DATA QUALITY GUIDEBOOK

Maintaining Optimal Data Quality on WHO's Digital Health Atlas Platform

World Health Organization

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How to read this Guidebook?

Welcome to the guidebook of data quality guidelines for using the Digital Health Atlas (DHA) platform effectively!

This guide aims to provide you with insights on digital health atlas platform and the data quality guidelines that must be followed to maximize the benefits offered by the DHA platform. Here's how you can make the most of this guidebook:

1. Begin by reading the overview section to get a high-level understanding of the purpose and scope of the guidebook. This section will provide you with an overview of the topics covered and what you can expect to learn.
2. Familiarize yourself with the structure of the guidebook. It may be divided into chapters, sections, or steps. Understanding the organization of the content will help you navigate through the guidebook more efficiently.
3. The guide provides comprehensive details of the digital health atlas platform; however, it is also recommended to use the DHA platform hands-on before proceeding to the chapter of data quality guidelines.
4. The data quality guidelines are split into four steps, these steps must be read sequentially to build a solid foundation of knowledge and ensure that you grasp the concepts in a logical order.
5. The data quality guidelines for data entry on the digital health atlas platform, are written to provide all the details to the user, it is recommended to make utmost use of the provided details by following the sequence below-
    a. Understand the context of the question
    b. Use the data quality guidelines (related to both key structural elements and individual questions) and quality checks to answer the question
    c. Validate your response by comparing with illustrations
6. To delve deeper into specific topics or gain more detailed conceptual understanding, make sure to explore the references provided throughout this guidebook. These references may include links to additional resources, documents, or articles that offer in-depth information on the subjects covered.
7. If you come across any complex or unclear sections in the guidebook, don't hesitate to seek clarification. Reach out to digital-health-atlas@who.int for additional support and guidance. Clearing any doubts will help you better understand and implement the data quality guidelines effectively.

Remember, this guidebook is a valuable resource for improving data quality on the DHA platform. Take the time to read and understand it thoroughly to make informed decisions and contribute to the platform's success.

Overview

The data quality guidebook for digital health atlas platform is created to help the users derive the intended benefits from the platform. The guidebook provides a high-level overview of the digital health atlas platform and outlines the data quality guidelines for data entry.

The guidebook is divided into three chapters-

Chapter I- Digital Health Atlas

The chapter focusses on providing details about the digital health atlas platform including platform purpose, features, functionalities and user roles. The lifecycle of the digital health project on the digital health atlas platform is also briefly described in the chapter.

Based on the information outlined in the platform purpose, the importance of data quality for efficiently managing the data within the digital health atlas platform is defined.

Chapter II- Data Quality Guidelines

The data quality guidelines are defined corresponding to the specific functionality of registering the projects on the DHA platform. The guidelines are outlined as a framework consisting of four steps-

Step I: Pre-Project Addition- Outlines the quality checks to made before adding the project on DHA.

Step II: Project Addition- Expounds the data quality guidelines corresponding identified group of questions and individual questions.

Step III: Post Project Addition- Defines the quality checks to be performed after adding the project details on DHA.

Step IV: Project Maintenance- Provides insights on how to maintain the relevant project details on DHA.

Chapter III- Mappings for Quality Checks

The quality checks related to mapping between different concepts identified in the data quality guidelines are clearly outlined in this chapter. It includes of mapping between-

1. Health System Challenges and Digital Health Interventions
2. System Categories and Digital Health Interventions

The guidebook ends with a concluding note and reference links to the conceptual documentation of the subjects covered within this guidebook.

Chapter I:

Digital Health Atlas

The WHO's Digital Health Atlas (DHA) Platform is an inventory of the digital health projects across the geographies to support the governments, implementors, and donors in coordinating the digital health activities.

The Digital Health Atlas Platform revolutionizes the coordination of digital health projects, addressing the challenges inherent in traditional methods, viz.

1. The DHA platform serves as a comprehensive inventory of digital health projects, preventing loss of information and providing valuable insights into the specific systems implemented at different health facilities.
2. DHA offers a standardized approach for accessing, documenting, and exchanging information on digital health projects
3. The DHA Platform eliminates the drawbacks of fragmented and uncoordinated digital investments, minimizing duplication of efforts and inefficiencies among stakeholders.

Platform Overview

The Digital Health Atlas platform allows access for three main roles- Implementors, Government, Investors/Donors. Implementors are given access to basic functionalities while Government and Investor/Donor are provided a set of incremental functionalities on the top of basic ones. Below is the comprehensive list of functionalities offered by the DHA Platform-

Feature	Implementor	Government			Investor/Donor		
		Viewer	Admin	System Admin	Viewer	Admin	System Admin
Account Management	✓	✓	✓	✓	✓	✓	✓
Searching Projects	✓	✓	✓	✓	✓	✓	✓
Registering Projects	✓	✓	✓	✓	✓	✓	✓
Export/ Import Project	✓	✓	✓	✓	✓	✓	✓
In/Activate API Key	✓	✓	✓	✓	✓	✓	✓
Assessing Projects	✓	✓	✓	✓	✓	✓	✓
Assessment Learning Resources	✓ View	✓ View	✓ Add	✓ Add	✓ View	✓ Add	✓ Add
User Management	✗	✓ Viewer	✓ Admin & Viewer	✓ All Levels	✓ Viewer	✓ Admin & Viewer	✓ All Levels
Country Page	✗	✗	✗	✓	✗	✗	✗
Update Map Data	✗	✗	✗	✓	✗	✗	✗
Project Approval	✗	✓ View	✓	✓	✗	✗	✗
Country Specific Questions	✗	✓ View	✓	✓	✗	✗	✗
Investor/Don-or Page	✗	✗	✗	✗	✗	✗	✓
Investor/Don-or Specific Questions	✗	✗	✗	✗	✓ View	✓	✓

The features outlined above can be elaborated upon as follows-

1. Search Project/s:

Users can easily search for projects on the platform using keywords and filters, gaining access to a list of projects that can be exported or viewed individually.

2. Register Project/s:

Users can add their digital health projects to the platform by importing data, activating API keys, or creating new projects. The registration process involves answering a comprehensive form that captures project details, solution overview, and technology used and saving the project as draft or publishing it.

The project/s in draft or published state can also be ***archived*** to be removed from the list of searchable projects while still being maintained for potential future reuse.

3. Assess Project:

The platform enables users to assess the readiness of their digital health projects for expansion. A standardized framework in the form of a yes-no questionnaire helps determine the project's readiness score for scaling.

4. Country Page:

This page offers specific functionalities for government users, including:

a) Manage Project Endorsement: Government users can evaluate and endorse the projects on the Digital Health Atlas platform.
b) Manage National Digital Health Reference Documents: Users can align country projects with the National Health Strategy by adding relevant documents.
c) Manage Users: Government users can manage access approvals for other government users.
d) Manage Country Specific Questionnaire: Government users can customize the registration project form by adding country-specific questions that align with their needs, these questions appear only when the project is being registered for the country that has specifically defined them.
e) Manage Country Map- The platform allows for updating country boundaries to reflect the latest developments.

5. Investor/Donor Page:

The Investor/Donor page provides functionalities for Investor/Donor users, including:

a) Manage Users: Investor/Donor users can manage access approvals for other Investor/Donor users.
b) Manage Investor/Donor Specific Questionnaire: Investor/Donors can customize the registration project form by adding specific questions that align with their requirements, these questions appear only when the project is being registered involving the investor that has specifically defined them.

By offering these features, the platform enhances user experience, facilitates collaboration, and ensures efficient management of digital health projects for implementors, government and investor/donor users.

Project Lifecycle in Digital Health Atlas

The process of registering a digital health project on the digital health atlas platform encompasses a comprehensive lifecycle approach. This approach ensures that the project effectively serves its purpose of promoting global coordination, while also allowing for ongoing updates and assessments to facilitate scaling.

By adhering to a lifecycle approach, the registration process becomes more than just a one-time event. It becomes an ongoing process that keeps the project aligned with the evolving needs and advancements in the digital health landscape.

The project lifecycle comprises various stages as below-

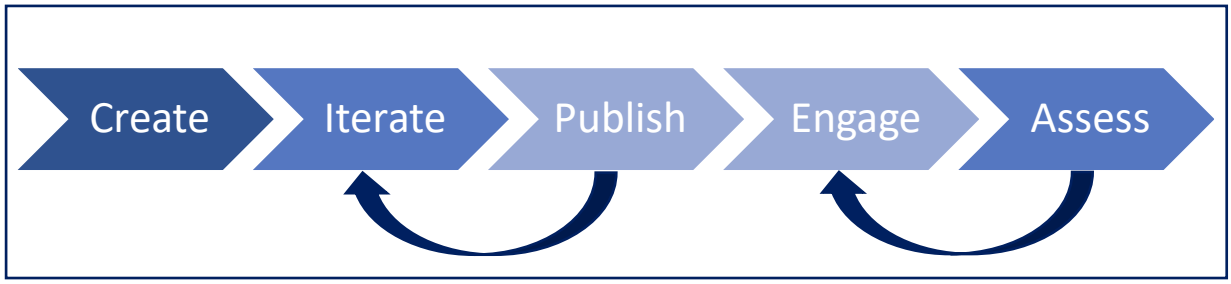


Diagram 1: Project Lifecycle Stages

1. Create

Creating a new digital health project on the DHA platform involves answering registration questions that cover both project and the corresponding technology details. This step allows to provide comprehensive information about the project, including its objectives, stages, stakeholder details, standards, and technology stack. The project can be saved as draft on providing all the relevant details.

2. Iterate

During this step, project owner can review the draft project from the reader's perspective and assess the completeness of the information outlined on the DHA platform. By considering various concepts and perspectives, one can make any necessary changes or updates to the information that was added earlier. This ensures that the project's details are accurate, comprehensive, and effectively convey the key aspects of the digital health initiative.

3. Publish

Once the digital health project is published on the platform, it becomes visible to all users. However, even after publishing, there is a flexibility to make continuous updates to the project to accommodate any changes that may occur on the platform or underlying concepts. This allows to ensure that the project remains up-to-date and aligned with the latest functionalities and concepts of the platform.

In addition to platform changes, it is essential to regularly update certain standard data points within the project. This will include updating statistics, project stages, and any other relevant data that may change over time. These updates are necessary to maintain accuracy and transparency by reflecting the most current information.

