analytical techniques, AI and business intelligence methods, data science curriculum, and workforce. Each focus area assesses seven domains (as defined by the WHO/ITU eHealth Strategy Toolkit) that match those of the Global Digital Health Index.

Methodology: To fill-in the scoring tool, the assessment team should: (1) conduct a desk review of existent assessments in the country; (2) conduct interviews with key informants provided by the country counterpart using the open questionnaire in the toolkit; and (3) complete a quantitative landscape profile with socioeconomic, infrastructure, digital health inventory, and capacity indicators. Once all the information is collected, the assessment team can (a) fill-in the Digital Health Maturity Scoring Tool directly, and/or (b) provide the scoring tool to key informants and average the individual inputs. Once the score is obtained, based on the information collected, the assessment team should explain the result using a gap analysis method (i.e., SWOT) and validate the results and recommendations with the county counterpart and other stakeholders (i.e., through a workshop).

Assessment scale: Each area is composed of indicators that are evaluated using a scale of 1-5, from Nascent (1) to Optimized (5).

Attributes: The tool's innovative approach is that it was customized using existent indicators. It includes 74 indicators grouped into four digital health dimensions and aligned to the seven components of the WHO-ITU Strategy Framework.

Client countries: All low and lower middle-income countries can use the tool.

Link: https://openknowledge.worldbank.org/handle/10986/36547

8. Summary

The Navigator for Digital Health Capability Models was created to provide guidance on maturity model-based tools for digital health systems, and to meet a need to understand what tools best fit specific assessment goals and contexts. The Navigator was developed through an iterative process of engaging tool users, designers, funders, and decision makers from national digital health entities to understand each tool's intended use, what specific guidance was needed, and how to best design a Navigator for the tools.

The Navigator is intended to serve a specific need in the larger digital health ecosystem by allowing users to identify a best-for-fit tool that will help them understand the current status and to identify priorities for digital health investment. By providing a framework for understanding the individual tools and mapping specific indicators between tools, users and funders can understand how to leverage assessments used in the past and avoid duplication of effort. The Navigator should be used in combination with other digital health resources, such as WHO's *Digital Implementation Investment Guide*.[8]

The Navigator is a guide to six tools as they exist in 2021. When or if the tools are updated, and when new tools become available, the Navigator will need to be updated accordingly to remain relevant. The tools included in this version of the Navigator focus on the national level of a health system. There are several valuable maturity model-based assessment tools that are designed for specific systems and specific digital components, such as terminology (Appendix E).

It should be acknowledged that the Navigator and the tools it examines do not include assessment content or indicators focused on the aspects of digital health systems that specifically support the equitable distribution of resources and access to healthcare. The Navigator's advisory team has identified the need for an equity lens to be applied to subsequent versions of these tools and to the resources that support the use of these tools.

The hope is that the Navigator will be updated and adapted as new tools become available and as the understanding of the digital health ecosystem transforms.

The Navigator team encourages those who use the tools included in the Navigator to share their use cases, assessment results, and information about selecting assessments with the DH&I Working Group to assist in the creation of a capability model tool use inventory to support countries and organizations in their digital health journeys, and to understand what has been done, where it has been done, and what lessons can be learned. If you have a tool use story to share, please contact the secretariat of the DH&I WG.

[8] World Health Organization (WHO). (2020). Digital implementation investment guide (DIIG): Integrating digital interventions into health programmes. Geneva: WHO. Retrieved from https://www.who.int/publications/i/item/who-digital-implementation-investment-guide.

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World Health Organization (WHO). (2021). *Global strategy on digital health 2020-2025*. Geneva, Switzerland: WHO. License: CC BY-NC-SA 3.0 IGO.

Appendix A. Tool Fact Sheets

Early Stage Digital Health Investment Tool (EDIT)

Overview: EDIT is designed to facilitate a discussion between a country and its stakeholders about the building blocks that they need to have in place before designing digital health solutions. EDIT was developed to serve as a general assessment of a country's readiness to implement digital solutions, and to close the gap between the desire to implement digital health systems and the actual readiness to do so.

Goal: Assess and monitor digital health readiness to prioritize digital health investments, and to develop a digital health (or eHealth) strategy.