4. Engage

The visibility of digital health project details enables global coordination among stakeholders. During this stage, the project is discovered and evaluated for its suitability and scalability, laying the foundation for potential future expansion. Stakeholders can assess the project's alignment with their goals, objectives, and requirements, considering factors such as its relevance, feasibility, and potential for growth. This evaluation process helps determine whether the project is a good fit and has the potential to be scaled up or expanded further.

If the project is deeming suitable, stakeholders connect and collaborate to determine the most sustainable path for its implementation.

5. Assess

During this stage, the project undergoes an assessment to determine its readiness for scaling. The project owner is required to answer a set of questions that provide insights into the project's readiness to be adopted by additional geographies and users. These questions are related to the aspects outlined in the MAPS Toolkit (References).

Based on the responses provided, the platform automatically generates a readiness to scale score. This score serves as an indicator of how prepared the project is to expand its reach and accommodate a larger user base in different geographical locations. The scoring system helps stakeholders gain a quantitative understanding of the project's scalability potential and assists in decision-making regarding its future implementation and growth strategies.

By following this lifecycle, the digital health atlas platform ensures that registered projects remain dynamic and responsive to the evolving needs of the global health community. It fosters ongoing collaboration, information sharing, and coordination, ultimately leading to enhanced effectiveness and impact in the question of digital health.

Importance of Data Quality in DHA Platform

The primary objective of adding digital health projects to the digital health atlas (DHA) platform is to enhance global coordination in managing the inventory of digital health projects. The success of this objective depends heavily on the quality of data being added into the DHA platform, as the platform's purpose can be undermined by poor data quality.

The quality of data fed into the digital health atlas platform can be assessed using five key dimensions:

1. ***Accuracy:*** This dimension focuses on ensuring that the data added is precise and reflects the intended meaning, considering the context and underlying concepts of the digital health project.
2. ***Completeness:*** This dimension ensures that the data provides a comprehensive and holistic picture of the project, leaving no significant gaps or missing information that would hinder a thorough understanding of the project's details.
3. ***Consistency:*** Consistency involves using standardized techniques and guidelines when entering data, ensuring that similar data points are treated uniformly and can be easily compared and analysed.
4. ***Validity:*** Validity refers to the data format and adherence to predefined rules or standards. Valid data follows the expected structure, format, and constraints, ensuring its reliability and compatibility with the DHA platform.
5. ***Uniqueness:*** Uniqueness emphasizes the need for distinct and non-duplicate data entries, avoiding redundancy and ensuring efficient data management and analysis.

The positive adherence to the above data quality dimensions, directly serve to the intended outcomes of the platform, viz.

1. ***Global Coordination:*** By maintaining data quality, the DHA platform enables improved global coordination in managing digital health projects. High-quality data ensures accurate representation of projects, facilitating effective collaboration, knowledge sharing, and resource allocation among stakeholders worldwide.
2. ***Enhanced Visibility:*** High-quality data ensures that the added projects have appropriate visibility within the DHA platform. This means that the relevant details of the projects are easily accessible, searchable, and discoverable by users.
3. ***Directed Monitoring:*** Good quality data enables effective monitoring of the projects in a meaningful and insightful manner. It allows stakeholders to track progress, identify trends, and make data-driven decisions based on reliable information.
4. ***Strengthened Impact of Investments:*** By maintaining data quality standards, the DHA platform can strengthen the impact of digital health investments. Accurate and comprehensive data helps stakeholders assess the effectiveness of projects, identify successful strategies, and promote knowledge sharing for improved outcomes.

Therefore, placing emphasis on data quality ensures that the DHA platform serves as a valuable resource for stakeholders, providing them with reliable information and facilitating efficient coordination in the management of digital health projects.

Chapter II:

Data Quality Guidelines

The data quality guidelines serve as a step-by-step guide that project owners must follow when registering their projects on the digital health atlas (DHA) platform. These guidelines are designed to ensure that the data added to the platform aligns with the desired outcomes of the DHA platform and meets the data quality dimensions.

By adhering to the guidelines, project owners can effectively navigate through the registration process and optimize the quality of the data they provide. The guidelines act as a cheat sheet, offering clear instructions and recommendations on how to achieve the desired data quality standards.

The guidelines are organized into a four-step framework that outlines specific actions to be taken at different stages: pre-project addition, project addition, post-project addition, and project maintenance.

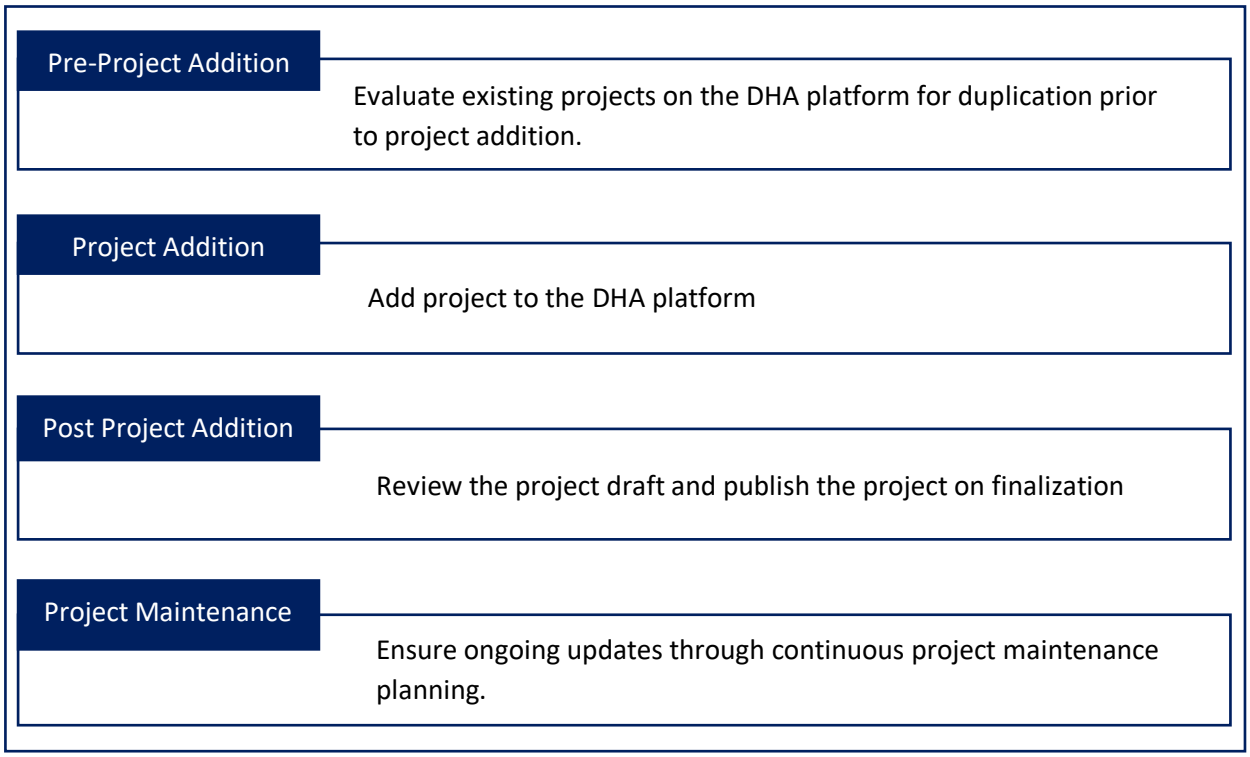


Diagram 2: Data Quality Guidelines Framework

Step I- Pre-Project Addition: Evaluate Project Distinctiveness

To maintain the efficiency and effectiveness of the DHA platform, it is crucial to avoid duplicate entries of the digital health projects. Therefore, before adding a new project to the platform, it is essential to conduct a thorough search to check if the project already exists.

Users can perform search on the platform by using the following methods:

Keywords: Users can enter relevant keywords related to a specific question or topic to narrow down their search results.

Filters: The platform provides various filtering options to refine search results based on specific criteria such as location, digital health interventions, system categories, etc.

To enhance the search experience for users on the digital health atlas (DHA) platform, following specific guidelines related to search options can be highly beneficial. To optimize search results and achieve precise outcomes, users performing search should follow best practices, including:

1. ***Outline Crucial Requirements:*** Clearly define the most important aspects of the project being searched to focus only on the essential elements. The identification of the crucial parameters can help user to land on the project that fulfils one or all the requirements.

   For example- Searching for a project that, i) solves the challenge of lack of population denominator ii) is a Health Management Information System iii) uses an open-source project license

2. ***Accurate Mapping:*** Accurately map the identified aspects to the appropriate search nodes i.e., filters or keywords within the platform to ensure relevant results.

   For example- The requirement, i) solves the challenge of lack of population denominator can be searched with the filter of Health System Challenges

   ii) is a Health Management Information System can be searched with the filter of Health Information System

   iii) uses an open-source project license can be searched using the keyword search.

3. ***Evaluate Critical Data Points:*** When searching, evaluate critical data points for each searched project to determine its suitability and relevance.

   For example- In above case, the critical data points are, i) Health System Challenge ii) Health Information System iii) Governance License

However, these best practices cannot lead to required outcomes unless the data was fed in the platform taking into consideration the search terms. For project owners to make their projects more discoverable, they should follow a set of best practices, such as:

1. ***Understand Search Patterns:*** Develop an understanding of common search patterns and the keywords or filters most used by users.
2. ***Optimal Data Input:*** Make informed decisions when entering data during project registration to ensure accurate and comprehensive information is provided.
3. ***Awareness of Critical Data Points:*** Be aware of the critical data points that users are likely to consider when searching for projects, and ensure they are accurately represented in the project details.

To enhance discoverability and maintain consistency in terms used across the platform, utilizing a digital health glossary can be highly advantageous. This glossary ensures the consistent use of terms throughout the platform, enabling effective and standardized search experiences for users.

By following these guidelines and utilizing a digital health glossary/s, both users and project owners can enhance the search experience on the DHA platform, enabling more precise and relevant results to be obtained.

By conducting a search on the DHA platform, users can identify if there are existing projects that align with their proposed project. This helps in avoiding unnecessary duplication and ensures that the platform's inventory remains clean, organized and streamlined.

The search outcome will determine how the project should be managed, and it can fall into one of the following scenarios:

1. ***Project already exists:*** If an existing project on the platform already covers all the necessary details of the project being considered, the user can choose not to register or update the project. In this case, there is no need to duplicate the project entry.
2. ***Project already exists, but there are advancements:*** If a project exists but there have been advancements or updates since its initial publication on the platform, the user should update the existing project. This involves adding and providing details about the advancements made to ensure that the project's information remains up to date. The user can get in touch with the contact person for advancements and getting added as an editor.
3. ***Project subset with different details:*** In some cases, a project may already exist on the platform, but the current addition pertains to a subset of the project involving different details. In this scenario, the user should register a new project that references the existing project as the parent. The user can then provide additional details specific to the project subset or add-ons.
4. ***Project does not exist:*** If the project does not exist on the platform, it can be added with all the precise details as described in Step II.

By considering these four scenarios, users can effectively manage digital health projects on the DHA platform, avoiding duplication, ensuring information accuracy, and providing relevant details based on the context of the project. This approach streamlines the projects and helps maintain a comprehensive and up-to-date inventory of digital health initiatives.

Step II- Project Addition: Adding Project to DHA Platform

To add a new digital health project to the digital health atlas (DHA) platform, the project owner is required to complete the registration form by filling in the necessary details. This step is crucial to provide comprehensive information about the project and ensure its accurate representation on the platform.

During this stage, the project owner should carefully consider the various questions on the registration form and determine how the data can be inputted in a way that optimizes comprehension for the reader. The data quality guidelines for this step encompass specific instructions on how to respond to each question, considering the guidelines corresponding to question's context and key structural element.

Key Structural Elements and Registration Questions

The digital health project registration form consists of various questions that capture essential project details. These questions can be broadly categorized into three elements: factual elements, qualitative elements, and quantitative elements.

These elements are a group of questions, questions that portray common characteristics related to data interpretation and potential areas for improvement. Therefore, the questions that fall within any of the three elements adhere to both the data quality guidelines specific to the element and the quality guidelines established for each individual question.

Quality Guidelines- Key Structural Elements

The context and data quality guidelines corresponding to the key structural elements are as below-

1. Factual Elements

Context	The factual elements in the digital health project registration form are the questions that provide comprehensive information about the end-to-end project ideation and corresponding facts. These elements, when combined, cover all the essential aspects of the project, ensuring the completeness of project details on the platform.
Quality Guidelines	1. All the questions must be answered to its greatest accuracy by understanding the question context 2. The open text questions must be answered by making use of keywords from the standard digital health glossaries (References)
Indicator	

2. Qualitative Element

Context	The qualitative elements in the registration form of the digital health project are questions that offer a standardized perspective on the project. These questions are derived from shared resources and aid in comprehending the specific category to which the project belongs. By providing a clear context through shared resources, these elements help eliminate errors that may arise from varied interpretations by different individuals.
Quality Guidelines	1. Subject Matter Experts handling different aspects of project must be consulted with for answering the qualitative questions 2. The questions must be answered by understanding the context of every selection option presented 3. All the options must be evaluated prior to finalizing the choice/s
Indicator	

3. Quantitative Element

Context	The quantitative elements in the registration form of the digital health project are the questions that quantitatively present the project details. These questions offer a transparent view to the reader, enhancing the project's credibility by providing objective and measurable information.
Quality Guidelines	1. The responses must be provided to its greatest accuracy by evaluating the current state of the project 2. The quantitative details must be updated at regular intervals by defining a standard update timeline
Indicator	

Mapping of Registration Questions with Key Structural Elements

Based on the context of key structural elements, the detailed mapping of every question on the DHA platform project registration form with the key structural elements is as below –

- Factual Elements, - Qualitative Elements, - Quantitative Elements

Q. No.	Question	Element
1	What is the project name?	
2	Who are your investment partners?	
3	Who are your implementing partners?	
4	What is the name of the lead organization?	
5	Which country is the project located in?	
6	What is the geographic scope of the project?	
7	Please provide a narrative summary of the digital health implementation.	
8	Contact Name	
9	Contact Email	
10	Add team member(s)- editors	
11	Add team member(s)- viewers	
12	What is the health focus area(s) address by DHI?	
13a	What are the health system challenges addressed by DHI?	
13b	Other challenges	
14a	What are the names of the software included in deployment?	
14b	What digital health intervention(s) are included in deployment?	
15	What health information system(s) in your country does this project support?	
16	What level of coverage does your project have (Sub-national, national)?	
17	Has the government contributed to the project, either financially or in-kind?	
18	Set start date of project	
19	Set current and previous stages of project	
20	Set end stage of project	
21	Under what license is the project governed?	
22	Can you provide a link to code documentation?	
23	Can you provide a link to a demo of the application?	
24	Can you provide a link to the software wiki page?	
25	Does your project share information with one or more of these digital Health Information System components?	
26	What data standards does your digital health project use?	

The context and data quality guidelines corresponding to the individual questions are as below-

Question 1: What is the project name?

Question Context-

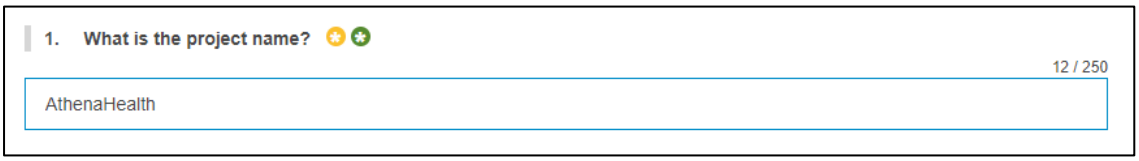
The project name question refers to the unique name of the implemented digital health solution.

Quality Guidelines-

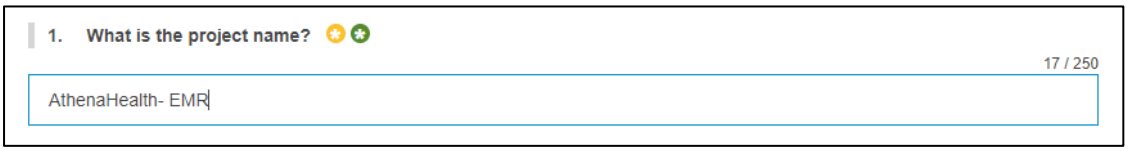
1. The project name must be written in the format: Project Name- System Type
2. While specifying the project name and system type, full form/s must be used over abbreviations

Negative Illustration-

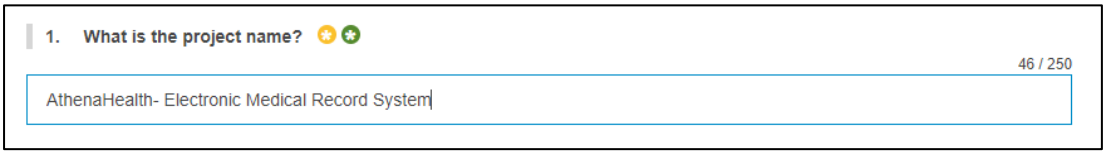
1. In the below illustration, the system type is missing



2. In the below illustration, the system type is written in abbreviations



Positive Illustration-



Question 2: Who are your investment partners?

Question Context-

The investment partners are the partners who have invested in the project either financially or in-kind.

Quality Guidelines-

If you cannot find your investment partner in the list corresponding to the question, ask Investor/Donor to register on DHA platform by sending an email to digital-health-atlas@who.int

Question 3: Who are your implementing partners?

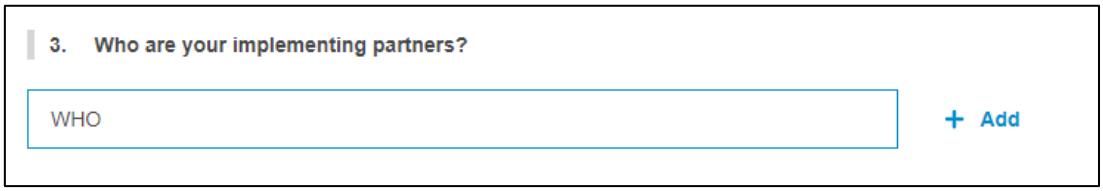
Question Context-

The implementing partners are the technologist and/or health expert deploying the digital health project.

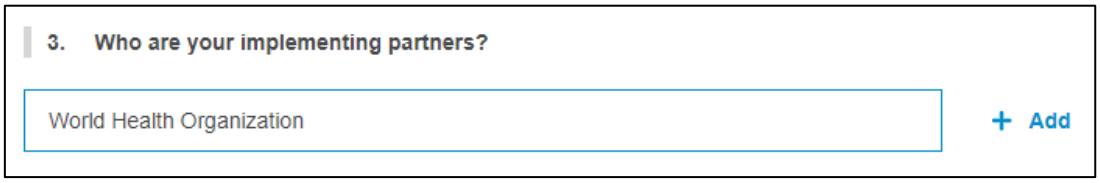
Quality Guidelines-

The affiliation name of the implementing partner must be entered in full form instead of abbreviations.

Negative Illustration-



Positive Illustration-



-Factual Elements | -Qualitative Elements | -Quantitative Elements

Question 4: What is the name of the lead organization?

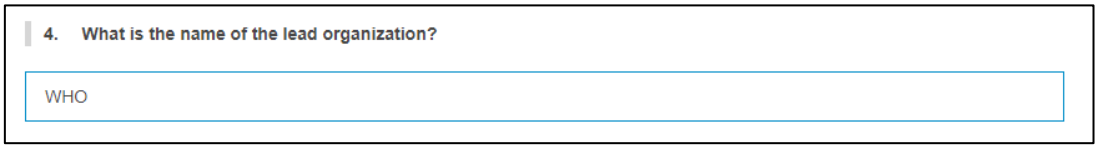
Question Context-

The lead organization is the one that steers the project direction and decisions. Projects generally have one lead organization and one or more supporting organizations.

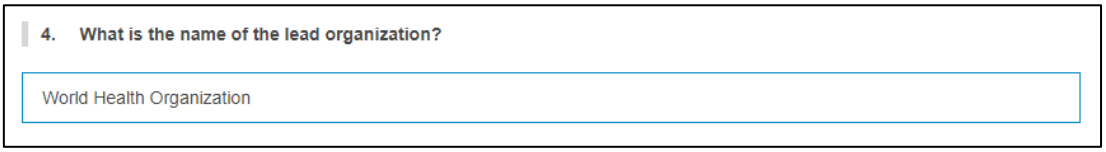
Quality Guidelines-

The affiliation name of the lead organization must be entered in full form instead of abbreviations.