Creator(s): EDIT was developed by the Kati Collective with funding from the Bill & Melinda Gates Foundation

Intended users: MOHs and their partners, including donors and other stakeholders

Process: Scores are derived by averaging individual, self-administered stakeholder assessments. The EDIT assessment takes about one to two weeks and can be conducted with a few key stakeholders who have in-depth of knowledge about the country's digital health landscape. Scoring is meant to inform and guide subsequent conversations among key stakeholders to improve digital health readiness and to develop overall strategies.

Areas of assessment (Building Blocks): Human capacity; investments and funding; data capture and use; infrastructure; standards and interoperability; and governance and policy

Methodology: Those completing the assessment review the criteria for each indicator and select the criteria that are most closely related to their country scenario.

Assessment scale: Building Blocks are composed of indicators that are evaluated using a scale of 1-5, from No Capacity (1) to Sustainable Capacity (5).

Attributes: Includes six essential building blocks, with 19 respective subcategories, and 71 indicators in total. Indicators are categorized as information, enabling, or critical.

Client countries: Malawi. The Electronic Immunization Registry-specific version of this tool has been used in several other countries.

Source(s):
https://katicollective.com/tools
https://katicollective.com/what-were-thinking-1/edit-a-tool-for-the-greater-good

Global Digital Health Index (GDHI)

Overview: The GDHI is an interactive digital resource that tracks, monitors, and evaluates the use of digital technology for health across countries. GDHI is built on a set of indicators, based on the framework set in the WHO-ITU 2012 National eHealth Strategy Toolkit, to help countries track, monitor, assess, and benchmark the effective use of digital health.

Creator(s): HealthEnabled, MOHs, WHO, the Commonwealth Medical Association, Asia eHealth Information Network, Johnson & Johnson, Royal Philips, the Bill & Melinda Gates Foundation, and USAID

Goal: Track, monitor, assess, and benchmark the effective use of digital health, and develop a digital health (or eHealth) strategy.

Intended users: Governments (including MOHs), private companies, nongovernmental organizations, and donors

Process: Web-based survey completed by stakeholders in one to two hours. Results are validated in the document review process. The GDHI also enables countries to compare their results with the global average or a specific overall phase.

Areas of assessment: Leadership and governance; strategy and assessment; legislation, policy, and compliance; workforce; standards and interoperability; infrastructure; and services and applications

Methodology: Data for each country are submitted via the annual GDHI survey by MOH representatives who lead digital health efforts in their respective countries. As part of the annual GDHI survey, country representatives must select the appropriate phase for each assessment indicator and provide evidence and a rationale to support their selections. The scores assigned to the seven core indicators of the GHDI assessment are used to calculate an overall country average. Sub-indicators are included to provide greater specificity to the assessment but are not directly used in calculating country or global averages.

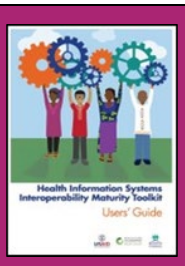
Assessment scale: Five maturity phases

Attributes: 19 core indicators aligned to the seven components of the WHO-ITU Strategy Framework

Client Countries: Afghanistan, Bangladesh, Benin, Chile, Democratic Republic of the Congo, Ethiopia, Indonesia, Jordan, Kuwait, Laos, Malaysia, Mali, Mongolia, New Zealand, Nigeria, Pakistan, Peru, Philippines, Portugal, Sierra Leone, Sri Lanka, Thailand, Uganda.[2]

Source(s):

1. http://index.digitalhealthindex.org/methodology
2. http://index.digitalhealthindex.org/map



HIS Interoperability Maturity Model (IMM)

Overview: The IMM assesses the ability of two or more information systems to exchange and use data from one another by identifying existing capacity, processes, and structures for key domains for HIS interoperability. Results are used to develop a roadmap to strengthen interoperability of the country's HIS, identify support resources, and set goal timelines.

Creator(s): MEASURE Evaluation; the Health Data Collaborative DH&I Maturity Model Small Working Group

Goal: Develop an HIS interoperability strategy and assess and improve HIS interoperability maturity.

Intended users: MOHs, implementing partners, and other stakeholders

Process: A two- to three-day consensus building workshop with stakeholders is conducted to implement the IMM assessment. Stakeholders include representatives from the MOH, digital health entities, implementing partners, and others involved in the interoperability of information systems.

Areas of assessment: Leadership and governance, human resources, technology

Methodology: Scoring allows for the full completion of levels and partial completion (if only two of three attributes have been met for a given level).

Assessment scale: Maturity levels from 1-5, ranging from nascent (1) to optimized (5)

Attributes: The HIS maturity model consists of a matrix made up of three domains and 18 subdomains.

Client Countries: Ghana, Kenya, Rwanda, Tanzania, Uganda, and Zanzibar

Source(s): https://lib.digitalsquare.io/handle/123456789/1468

Information Systems for Health (IS4H) Toolkit

Overview: The IS4H Toolkit serves as a reference framework that guides countries along the path of change marked by the information and knowledge revolution. It provides a path for establishing strategic priorities for IS4H capacity development and acts as a tool for ongoing monitoring and evaluation of process improvement to implement a better decision and policymaking mechanism through health-related information systems that ensure universal, free, and timely access to data and strategic information using the most cost-effective ICT tools.

Creator(s): PAHO

Goal: Develop an HIS strategy, and monitor and evaluate HIS process improvements.

Intended users: Policymakers, MOHs, nongovernmental organizations

Process: Assessment includes meetings with SMEs, desk reviews, observations of information platform use, and interviews with front-line administrative and clinical staff. Data are collected through interviews during a five-day workshop.

Areas of assessment: The IS4H framework is built around four strategic domains: data management and information technologies, management and governance, innovation, and knowledge management and sharing.

Methodology: A core group of five to ten people is formed to conduct the maturity model assessment process. This group should include representatives from the MOH and other stakeholders across the key IS4H domains, including information technology, information management, information analysis and use, and e-government. PAHO consultants review the findings of the core team and develop a report for review. This is followed by a Future State and Critical Success Factors Workshop and a Strategic Roadmap Workshop.

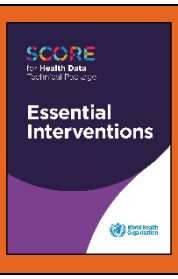
Assessment scale: Five maturity levels

Attributes: Four strategic goals, 26 components

Client countries: Fourteen Latin American and Caribbean countries

Source(s):

1. https://www.paho.org/ish/index.php/en/is4h-basics
2. https://www.paho.org/ish/images/toolkit/IS4H-APG-EN.pdf?ua=1



Survey, Count, Optimize, Review, Enable (SCORE) Essential Interventions

Overview: The SCORE for Health Data Technical Package supports WHO Member States in the effective collection, analysis, reporting, and use of health data to improve population health and achieve health-related SDGs. SCORE is intended to help address critical gaps in country health data and strengthen them, where possible, by helping users identify national and subnational priorities.

Creator(s): WHO country representatives, WHO technical experts, external agencies, individual experts

Goal: Assess and strengthen a country's HIS and data to track progress toward the health-related SDGs.

Intended users: MOHs and implementing partners

Process: The WHO conducts desk reviews of qualitative and quantitative data from multiple sources, including global, regional, and national survey reports; health information databases; birth and death registration portals; and health facility data. These preliminary data are shared with WHO Member States for review and validation, during which additional data are submitted by MOHs, national public health institutions, bureaus of statistics, ministries of finance, and other partners. Collated data and assessments are sent to governments of Member States for review and sign-off.

Areas of assessment: The SCORE Essential Interventions document uses five interventions: survey populations and health risks; count births, deaths, and causes of deaths; optimize health service data; review progress and performance; and enable data use for policy and action.

Methodology: A country scores 1-5 for each of the five intervention categories in the SCORE Assessment. Each intervention is divided into key elements, which are further divided into indicators. Indicators are defined by a set of attributes or items. Scoring begins at the indicator level by assessing the attributes. Indicators are scored based on a country's current capacity.

Assessment scale: Each indicator is given a score from 1-5.

Attributes: Twenty-four quantitative and qualitative indicators for assessing SCORE interventions at different levels

Client countries: Includes 133 countries across Africa, the Americas, Eastern Mediterranean, Europe, Southeast Asia, and Western Pacific United Nations-designated regions.