Negative Illustration-



Positive Illustration-



Question 5: Which country is the project located in?

There are no specific guidelines for this question apart from the one's outlined on the platform; however, the element level quality guidelines still apply.

Question 6: What is the geographic scope of the project?

This question is not mandatory to answer, however, we strongly recommend answering this question as the current and target geographic scope can provide a clear understanding of the planned scale and possibility of scaling-up beyond it.

Question Context-

The geographic scope of the project is the current and prospective scale of the project.

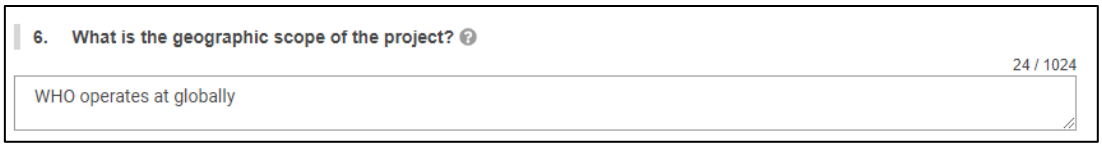
Quality Guidelines-

The question must be answered by taking into consideration below pointers-

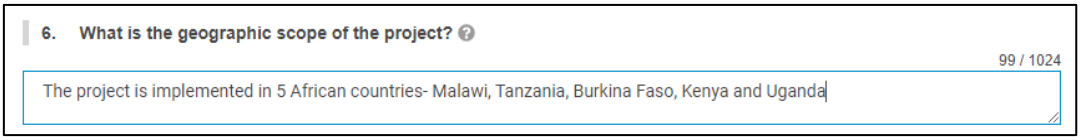
1. Reference of the current and planned expansion of the project, i.e., regions/nations where-
    a. Project is implemented
    b. Project is being implemented
    c. Project will be implemented
2. Details on readiness check points required for the implementation of the project in geographies other than the one's planned.

Negative Illustration-

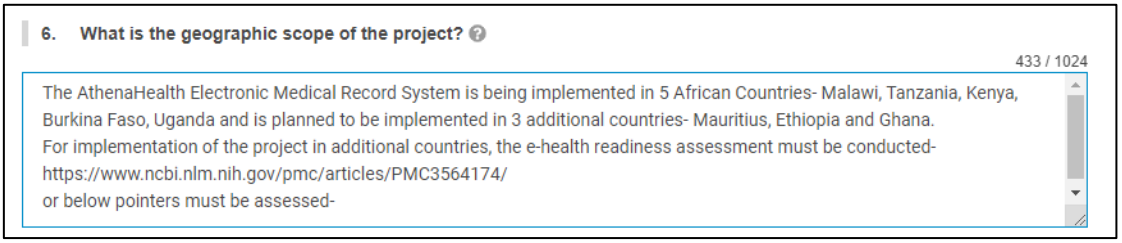
1. The below illustration isn't specifying the project scope-



2. In the below illustration, the target scale and readiness checkpoints are not specified-



Positive Illustration-



Question 7: Please provide a narrative summary of the digital health implementation.

Question Context-

The summary of the digital health implementation is a high-level overview of the project portraying its end-to-end picture.

Quality Guidelines-

The response to the question must include of following pointers in the response-

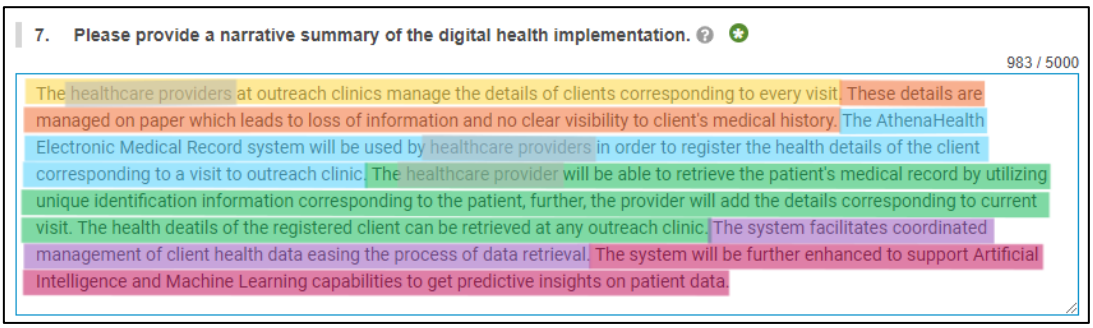
Note- It is recommended to add details corresponding to all the overview pointers, however, if few pointers are not applicable for the project, then those can be skipped.

Overview Pointers	What to Add?
Business Context	Circumstances, conditions and factors surrounding the project
Problem Statement	Problems that are being solved by the solution
Solution Overview	Details of the project
Process Overview	Process details with involvement of solution
User Groups Served	Intended users of the solution
Benefits	Benefits that can be derived from the solution
Future Agenda	Define the future goals for the project as applicable
References	URLs corresponding to DHA Project or underlying concept or site address as applicable

Negative Illustration-

Positive Illustration-

The colour codes below correspond to the colour codes of the overview pointers defined in the quality guidelines-



Question 8: Contact Name

There are no specific guidelines for this question apart from the one's outlined on the platform; however, the element level quality guidelines still apply.

Question 9: Contact Email

There are no specific guidelines for this question apart from the one's outlined on the platform; however, the element level quality guidelines still apply.

Question 10: Add team members- (editors)

There are no specific guidelines for this question apart from the one's outlined on the platform; however, the element level quality guidelines still apply.

Question 11: Add team members- (viewers)

There are no specific guidelines for this question apart from the one's outlined on the platform; however, the element level quality guidelines still apply.

Question 12: What is the health focus area(s) addressed by DHI?

Question Context-

The health focus area is the specific health ailment focussing which the project was implemented.

Quality Guidelines-

The health focus areas must fall in line with the outlined project summary.

Question 13a: What are the health system challenges addressed by the Digital Health Intervention?

Question Context-

The health system challenges are the challenges faced or the needs encountered in the current health system.

Quality Checks-

The health system challenges must correspond to the problems addressed or benefits derived outlined project summary.

Quality Checks-

Health System Challenge	Context
1.1 Lack of population denominator	The data corresponding to the total number of people in a population for a defined use case at the start of the observation or study period is not available.
1.2 Delayed reporting of events	There is a delayed availability or reporting of data, including reporting to district, regional or national health authorities.
1.3 Lack of quality/ reliable data	Data is available but is not of good quality and is not reliable.
1.4 Communication roadblocks	The communication between clients, health service providers and health system managers is difficult due to manual or traditional ways of interactions, mistrust, language or cultural barriers.
1.5 Lack of access to information or data	The data is available but not accessible either due to insufficient data collection or unavailability of modes to access the data or availability of difficult modes to access the data.
1.6 Insufficient utilization of data & information	The data is available but is not utilized to full extent either because of limited skills and implemented procedures for usage or availability of data in the traditional mode/s.
1.7 Lack of unique identifier	Lack of a reference/identifier that marks an individual, entity or record as unique.
2.1 Insufficient supply of commodities	Insufficient commodities available for the purchase of health system and clients
2.2 Insufficient supply of services	Inadequate provision of medical services
2.3 Insufficient supply of equipment	Inadequate provision of medical equipment's against the demand of health system and clients
2.4 Insufficient supply of qualified health workers	Health Workforce Shortage
3.1 Poor patient experience	Unfavourable experience of a health service user when using the healthcare system; whether due to policies, processes, interactions with healthcare professionals or other aspects of the health system.

3.2 Insufficient health worker competence	Health worker lacking the necessary skills, experience, behaviours, knowledge and judgement to safely carry out required functions in a health system.
3.3 Low quality health commodities	Poor quality of medical goods and commodities
3.4 Low health worker motivation	1. Minimal/No support for healthcare providers from the supervisors and managers. 2. Lack of motivations due to poor working conditions, financial and morale reasons.
3.5 Insufficient continuity of care	Lack of mechanisms to support continuity of care such as: - uncoordinated referrals - lack of interoperable digital systems causing health service users' data being in disparate systems
3.6 Inadequate supportive supervision	Minimal support for: - healthcare providers from supervisors/providers - clients from healthcare providers
3.7 Poor adherence to guidelines	Little to no adherence to guidelines outlined for patient care including clinical guidelines, standards and protocols in health system
4.1 Lack of alignment with local norms	Health systems' discrepancy with the regional and cultural context of the population
4.2 Programs which do not address individual beliefs or practices	Health systems' initiatives are not in line with the health understanding of the population
5.1 Low demand for services	Little to no demand for services due to- a) unawareness of the availability of services to resolve the health issues b) financial barriers c) no health tracking
5.2 Geographic inaccessibility	Geographic barriers to avail the- a) Laboratory and Diagnostics Services b) Medication Products & Services c) Healthcare Provider Services
5.3 Low adherence to treatment	Little/ No adherence to the defined treatment procedure including clinician revisits, medication, etc.
5.4 Loss to follow up	Inability to locate client details in order to determine their health status and take actions.
6.1 Inadequate workflow management	Lack of mechanisms to appropriately manage defined workflows.
6.2 Lack of or inappropriate referrals	Absence of proper referrals mechanism from- a) healthcare provider to healthcare provider b) healthcare to other sectors
6.3 Poor planning and coordination	Insufficient organisation of the different elements required to deliver adequate health services including- a) Human Resources b) Healthcare Services c) Goods & Commodities
6.4 Delayed provision of care	Retarded access to care due to- a) Loss of health tracking b) Limited availability of services c) Geographic Barriers

6.5 Inadequate access to transportation	Limited/No access to the healthcare facilities and services due to logistics barriers
7.1 High cost of manual processes	Involvement of human activity for a process which has the capacity to be executed by using technology
7.2 Lack of effective resource allocation	Improper planning and allotment financial resources
7.3 Client-side expenses	Lack of policies or procedures that will prevent medical spending of a household that exceeds a certain level of capacity to pay.
7.4 Lack of coordinated payer mechanism	Lack of policies, procedures or schemes that will enable clients to access healthcare services smoothly and without experiencing undue financial hardship.
8.1 Insufficient patient engagement	Inadequate information exchange of- a) Health Events b) Health System Feedback c) Healthcare literacy (precautions, home remedy)
8.2 Unaware of service entitlement	Clients and Healthcare Providers are uninformed about the health service entitlements for the clients.
8.3 Absence of community feedback mechanism	Lack of methods, procedures and systems for population to provide feedback to the health system
8.4 Lack of transparency in commodity transactions	No visibility to the funds flow in the process of acquiring and delivering medical goods.
8.5 Poor accountability between the levels of the health sector	Absence of or undetermined framework for outlining the responsibilities of health system at different levels
8.6 Inadequate understanding of beneficiary populations	Minimal understanding of the population eligible for a scheme related to insurance, health program, subsidies.