Source(s):

1. https://cdn.who.int/media/docs/default-source/world-health-data-platform/score/who_2021-01-29_methodology-score_tb.pdf?sfvrsn=6c507a39_3&download=true
2. https://www.who.int/news-room/q-a-detail/score-technical-package

HIS Stages of Continuous Improvement (SOCI) Toolkit

Overview: The SOCI toolkit establishes a systematic basis of measurement for describing the components of an HIS, setting goals for future levels of maturity, and laying the foundation for the development of improvement plans to realize the next stages of progress toward a stronger HIS. This tool was designed to help countries or organizations holistically assess, plan, and prioritize interventions and investments to strengthen an HIS.

Creator(s): MEASURE Evaluation, the United States Centers for Disease Control and Prevention, Health Data Collaborative's DH&I Maturity Model Small Working Group

Goals: Develop an HIS strategy; and determine the current and desired maturity levels to develop a roadmap for continuous HIS improvement.

Intended users: HIS leadership at the MOH and others internal and external to the government

Process: A country or organization must first define what is meant by HIS in its context; this is called defining the scope. This will help determine which stakeholders will be involved. Implementation of the SOCI Toolkit is estimated to take a few weeks to complete. This timeframe includes planning/leadership meetings, conducting the assessment, an in-person stakeholder workshop, and dissemination of the findings from the analysis.

Areas of assessment: Leadership and governance; management and workforce; ICT infrastructure, standards and interoperability; HIS data quality and use

Methodology: The HIS SOCI assessment tool can be administered in three different ways: self-administered, externally administered, or a hybrid of self- and facilitator-administered. Initial scoring is done by averaging scores from stakeholders; final assessment scores are determined during a consensus building workshop.

Assessment scale: Five stages of progression from 1-5, ranging from emerging/ad hoc (1) to optimized (5)

Attributes: Five HIS core domains, 13 components, and 39 subcomponents; the domains and components are derived from and map to elements of the WHO-ITU Strategic Framework

Client countries: Uganda; adaptations used in Cameroon, Côte d'Ivoire, and Ethiopia

Source(s): https://www.measureevaluation.org/resources/publications/ms-19-158/at_download/document

Appendix B. Components of Each Maturity Model

Although each tool touches on the digital health building blocks outlined in the WHO-ITU Strategy Framework, each individual tool varies by the specific attributes of digital health it covers and how the levels or stages of maturity are defined. This table outlines the levels of maturity, how each tool is organized, key areas for the assessments, and notes on how scoring is done.

	EDIT	GDHI	IMM	IS4H	SCORE	SOCI
Number of levels/stages	1-5	1-5 maturity phases	1-5 levels	1-5 maturity levels	1-5	1-5
Attributes	Six essential building blocks with 19 respective subcategories and 71 total indicators, categorized as information, enabling, or critical	Nineteen core indicators aligned to the seven components of the WHO-ITU Strategy Framework	Three domains and 18 respective subdomains	Four strategic goals, 26 components	Twenty-four quantitative and qualitative indicators for assessing SCORE interventions at different levels	Five HIS core domains, 13 corresponding components, and 39 subcomponents
Notes on scoring	Average scores from multiple stakeholders; tool allows for weighting of certain stakeholder's responses.	In average phase calculations, the platform rounds up and is meant to celebrate achievements.	Scoring allows for full completion of levels and partial completion (if only 2 of 3 attributes have been met for a given level).	Average of ranking scores for each goal.	A country scores 1-5 for each of the five intervention categories.	Initial scoring done by averaging scores from stakeholders; final assessment scores determined in a consensus building workshop.
Areas/ domains or measurement	1. Human capacity 2. Standards and interoperability 3. Governance and policy 4. Data capture and use 5. Investments and funding 6. Infrastructure	1. Leadership and governance 2. Strategy and investment 3. Legislation, policy, and compliance 4. Workforce 5. Standards and interoperability 6. Infrastructure 7. Services and applications	1. Leadership and governance 2. Human resources 3. Technology	1. Data management and information technologies 2. Management and governance 3. Knowledge management and sharing 4. Innovation	1. Survey populations and health risks 2. Count births, deaths, and causes of deaths 3. Optimize health service data 4. Review progress and performance 5. Enable data use for policy and action	1. Leadership and governance 2. Management and workforce 3. ICT infrastructure 4. Standards and interoperability 5. Data quality and use

Appendix C. Additional Details about the Tools

Resources and Technical Capabilities Needed for Individual Tools

The most important consideration is the goal of conducting the assessment, but the methods for conducting the assessment and resources needed are also important in planning for the assessment.

Tools vary in terms of the resources needed to conduct the assessment. Some assessments can be completed in one to two hours with a few key stakeholders, whereas other tools prescribe multi-day workshops with SMEs. The table below provides an overview of the resources needed for each assessment, as prescribed by the tool.

EDIT	Scores are derived from averaging individual, self-administered stakeholder assessments completed in an Excel workbook. EDIT is flexible, and depending on available resources, can be completed in a few hours with key stakeholders or through in-depth consultations. Stakeholders should have a depth of knowledge about the country's digital health landscape or of specific key areas: human capacity, investments and funding, data capture and use, infrastructure, standards and interoperability, and governance and policy. This will require a few weeks of advance planning, and the time needed to complete the assessment will vary depending on the desired depth of assessment results.
GDHI	GDHI scoring is done using a web-based survey that can be completed in one to two hours with input from a few key digital health stakeholders. Results are then validated in a document review process and expert consultations with the MOH, as needed.
IMM	Scores are determined during a two- to three-day consensus building workshop with key stakeholders from across government entities, such as the MOH, digital health strategists, implementing partners, and others involved in interoperability of information systems. The workshop usually requires a few weeks of advanced planning.
IS4H	Data are collected through site visits, interviews, and a five-day workshop with stakeholders who have expertise in national information systems governance, human resources, data management, business and clinical workflow and processes, and information technology platforms and infrastructure. Assessment planning and roadmap development take several months from start to finish.
SOCI	Scores are determined in a one- to two-day consensus building workshop to determine the scores and to develop a roadmap. The workshop should include key stakeholders from across ministries and relevant implementing partners with expertise in HIS, workforce, ICT, interoperability, and data use. This process requires a few weeks of advanced planning.
SCORE	The assessment process is multistep, including expert consultation, desk review, data collection, preliminary and final validation, and an analysis process. Assessments to date have been conducted with WHO Member States; results were shared in a 2020 report.

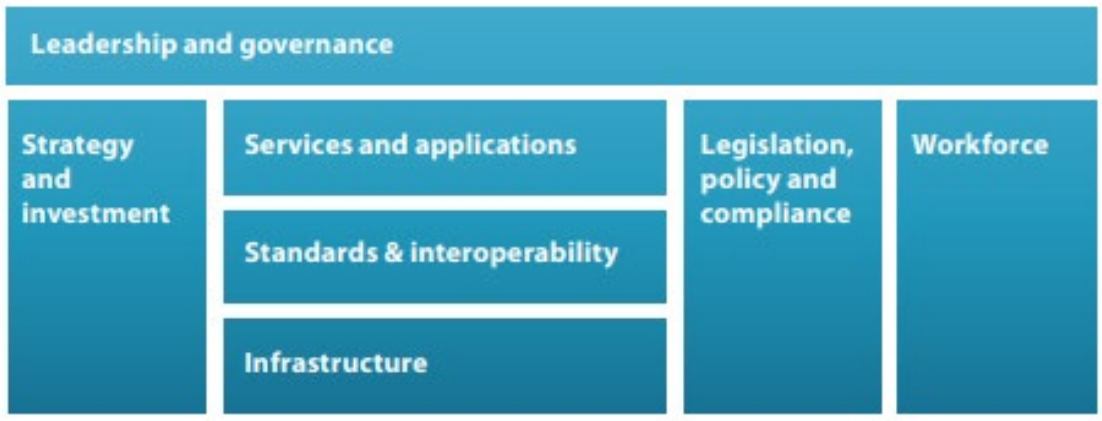
In What Languages Are the Tools Available?

All tools included in the Navigator are available in English, but some tools are available in other languages. Some tools may have been adapted or support in other languages. The table below lists in what languages the tools and their supporting documents are currently publicly available.