Question 13b: Other Challenges

Question Context-

The health system challenges that are not listed in the Question 13a. will be defined and will indicate the challenges faced or the needs encountered in the current health system.

Quality Guidelines-

The additional health system challenge must be outlined with a brief description in the following format:

Outline- Brief Description

Illustration-

Question 14a: What are the names of the software included in deployment?

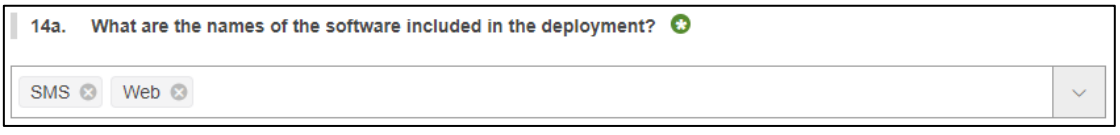
Question Context-

The software included in deployment are the readymade products, platforms, software development frameworks or programming languages.

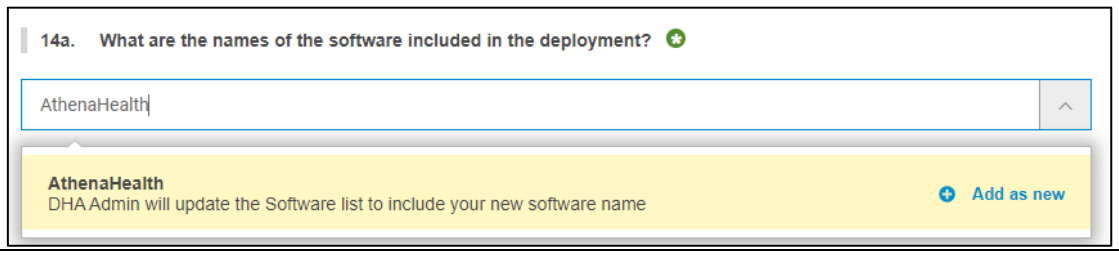
Quality Guidelines-

If the software included in the deployment of your project is not included in the list, type the software name and use add as new option to save it to the list and use it against the project.

Negative Illustration-



Positive Illustration-



Question 14b: What Digital Health Interventions (DHIs) are included in the deployment?

Question Context-

The digital health interventions are the functionalities that are used to support the health system needs.

Quality Guidelines-

1. The digital health intervention must correspond to the solution overview outlined in the project summary.
2. The digital interventions must be selected by understanding the context from the document WHOs Classification of Digital Health Interventions V.1.0. (References)
3. The interventions must be selected to map/correspond/solve the selected health system challenge/s.

Quality Check-

Refer to the detailed mapping of Health System Challenges and Digital Health Interventions in Chapter III.

Question 15: What health information system(s) in your country does this project support?

This question is not mandatory to answer, however, we strongly recommend answering this question as defining the system categories in which the digital health interventions (functionalities) fit can provide a complete picture of technology solution to the reader.

Question Context-

The system categories or health information system(s) are the types of technology systems/ applications designed to deliver the digital health interventions/functionalities.

Quality Guidelines-

1. The system categories must correspond to the solution overview outlined in the project summary.
2. The interventions selected in previous question must be mapped with the system categories, to find out which system category does the intervention best fit into for the project.

Quality Check-

Refer to the detailed mapping of System Categories and Digital Health Interventions in Chapter III.

Question 16: What level of coverage does the project have?

This question is not mandatory to answer, however, we strongly recommend answering this question as insufficient information on project coverage leads to failure in providing a transparent view of the current project state to target readers, casting doubt on its credibility.

Question Context-

The project coverage is the current scale of the project outlining the growth, adoption and expansion of the project.

Quality Guidelines-

There are no specific guidelines for this question apart from the one's outlined on the platform; however, the element level quality guidelines still apply.

Question 17: Has the government contributed to the project, either financially or in-kind?

There are no specific guidelines for this question apart from the one's outlined on the platform; however, the element level quality guidelines still apply.

Question 18: Set start date of the project.

Question Context-

The start date of the project marks the initiation of project ideation.

Quality Guidelines-

There are no specific guidelines for this question apart from the one's outlined on the platform; however, the element level quality guidelines still apply.

Question 19: Set current and previous stages of the project.

This question is not mandatory to answer, however, we strongly recommend answering this question as incomplete and inaccurate project status information undermines the reader's confidence in the project's progress and potential for expansion.

Question Context-

The stage is the development phase of the project.

Quality Guidelines-

1. A completion date must be selected corresponding to the previous project stage/s.
2. A target completion date must be selected corresponding to the current project stage. The date must be updated to the real completion date once the stage progresses towards completion.

Question 20: Set end stage of the project.

Question Context-

The end stage marks the project completion or hand-over.

Quality Guidelines-

The target end-date of the project must be defined and added as a response to this question, this target date must be updated to the real project end-date once the project is complete.

Question 21: Under what license is the project governed?

Question Context-

The project governance license defines the terms for the availability, customization and redistribution of original source code.

Quality Guidelines-

There are no specific guidelines for this question apart from the one's outlined on the platform; however, the element level quality guidelines still apply.

Quality Checks-

License	Context
Freemium	Choose Freemium if your software is available in both free and paid versions
Non-Protective free and open-source software	Choose non-protective free and open source if your software is available for free, can be customized without restrictions and freely redistributed
Open-Source Software	Choose open-source software if the codebase of your software is freely downloadable
Proprietary	Choose Proprietary if your software is paid and not available with source code
Protective free and open-source software	Choose protective free and open source if there are specific terms and conditions under which your software is free to use or if there are any restrictions to code customizations

Question 22: Can you provide a link to the code documentation?

Question Context-

The Code documentation is a collection of documents and code comments explaining how code works and how to use it.

Quality Guidelines-

It is recommended to publish technical documentation of your project if your software is-

a. Freemium
b. Non-protective free and open source
c. Open-Source Software
d. Protective free and open source

And the public access link must be added as a response to this question.

Question 23: Can you provide a link to a demo of the application?

Question Context-

The demo of the application is a visual guide to introduce users to the user interface and key features of the project.

Quality Guidelines-

It is recommended to have a demo instance of your software publicly available and public access link should be added as response to this question.

Question 24: Can you provide a link to software wiki page?

Question Context-

The software wiki page is a user manual that documents all the details of the project.

Quality Guidelines-

It is recommended to make user manual of your project freely available and public access link should be added as a response to this question.

Question 25: Does your project share information with one or more of these digital health information system components?

Question Context-

Refers to other digital health systems that the project interfaces with.

Quality Guidelines-

The link given must point to specific system and not generic website of the vendor.

Question 26: What data standards does your digital health project use?

This question is not mandatory to answer, however, we strongly recommend answering this question as the interoperability standards indicate a possibility of data exchange across systems and thereby improves the reader's confidence in the project.

Question Context-

The data standards used by the project are the documented agreements on representation, format, definition, structuring, tagging, transmission, manipulation, use and management of health-related, demographic and technical data.

Quality Guidelines-

There are no specific guidelines for this question apart from the one's outlined on the platform; however, the element level quality guidelines still apply.

Quality Checks-

Category	Standard	Context
Health Data Exchange Standards	ADX	The Aggregate Data Exchange (ADX) Profile supports interoperable public health reporting of aggregate health data.
	CDA	Clinical Document Architecture (CDA) is a set of standards that describe the structure and semantics of clinical data in XML (Extensible Markup Language) for easy exchange.
	CSD	The Care Services Discovery (CSD) registry contains information about health organizations, facilities, services and providers
	DICOM	Digital Imaging and Communication in Medicine (DICOM) is an international standard and file format for medical images, such as CT scans, MRIs and printer images.
	FHIR	The Fast Healthcare Interoperability Resources (FHIR) standard is a set of rules and specifications for exchanging electronic health care data.
	HL7 v2	Health Level Seven Version 2 (HL7 v2) is a widely implemented messaging standard that allows the exchange of clinical data between systems.
	HL7 v3	Health Level Seven Version 3 (HL7 v3) is an XML-based document markup standard that specifies the structure and logic of "clinical documents" for the purpose of exchange between healthcare providers and patients.
	MHD	The Mobile access to Health Documents (MHD) Profile defines one standardized interface to health document sharing for use by mobile devices.
	PDQ	Patient Demographics Query (PDQ) provides a query to a central patient information server and retrieve a patient's demographic and visit information.
	PDQm	In Patient Demographics Matching, the Patient Demographics Supplier provides a service to the Patient Demographics Consumer in finding a "best fit" list of possible patient

		identities that match the demographics information contained in the query parameters.
	SVS	Sharing Value Sets (SVS) provides a means through which healthcare systems producing clinical or administrative data, can receive a common, uniform nomenclature managed centrally.
	XDS	Cross Enterprise Document Sharing (XDS) is a system of standards for cataloguing and sharing patient records across health institutions.
	XUA	The Cross-Enterprise User Assertion Profile (XUA) provides a means to communicate across cross applications by authenticating users, applications or systems.
Health Data Standardization	CIEL	Concepts for Integrated Epidemiology and Linkage (CIEL) is a health data standardization initiative that focuses on creating and maintaining standardized codes and concepts for health-related data.
	CPT	Current Procedural Terminology (CPT) serves as a standardized system for reporting medical procedures and services provided by healthcare professionals.
	ICD10	International Classification of Diseases, 10th Revision (ICD10) is international standard for coding and classification of diseases and health conditions.
	ICD11	International Classification of Diseases, 11th Revision (ICD11) is the latest version of international standard for coding and classification of diseases and health conditions
	LOINC	Logical Observation Identifiers Names and Codes (LOINC) is a health data standard that focuses on the identification and exchange of clinical laboratory and other medical observations.
	RxNorm	Prescription Norms (RxNorm) is a standardized terminology for medications which provides a structured system for representing and exchanging drug-related information, including medication names, ingredients, strengths, dosages, and other related concepts.
	SNOMED	Systematized Nomenclature of Medicine (SNOMED) is a comprehensive and internationally recognized health data standard used for clinical terminology and coding in healthcare systems.
	UCUM	Unified Code for Units of Measure (UCUM) is a health data standard that provides a unified and standardized approach for representing and exchanging units of measure in healthcare.
Demographic data standardization	ISCO-8	International Standard Classification of Occupations, 8th edition (ISCO-8) is a classification system to categorize and standardize occupational information.
	ISCO-88	International Standard Classification of Occupations, 1988 edition (ISCO-88) is an older classification system to categorize and standardize occupational information.
	ISO-3166	International Organization for Standardization-3166 (ISO-3166) is a standard that defines codes for identifying countries and their subdivisions.