EDIT	• English
GDHI	• Arabic • English • French • Portuguese • Spanish
IMM	• English • French
SOCI	• English • French (forthcoming)
IS4H	• English • Spanish
SCORE	• English

Key Areas for Assessment

The figure below shows the building blocks of a digital health (eHealth) strategy (WHO-ITU,). Although all tools included in the Navigator touch on each area, some tools cover certain building blocks in more depth.



Appendix D. Where Have the Tools Been Used?

This consideration is not an available selection criterion in the Excel-based Decision Support Workbook, but it may be an important issue for those determining a best-for-fit tool. Tool users may also want to consider where the tools have been used, and review reported results from specific contexts to better understand the tool's practical application. The table below lists the countries where tools have been used. Publicly available assessment reports are linked by country.

EDIT	Malawi. The Electronic Immunization Registry specific version of this tool has been used in several other countries.
GDHI	Afghanistan, Bangladesh, Benin, Chile, Ethiopia, Indonesia, Jordan, Kuwait, Laos, Malaysia, Mali, Mongolia, New Zealand, Nigeria, Pakistan, Peru, Philippines, Portugal, Sierra Leone, Sri Lanka, Thailand, Uganda
IMM	Ghana, Kenya, Rwanda, Tanzania, Uganda, and Zanzibar
SOCI	Uganda; adaptations used in Cameroon, Côte d'Ivoire, and Ethiopia
IS4H	49 LAC countries (not publicly available)
SCORE	133 member states

Appendix E. Glossary of Key Terms

Term	Definition
Digital health	Digital health is the systematic application of information and communications technologies, computer science, and data to support informed decision making by individuals, the health workforce, and health systems to strengthen resilience to disease and improve health and wellness (WHO, 2020).
Digital health ecosystem	The combined set of digital health components representing the enabling environment, foundational architecture, and ICT capabilities available in a given context or country (WHO, ITU, 2020).
Digital health enterprise	The organizational unit, organization, or collection of organizations that shares a set of health goals, and collaborates to provide specific health products and/or services to clients, along with the business processes, data, systems, and technologies used to support the operations of the health system, including the point-of-service software applications, devices and hardware, governance, and underlying information infrastructure (such as the digital health platform) functioning in a purposeful and unified manner (WHO, 2020).
Digital health implementation	A discrete technology functionality—or capability—designed to achieve a specific objective addressing a health system challenge. Examples of digital health interventions include decision support, targeted client communications, and stock notifications (WHO, 2020).
Digital health strategy	An overarching plan that describes high-level actions required to achieve national health system goals. These actions may describe how new digital health components will be delivered or how existing components will be repurposed or extended. It may also be known as an eHealth strategy (WHO, 2020).
eHealth	The use of ICT for health (WHO, 2006).
Global goods	Global goods are digital software health tools that are adaptable to different countries and contexts to help address key health system challenges (PATH, 2019).
Health information system (HIS)	The HIS provides the basis for decision making and has four key functions: data generation, compilation, analysis and synthesis, and communication and use. The HIS collects data from the health sector and other relevant sectors; analyses the data; ensures their overall quality, relevance, and timeliness; and converts the data into information for health-related decision making (WHO, 2012).
HIS subsystem	Related national information systems that include systems for managing data on community health, health financing, logistics, and more (RHINO, 2021).

Term	Definition
Health management information system (HMIS)	Facility-based data aggregation system that is used for public health-related decision making. Its main users are public policy makers, health officers, researchers, planning departments of health offices, HMIS focal persons, data entry clerks, and many others, ranging from health facility to federal management levels (RHINO, 2021).
Interoperability	The ability of different applications to access, exchange, integrate, and use data in a coordinated manner through the use of shared application interfaces and standards, within and across organizational, regional, and national boundaries, to provide timely and seamless portability of information and optimize health outcomes (WHO, 2020).
Maturity model	Maturity models typically consist of several (three to six) stages of maturity that characterize an improvement process and encompass a broad collection of organizational activities and structures. They often provide abstract descriptions of maturity levels and broad assessment criteria for a range of users (Carvalho, 2016).
mHealth	The use of mobile and wireless technologies to support the achievement of health objectives (WHO, 2011).
Stakeholders	All persons affected by or interested in the consequences of a digital health implementation, including planners, end users, beneficiaries, and funders (WHO, 2020).

Appendix F. Publicly Available Maturity Model-Based Tools

This is a list of additional maturity model-based tools—of which the Navigator technical team is aware—that are not included in the Navigator version 1.0. The six tools included in the Navigator focus on the overall digital health ecosystem, whereas the tools listed below focus on specific aspects of digital health or specific systems. Future work to map these tools with the tools included in the Navigator would be of value to the field of digital health.

- Digital Health Indicator Rapid Assessment Tool
- Terminology Management Maturity Model
- Digital Health Investment Review Tool
- Digital Health Profile & Maturity Assessment Toolkit
- Digital Health Software: Global Good Maturity Model
- COVID-19 and Telemedicine: Tool for assessing the maturity level of health institutions to implement telemedicine services

Community Health Information System (CHIS) Maturity Models

1. DHIS2 Community Health Information System (CHIS) Guidelines and Assessment Tool
2. Community Health Worker Assessment and Improvement Matrix (CHW AIM)
3. Digital Health Tools for Community Health Worker Programs: Maturity Model and Toolkit
4. Scale to Track the Stages of Development of Community-Based Health Information Systems

Appendix G. Instructions for the Decision Support Workbook

The Excel-based Decision Support Workbook asks users to input their **main goal in conducting an assessment** and makes a recommendation. Users will also be asked to indicate if any of the **tools have been used in the previous two years** in their specific context, country, or organization. Users may be prompted to **select additional criteria** if more than one tool aligns with the selected goal. Recommendations are meant to indicate which tools users should **review more closely to determine best fit for purpose.**

Before using the tool selection tab, users should review the **Overview** and **Instructions** tabs.

Steps for using the Decision Support Workbook:

1. Select the **Tool Selection** tab in the Workbook.
2. Select up to two goals for implementing an assessment and any previous tools used.
    i. If two goals are selected that don't align with one specific tool, you will be prompted to select fewer goals.
    ii. If multiple tools align with the selected goal statement, you will be prompted to select additional criteria.
3. If prompted to select additional criteria, you must make **at least one additional selection.** Additional selection options include:
    i. **Languages** in which toolkits are available
    ii. **Methods** prescribed for each tool
    iii. **Key areas** each assessment covers
4. The workbook will make a recommendation based on your responses.
5. If additional criteria selected does not align with a tool option, two tool options will be recommended for further review.
6. If you have used a different tool(s) in the previous two years, new tabs will populate which compare indicators across the recommended and previous tool.

Select main goal(s) as a primary means of selecting a tool (up to two).

What is the main goal of conducting an assessment?	
Assess and monitor digital health readiness to prioritize digital health investments	☐
Track, monitor, assess, and benchmark the effective use of digital health	☐
Develop digital health (or eHealth) strategy	☐
Develop a health information systems (HIS) interoperability strategy	☐
Assess and improve HIS interoperability maturity	☐
Develop an HIS strategy	☑
Monitor and evaluate HIS process improvements	☐
Determine current and desired maturity levels to develop a roadmap for continuous HIS improvement	☐
Assess and strengthen country HIS and data to track progress towards the health-related SDGs	☐
Have you used any of the tools in the last 2 years?	
Global Digital Health Index (GDHI)	☑
HIS Interoperability Maturity Model (IMM)	☐
HIS Stages of Continuous Improvement (SOCI)	☐
Early Stage Digital Health Investment Toolkit (EDIT)	☐
Information Systems for Health Maturity Assessment tool (IS4H)	☐
Survey, Count, Optimize, Review, Enable tool (SCORE)	☐
NONE	☐
Process	
Reset	
Save & Close	

What is the main goal of conducting an assessment?	
Assess and monitor digital health readiness to prioritize digital health investments	☐
Track, monitor, assess, and benchmark the effective use of digital health	☐
Develop digital health (or eHealth) strategy	☐
Develop a health information systems (HIS) interoperability strategy	☐
Assess and improve HIS interoperability maturity	☐
Develop an HIS strategy	☑
Monitor and evaluate HIS process improvements	☐
Determine current and desired maturity levels to develop a roadmap for continuous HIS improvement	☐
Assess and strengthen country HIS and data to track progress towards the health-related SDGs	☐
Have you used any of the tools in the last 2 years?	
Global Digital Health Index (GDHI)	☑
HIS Interoperability Maturity Model (IMM)	☐
HIS Stages of Continuous Improvement (SOCI)	☐
Early Stage Digital Health Investment Toolkit (EDIT)	☐
Information Systems for Health Maturity Assessment tool (IS4H)	☐
Survey, Count, Optimize, Review, Enable tool (SCORE)	☐
NONE	☐

Process

Reset

Save & Close

Select any/all tools that have been used in the context in the **previous two years.**

When more than one tool aligns with the goal, additional criteria can be selected.