Technical Standards	GML	Geography Markup Language (GML) is an XML-based standard for encoding and exchange of geographic data.
	GS1	Global System of Standards (GS1) enable the accurate and consistent identification, capture, and sharing of information about products, locations, assets, and other entities.
	mACM	Mobile Alert Communication Management (mACM) provides the infrastructural components needed to send short, unstructured text alerts to human recipients and can record the outcomes of any human interactions upon receipt of the alert.
	SDMX	Statistical Data and Metadata Exchange (SDMX) is a standard for exchanging statistical data and metadata.
	xForms	XHTML Forms(xForms) is a markup language standard for creating web forms with advanced features and functionality
Security and Privacy Standards	ATNA	The Audit Trail and Node Authentication (ATNA) Integration Profile establishes security measures which, together with the Security Policy and Procedures, provide patient information confidentiality, data integrity and user accountability.
	BPPC	Basic Patient Privacy Consents (BPPC) provides a mechanism to record the patient privacy consent(s) and a method for Content Consumers to use to enforce the privacy consent appropriate to the use.
	PIX or PIXm	(mobile) Patient Identifier Cross-referencing (PIX) supports the cross-referencing of patient identifiers from multiple Patient Identifier Domains.

The project addition stage thereby focusses on adding the data to the digital health atlas platform by understanding the question context and following the outlined guidelines as it is crucial to maintaining data quality throughout the platform.

Step III- Post Project Addition: Reviewing Project and Publishing

On addition of the project to the digital health atlas platform, it must not be immediately published for a wider audience. Instead, a thorough review cycle must be conducted to ensure that the project, when viewed from the perspective of the target reader, provides a complete picture and fulfils their needs and expectations.

The review cycle involves revisiting each question and ensuring its alignment with the overall project idea. It is advisable to individually review the questions to verify their relevance to the context and adherence to the data quality guidelines.

In addition, specific checks can be performed based on the key structural element that each question belongs to:

Element	Review Check	Example
Factual Element	Ensure that the question provides complete details that accurately represent the overall idea and specifics of the project.	Review the Project Overview to confirm its depiction as abstract of the project.
Qualitative Element	Review the question to ensure that the responses align with the solution characteristics stated in the factual elements and have undergone quality checks.	Review the Digital Health Interventions to validate their mapping with the Health System Challenges.
Quantitative Element	Examine the question to verify the availability of numerical data that accurately reflects the intended information.	Review the Project Coverage to ascertain the number of digital health implementation users.

This comprehensive evaluation helps ensure that all questions effectively contribute to the larger picture of the project.

If any deviations or discrepancies are identified during the review, necessary revisions should be made to the data to ensure that the published project provides an accurate and comprehensive depiction of the outlined details. This helps maintain the integrity of the information presented to readers on the platform.

By conducting a thorough review cycle and making any required revisions, project owners can ensure that the published project effectively communicates the necessary information and enables readers to gain a clear understanding of the project's objectives and implementation.

Step IV- Project Maintenance: Plan for Ongoing Updates

Once a digital health project is published on the digital health atlas (DHA) platform, it is important to note that it is not locked in a view-only mode. Regular updates must be made to the published projects to provide readers with a transparent view of the project details.

To ensure timely updates and create a plan for the same, project owners should follow the steps outlined below:

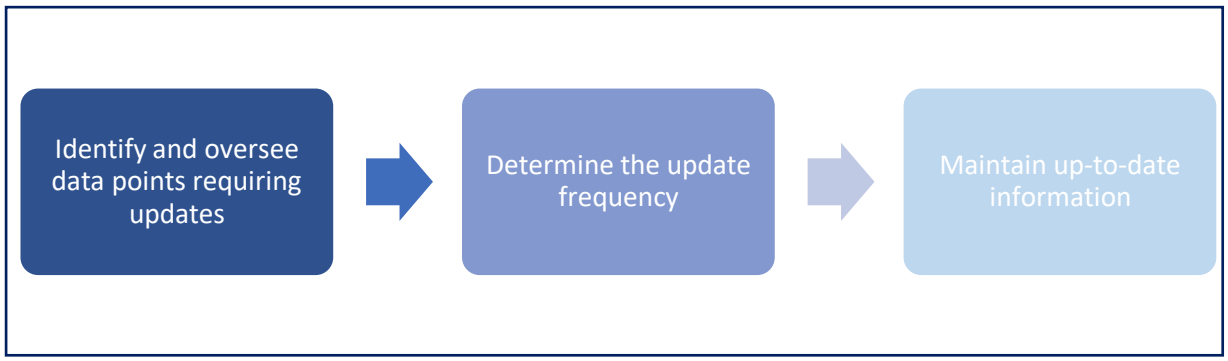


Diagram 3: Steps to create a project maintenance plan

1. ***Identify and oversee data points requiring updates:*** Project owners should actively monitor and identify the data points within their project details that may require updates over time. This may include information such as project progress, new developments, and/or changes in implementation strategies or project coverage.
2. ***Determine the update frequency:*** It is crucial to establish a clear frequency for updating the project details within the DHA platform. This frequency should be based on the project's nature, evolving requirements, and the need to provide accurate and up-to-date information to readers. Common update frequencies can range from monthly, quarterly, biannually, or annually, depending on the project's dynamics.
3. ***Proactively maintain accurate and up-to-date information:*** Project owners should take proactive steps to ensure that the information provided in the project details remains accurate and up to date. This may involve reviewing and revising the data, incorporating recent project developments, and addressing any changes that impact the project's implementation or scope or scale.

By following these steps, project owners can ensure that the published projects on the DHA platform maintain transparency and provide readers with the most accurate and current information available. Regular updates help maintain the credibility and relevance of the project details, fostering an environment of transparency and accountability within the digital health ecosystem.

Chapter III:

Mappings for Quality Checks

To respond to questions 14b and 15, you need to follow these steps:

1. Locate the Health System Challenge chosen in 13a within the mappings of Health System Challenges and Digital Health Interventions. Then, identify the appropriate digital health interventions associated with the selected challenge.
2. Search for the chosen digital health interventions in the System Categories and Digital Health Interventions mapping. Subsequently, determine the systems that align with the selected digital health interventions.

Health System Challenges and Digital Health Interventions

The health system challenge can be addressed/solved by implementation of one or all the mapped digital health interventions corresponding to the challenge.

The health system challenge (in bold) and the corresponding digital health interventions solving the challenge are as in the table below-

Note- The use of digital health interventions is not strictly restricted to the ones mapped. The mapping serves as a reference for best practices, and you can find the complete list of DHIs in the Classification of Digital Health Interventions V.1.0. (References)

1.1 - Lack of population denominator ---------- *Health System Challenge*
2.1.2 - Enrol client for health services/clinical care plan ---------- *Digital Health Intervention*
2.2.1 - Longitudinal tracking of clients' health status and services
2.2.2 - Manage clients' structured clinical records
2.2.3 - Manage client's unstructured clinical records
2.2.4 - Routine health indicator data collection and management
3.4.1 - Notify birth event
3.4.2 - Register birth event
3.4.3 - Certify birth event
3.4.4 - Notify death event
3.4.5 - Register death event
3.4.6 - Certify death event
4.1.1 - Non-routine data collection and management
4.1.2 - Data storage and aggregation
4.1.3 - Data synthesis and visualization
4.1.4 - Automated analysis of data to generate new information or predictions on future events
4.3.2 - Map location of health events
4.3.3 - Map location of clients and households
4.4.1 - Data exchange across systems
1.2 - Delayed reporting of events
1.5.2 - Reporting of public health events by clients
2.10.1 - Transmit diagnostic result to healthcare provider
2.2.1 - Longitudinal tracking of clients' health status and services
2.2.2 - Manage clients' structured clinical records
2.2.3 - Manage client's unstructured clinical records
2.2.4 - Routine health indicator data collection and management
2.3.1 - Provide prompts and alerts based according to protocol
2.3.2 - Provide checklist according to protocol
2.4.1 - Consultations between remote client and healthcare provider
2.4.2 - Remote monitoring of client health or diagnostic data by healthcare provider
2.4.3 - Transmission of medical data to healthcare provider
3.3.1 - Notification of public health events from point of diagnosis
3.4.1 - Notify birth event
3.4.2 - Register birth event
3.4.3 - Certify birth event
3.4.4 - Notify death event

3.4.5 - Register death event
3.4.6 - Certify death event
4.1.1 - Non-routine data collection and management
4.1.2 - Data storage and aggregation
4.1.3 - Data synthesis and visualization
4.1.4 - Automated analysis of data to generate new information or predictions on future events
1.3 - Lack of quality/ reliable data
4.2.1 - Parse unstructured data in structured data
4.2.2 - Merge, de-duplicate, and curate coded datasets or terminologies
4.2.3 - Classify disease codes or cause of mortality
1.4 - Communication roadblocks
1.1.1 - Transmit health event alerts to specific population group(s)
1.1.2 - Transmit targeted health information to client(s) based on health status or demographics
1.1.3 - Transmit targeted alerts and reminders to client(s)
1.1.4 - Transmit diagnostics result, or availability of result, to client(s)
1.2.1 - Transmit targeted alerts and reminders to client(s)
1.2.2 - Transmit untargeted health event alerts to undefined group
1.3.1 - Peer group for clients
1.5.1 - Reporting of health system feedback by client
1.5.2 - Reporting of public health events by clients
1.6.1 - Client look-up of health information
2.10.1 - Transmit diagnostic result to healthcare provider
2.4.1 - Consultations between remote client and healthcare provider
2.4.2 - Remote monitoring of client health or diagnostic data by healthcare provider
2.4.3 - Transmission of medical data to healthcare provider
2.4.4 - Consultations for case management between healthcare provider(s)
2.5.1 - Communication from healthcare provider(s) to supervisor
2.5.2 - Communication and performance feedback to healthcare provider(s)
2.5.3 - Transmit routine news and workflow notifications to healthcare provider(s)
2.5.4 - Transmit non-routine health event alerts to healthcare provider(s)
2.5.5 - Peer group for healthcare providers
2.6.1 - Coordinate emergency response and transport
2.6.2 - Manage referrals between points of service within health sector
2.6.3 - Manage referrals between health and other sectors
3.3.1 - Notification of public health events from point of diagnosis
1.5 - Lack of access to information/data
1.4.1 - Access by client to own medical records
1.4.2 - Self monitoring of health or diagnostic data by client
1.4.3 - Active data capture/documentation by client
1.6.1 - Client look-up of health information
2.1.2 - Enrol client for health services/clinical care plan
2.10.3 - Capture diagnostic results from digital devices
2.2.1 - Longitudinal tracking of clients' health status and services
2.2.2 - Manage clients’ structured clinical records
2.2.3 - Manage client's unstructured clinical records
2.2.4 - Routine health indicator data collection and management

2.3.1 - Provide prompts and alerts based according to protocol 2.3.2 - Provide checklist according to protocol 2.4.3 - Transmission of medical data to healthcare provider 2.7.1 - Identify client(s) in need of services 3.1.1 - List health workforce cadres and related identification information 3.1.4 - Record training credentials of healthcare provider(s) 3.4.1 - Notify birth event 3.4.2 - Register birth event 3.4.3 - Certify birth event 3.4.4 - Notify death event 3.4.5 - Register death event 3.4.6 - Certify death event 4.1.1 - Non-routine data collection and management 4.1.2 - Data storage and aggregation
1.6 - Insufficient utilization of data & information
1.4.1 - Access by client to own medical records 1.6.1 - Client look-up of health information 2.2.1 - Longitudinal tracking of clients' health status and services 2.2.2 - Manage clients' structured clinical records 2.2.3 - Manage client's unstructured clinical records 2.3.1 - Provide prompts and alerts based according to protocol 2.3.2 - Provide checklist according to protocol 2.7.1 - Identify client(s) in need of services 2.7.2 - Schedule healthcare provider's activities 3.1.2 - Monitor performance of healthcare provider(s) 3.7.2 - Assess health facilities 4.1.3 - Data synthesis and visualization 4.1.4 - Automated analysis of data to generate new information or predictions on future events 4.2.1 - Parse unstructured data in structured data 4.2.2 - Merge, de-duplicate, and curate coded datasets or terminologies 4.4.1 - Data exchange across systems
1.7 - Lack of unique identifier
2.1.1 - Verify client unique identity 4.2.3 - Classify disease codes or cause of mortality
2.1 - Insufficient supply of commodities
3.2.1 - Manage inventory and distribution of health commodities 3.2.2 - Notify stock levels of health commodities
2.2 - Insufficient supply of services
1.4.2 - Self monitoring of health or diagnostic data by client 1.4.3 - Active data capture/documentation by client 2.1.2 - Enrol client for health services/clinical care plan 2.10.3 - Capture diagnostic results from digital devices 2.7.1 - Identify client(s) in need of services 2.7.2 - Schedule healthcare provider's activities
2.3 - Insufficient supply of equipment
3.6.1 - Monitor status of heath equipment

3.6.2 - Track regulation and licensing of medical equipment
2.4 - Insufficient supply of qualified health workers
3.1.3 - Manage certification/registration of healthcare provider(s)
3.1 - Poor patient experience
All the digital health interventions apply (challenge can be solved by any DHI from the complete list)
3.2 - Insufficient health worker competence
2.3.1 - Provide prompts and alerts based according to protocol 2.3.2 - Provide checklist according to protocol 2.8.1 - Provide training content to healthcare provider(s) 2.8.2 - Assess capacity of healthcare provider(s) 3.1.1 - List health workforce cadres and related identification information 3.1.2 - Monitor performance of healthcare provider(s) 3.1.4 - Record training credentials of healthcare provider(s)
3.3 - Low quality health commodities
2.10.4 - Track biological specimens 2.9.3 - Report adverse drug events 3.2.3 - Monitor cold-chain sensitive commodities 3.2.4 - Register licensed drugs and health commodities 3.2.5 - Manage procurement of commodities 3.2.6 - Report counterfeit or substandard drugs by clients
3.4 - Low health worker motivation
2.5.1 - Communication from healthcare provider(s) to supervisor 2.5.2 - Communication and performance feedback to healthcare provider(s) 2.5.3 - Transmit routine news and workflow notifications to healthcare provider(s) 2.5.5 - Peer group for healthcare providers 3.5.4 - Transmit routine payroll payment to healthcare provider(s) 3.5.5 - Transmit or manage incentives to healthcare provider(s)
3.5 - Insufficient continuity of care
2.2.1 - Longitudinal tracking of clients' health status and services 2.2.2 - Manage clients's structured clinical records 2.2.3 - Manage client's unstructured clinical records 2.6.2 - Manage referrals between points of service within health sector 2.6.3 - Manage referrals between health and other sectors 4.4.1 - Data exchange across systems
3.6 - Inadequate supportive supervision
2.4.1 - Consultations between remote client and healthcare provider 2.4.2 - Remote monitoring of client health or diagnostic data by healthcare provider 2.4.3 - Transmission of medical data to healthcare provider 2.4.4 - Consultations for case management between healthcare provider(s) 2.5.1 - Communication from healthcare provider(s) to supervisor 2.5.2 - Communication and performance feedback to healthcare provider(s) 2.5.5 - Peer group for healthcare providers
3.7 - Poor adherence to guidelines
2.3.1 - Provide prompts and alerts based according to protocol 2.3.2 - Provide checklist according to protocol

2.3.3 - Screen clients by risk or other health status
4.1 - Lack of alignment with local norms
All the digital health interventions apply (challenge can be solved by any DHI from the complete list)
4.2 - Programs which do not address individual beliefs or practices
All the digital health interventions apply (challenge can be solved by any DHI from the complete list)
5.1 - Low demand for services
1.1.1 - Transmit health event alerts to specific population group(s)
1.1.2 - Transmit targeted health information to client(s) based on health status or demographics
1.1.3 - Transmit targeted alerts and reminders to client(s)
1.1.4 - Transmit diagnostics result, or availability of result, to client(s)
1.2.1 - Transmit targeted alerts and reminders to client(s)
1.2.2 - Transmit untargeted health event alerts to undefined group
1.6.1 - Client look-up of health information
1.7.2 - Transmit or manage vouchers to client(s) for health services
1.7.3 - Transmit or manage incentives to client(s) for health services
2.2.1 - Longitudinal tracking of clients' health status and services
2.2.4 - Routine health indicator data collection and management
5.2 - Geographic inaccessibility
1.4.2 - Self monitoring of health or diagnostic data by client
2.10.3 - Capture diagnostic results from digital devices
2.4.1 - Consultations between remote client and healthcare provider
2.4.2 - Remote monitoring of client health or diagnostic data by healthcare provider
2.4.3 - Transmission of medical data to healthcare provider
2.4.4 - Consultations for case management between healthcare provider(s)
3.2.1 - Manage inventory and distribution of health commodities
4.3.1 - Map location of health facilities/structures
4.3.2 - Map location of health events
4.3.3 - Map location of clients and households
4.3.4 - Map location of healthcare providers
5.3 - Low adherence to treatment
1.1.2 - Transmit targeted health information to client(s) based on health status or demographics
1.1.3 - Transmit targeted alerts and reminders to client(s)
2.1.2 - Enrol client for health services/clinical care plan
2.7.1 - Identify client(s) in need of services
2.9.2 - Track client's medication consumption
5.4 - Loss to follow up
1.1.3 - Transmit targeted alerts and reminders to client(s)
2.2.1 - Longitudinal tracking of clients' health status and services
6.1 - Inadequate workflow management
2.3.1 - Provide prompts and alerts based according to protocol
2.3.2 - Provide checklist according to protocol
2.5.3 - Transmit routine news and workflow notifications to healthcare provider(s)
2.7.2 - Schedule healthcare provider's activities
6.2 - Lack of or inappropriate referrals

2.6.1 - Coordinate emergency response and transport
2.6.2 - Manage referrals between points of service within health sector
2.6.3 - Manage referrals between health and other sectors
6.3 - Poor planning and coordination
2.10.2 - Transmit and tract diagnostic orders
2.6.1 - Coordinate emergency response and transport
2.7.1 - Identify client(s) in need of services
2.7.2 - Schedule healthcare provider's activities
2.8.2 - Assess capacity of healthcare provider(s)
2.9.1 - Transmit or track prescription orders
3.2.1 - Manage inventory and distribution of health commodities
3.7.1 - List health facilities and related information
6.4 - Delayed provision of care
2.2.1 - Longitudinal tracking of clients' health status and services
2.2.4 - Routine health indicator data collection and management
2.3.3 - Screen clients by risk or other health status
2.7.1 - Identify client(s) in need of services
2.7.2 - Schedule healthcare provider's activities
3.7.1 - List health facilities and related information
3.7.2 - Assess health facilities
4.3.1 - Map location of health facilities/structures
4.3.2 - Map location of health events
4.3.3 - Map location of clients and households
4.3.4 - Map location of healthcare providers
6.5 - Inadequate access to transportation
2.6.1 - Coordinate emergency response and transport
4.3.1 - Map location of health facilities/structures
4.3.3 - Map location of clients and households
4.3.4 - Map location of healthcare providers
7.1 - High cost of manual processes
All the digital health interventions apply (challenge can be solved by any DHI from the complete list)
7.2 - Lack of effective resource allocation
3.5.6 - Manage budget and expenditures
7.3 - Client-side expenses
1.7.1 - Transmit or manage out of pocket payments by clients(s)
3.5.1 - Register and verify client insurance membership
3.5.2 - Track insurance billing and claim submission
7.4 - Lack of coordinated payer mechanism
3.5.1 - Register and verify client insurance membership
3.5.2 - Track insurance billing and claim submission
3.5.3 - Track and manage insurance reimbursement
8.1 - Insufficient patient engagement
1.1.1 - Transmit health event alerts to specific population group(s)
1.1.2 - Transmit targeted health information to client(s) based on health status or demographics
1.1.3 - Transmit targeted alerts and reminders to client(s)