In what language will the assessment be conducted?	
English	☐
French	☐
Spanish	☐
Portuguese	☐
Arabic	☐
What assessment method(s) do available resources support?	
Half-day workshop with 2-3 key stakeholders	☐
Individual interviews conducted and aggregated remotely	☐
Desk review of documents, individual stakeholder interviews, and consensus-building workshop (1-2 days)	☐
Individual stakeholder interviews and consensus-building workshop (2-3 days)	☐
Week-long stakeholder workshop and site visits/observations	☐
Desk review of documents and data sources followed by validation workshop with country government officials	☐
Which building blocks are your priority to assess? *see WHO-ITU National eHEalth strategy building blocks	
Leadership and governance	☐
Strategy and Investment	☐
Legislation, policy, and compliance	☐
Workforce	☐
Standards and interoperability	☐
ICT Infrastructure	☐
Services and applications	☐
Data quality and use	☐

Make additional selections to further filter tool recommendations.

Decision support output

Tools that align most closely with assessment goals will be recommended.

Based on the goal(s) you have selected:

The tools that best fits your selected goal(s)	Based on main selection criteria:
Tool Name: GDHI	**Selected Goal:** Develop digital health (or eHealth) strategy
Tool Name: EDIT	**Selected Goal:** Develop digital health (or eHealth) strategy

If additional criteria is selected, this may narrow the tool selection. In this example, Portuguese was selected as the preferred tool language.

Based on your additional selected criteria, the most appropriate tool in the Navigator is:

Most appropriate tool:	Based on additional selection criteria:
Tool Name: GDHI	Portuguese

Please select the **GDHI** tab for more information on this tool
Please review the findings from past assessment using **GDHI** before deciding to conduct another assessment using **GDHI**.

Appendix H. Assessment Criteria, by Tool

	GDHI	IMM	SOCI	EDIT	IS4H	SCORE
What is the main goal of conducting an assessment?						
Assess and monitor digital health readiness to prioritize digital health investments				X		
Track, monitor, assess, and benchmark the effective use of digital health	X					
Develop a digital health (or eHealth) strategy	X			X		
Develop a health information systems (HIS) interoperability strategy		X				
Assess and improve HIS interoperability maturity		X				
Develop an HIS strategy			X		X	
Monitor and evaluate HIS process improvements					X	
Determine current and desired maturity levels to develop a roadmap for continuous HIS improvement			X			
Assess and strengthen country HIS and data to track progress towards the health-related SDGs						X
In what language will the assessment be conducted?	X	X	X	X	X	X
English	X	X				
French	X				X	
Spanish	X					
Portuguese	X					
Arabic	X	X	X	X	X	X
What assessment method(s) do available resources support?						
Half-day workshop with 2-3 key stakeholders	X			X		

	GDHI	IMM	SOCI	EDIT	IS4H	SCORE
Individual interviews conducted and aggregated remotely	X			X		
Desk review of documents, individual stakeholder interviews, and consensus-building workshop (X-2 days)			X	X		
Individual stakeholder interviews and consensus-building workshop (2-3 days)		X		X		
Week-long stakeholder workshop and site visits/observations					X	
Desk review of documents and data sources followed by validation workshop with country government officials						X
Which building blocks are your priority to assess?*						
Leadership and governance	X	X	X	X	X	X
Strategy and Investment	X	X	X	X	X	X
Legislation, policy, and compliance	X	X	X	X	X	X
Workforce	X	X	X	X	X	X
Standards and interoperability	X	X	X	X	X	X
ICT Infrastructure	X	X	X	X	X	X
Services and applications	X	X			X	X
Data quality and use			X		X	X

* See WHO-ITU National eHealth strategy building blocks.

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