1.1.4 - Transmit diagnostics result, or availability of result, to client(s) 1.2.1 - Transmit targeted alerts and reminders to client(s) 1.2.2 - Transmit untargeted health event alerts to undefined group 1.5.2 - Reporting of public health events by clients
8.2 - Unaware of service entitlement
1.2.1 - Transmit targeted alerts and reminders to client(s)
8.3 - Absence of community feedback mechanism
1.5.1 - Reporting of health system feedback by client 2.5.2 - Communication and performance feedback to healthcare provider(s) 3.1.2 - Monitor performance of healthcare provider(s)
8.4 - Lack of transparency in commodity transactions
2.9.1 - Transmit or track prescription orders 3.2.1 - Manage inventory and distribution of health commodities
8.5 - Poor accountability between the levels of the health sector
All the digital health interventions apply (challenge can be solved by any DHI from the complete list)
8.6 - Inadequate understanding of beneficiary population
2.1.2 - Enrol client for health services/clinical care plan 2.2.1 - Longitudinal tracking of clients' health status and services 2.2.2 - Manage clients' structured clinical records 2.2.3 - Manage client's unstructured clinical records 2.2.4 - Routine health indicator data collection and management

System Categories and Digital Health Interventions

The selection of digital health intervention based on mapping between health system challenges and digital health interventions can be further evaluated to understand the system category that it fits in. The selected digital health intervention (functionalities) can fit in one or more system categories.

The system category (in bold) and the corresponding digital health interventions fitting in that system as a functionality are as in the table below-

A - Census, population information & data warehouse ---------- *System Category*
4.1.1 - Non-routine data collection and management ---------- *Digital Health Intervention*
4.1.2 - Data storage and aggregation
4.1.3 - Data synthesis and visualization
4.1.4 - Automated analysis of data to generate new information or predictions on future events
4.2.1 - Parse unstructured data in structured data
4.2.2 - Merge, de-duplicate, and curate coded datasets or terminologies
4.2.3 - Classify disease codes or cause of mortality
2.1.2 - Enrol client for health services/clinical care plan
B - Civil registration and vital statistics
3.4.1 - Notify birth event
3.4.2 - Register birth event
3.4.3 - Certify birth event
3.4.4 - Notify death event
3.4.5 - Register death event
3.4.6 - Certify death event
C - Client Applications
1.4.3 - Active data capture/documentation by client
1.1.3 - Transmit targeted alerts and reminders to client(s)
2.7.1 - Identify client(s) in need of services
D - Client Communication System
1.1.1 - Transmit health event alerts to specific population group(s)
1.1.2 - Transmit targeted health information to client(s) based on health status or demographics
1.1.3 - Transmit targeted alerts and reminders to client(s)
1.1.4 - Transmit diagnostics result, or availability of result, to client(s)
1.2.1 - Transmit targeted alerts and reminders to client(s)
1.2.2 - Transmit untargeted health event alerts to undefined group
1.3.1 - Peer group for clients
1.5.1 - Reporting of health system feedback by client
1.5.2 - Reporting of public health events by clients
2.5.3 - Transmit routine news and workflow notifications to healthcare provider(s)
E - Clinical Terminology and Classifications
4.2.3 - Classify disease codes or cause of mortality
2.3.1 - Provide prompts and alerts based according to protocol
2.3.2 - Provide checklist according to protocol
F - Community-based Information system
2.1.2 - Enrol client for health services/clinical care plan
2.2.1 - Longitudinal tracking of clients' health status and services

2.2.2 - Manage clients's structured clinical records
2.2.3 - Manage client's unstructured clinical records
2.3.1 - Provide prompts and alerts based according to protocol
2.3.2 - Provide checklist according to protocol
2.3.3 - Screen clients by risk or other health status
2.7.1 - Identify client(s) in need of services
2.7.2 - Schedule healthcare provider's activities
1.1.1 - Transmit health event alerts to specific population group(s)
1.1.2 - Transmit targeted health information to client(s) based on health status or demographics
1.1.3 - Transmit targeted alerts and reminders to client(s)
1.1.4 - Transmit diagnostics result, or availability of result, to client(s)
1.3.1 - Peer group for clients
1.5.1 - Reporting of health system feedback by client
G - Data Interchange, Interoperability & Accessibility
4.4.1 - Data exchange across systems
H - Electronic Medical Record
1.4.1 - Access by client to own medical records
2.1.2 - Enrol client for health services/clinical care plan
2.2.1 - Longitudinal tracking of clients' health status and services
2.2.2 - Manage clients's structured clinical records
2.2.3 - Manage client's unstructured clinical records
2.7.1 - Identify client(s) in need of services
2.3.3 - Screen clients by risk or other health status
I - Emergency response systems
2.6.1 - Coordinate emergency response and transport
J - Environmental Monitoring System
4.1.1 - Non-routine data collection and management
4.1.3 - Data synthesis and visualization
4.1.4 - Automated analysis of data to generate new information or predictions on future events
K - Facility Management Information System
3.7.1 - List health facilities and related information
3.7.2 - Assess health facilities
L - Geographic Information System
4.3.1 - Map location of health facilities/structures
4.3.2 - Map location of health events
4.3.3 - Map location of clients and households
4.3.4 - Map location of healthcare providers
M - Health finance and insurance information system
1.7.1 - Transmit or manage out of pocket payments by clients(s)
1.7.2 - Transmit or manage vouchers to client(s) for health services
1.7.3 - Transmit or manage incentives to client(s) for health services
3.5.1 - Register and verify client insurance membership
3.5.2 - Track insurance billing and claim submission
3.5.3 - Track and manage insurance reimbursement
3.5.4 - Transmit routine payroll payment to healthcare provider(s)
3.5.5 - Transmit or manage incentives to healthcare provider(s)

3.5.6 - Manage budget and expenditures
N - Health Management Information System
4.1.1 - Non-routine data collection and management
4.1.2 - Data storage and aggregation
4.1.3 - Data synthesis and visualization
2.2.1 - Longitudinal tracking of clients' health status and services
2.2.2 - Manage clients’ structured clinical records
2.2.3 - Manage client's unstructured clinical records
4.1.4 - Automated analysis of data to generate new information or predictions on future events
O - Human Resource Information System
2.5.1 - Communication from healthcare provider(s) to supervisor
2.5.2 - Communication and performance feedback to healthcare provider(s)
2.5.3 - Transmit routine news and workflow notifications to healthcare provider(s)
2.5.4 - Transmit non-routine health event alerts to healthcare provider(s)
2.5.5 - Peer group for healthcare providers
2.6.2 - Manage referrals between points of service within health sector
2.6.3 - Manage referrals between health and other sectors
3.1.1 - List health workforce cadres and related identification information
3.1.2 - Monitor performance of healthcare provider(s)
3.1.3 - Manage certification/registration of healthcare provider(s)
2.4.4 - Consultations for case management between healthcare provider(s)
2.7.2 - Schedule healthcare provider's activities
P - Identification registries and directories
2.1.1 - Verify client unique identity
Q - Knowledge management system
1.6.1 - Client look-up of health information
2.3.1 - Provide prompts and alerts based according to protocol
2.3.2 - Provide checklist according to protocol
R - Laboratory and diagnostics Information System
1.4.2 - Self monitoring of health or diagnostic data by client
2.10.1 - Transmit diagnostic result to healthcare provider
2.10.2 - Transmit and tract diagnostic orders
2.10.3 - Capture diagnostic results from digital devices
2.10.4 - Track biological specimens
3.6.1 - Monitor status of heath equipment
3.6.2 - Track regulation and licensing of medical equipment
1.4.3 - Active data capture/documentation by client
2.3.3 - Screen clients by risk or other health status
1.1.4 - Transmit diagnostics result, or availability of result, to client(s)
S - Learning and training system
2.8.1 - Provide training content to healthcare provider(s)
2.8.2 - Assess capacity of healthcare provider(s)
3.1.4 - Record training credentials of healthcare provider(s)
2.5.5 - Peer group for healthcare providers
T - Logistics Management Information System
3.2.1 - Manage inventory and distribution of health commodities

3.2.2 - Notify stock levels of health commodities
3.2.3 - Monitor cold-chain sensitive commodities
3.2.5 - Manage procurement of commodities
U - Pharmacy Information System
2.9.1 - Transmit or track prescription orders
2.9.2 - Track client's medication consumption
2.9.3 - Report adverse drug events
3.2.4 - Register licensed drugs and health commodities
3.2.5 - Manage procurement of commodities
3.2.6 - Report counterfeit or substandard drugs by clients
V - Public Health and Disease Surveillance Systems
2.2.4 - Routine health indicator data collection and management
3.3.1 - Notification of public health events from point of diagnosis
1.6.1 - Client look-up of health information
W - Research Information System
4.1.1 - non-routine data collection and management
4.1.2 - Data storage and aggregation
X - Shared Health Record and Health Information Repository
2.2.1 - Longitudinal tracking of clients' health status and services
2.2.2 - Manage clients' structured clinical records
2.2.3 - Manage client's unstructured clinical records
Y - Telemedicine
2.4.1 - Consultations between remote client and healthcare provider
2.4.2 - Remote monitoring of client health or diagnostic data by healthcare provider
2.4.3 - Transmission of medical data to healthcare provider
2.4.4 - Consultations for case management between healthcare provider(s)

Concluding Note

Data quality guidelines are an integral part of the data entered on the digital health atlas (DHA) platform. The data quality guidelines must be adhered to at every juncture of using the digital health atlas platform and must be followed consistently during two key stages: searching for projects and registering projects on the platform.

When searching for projects, users should adhere to the guidelines to ensure accurate and relevant search results. By using appropriate keywords, applying relevant filters, and considering the context of the search, users can effectively navigate the platform and find the desired projects that meet their specific criteria.

Similarly, when registering projects on the DHA platform, project owners must diligently adhere to the data quality guidelines. This involves providing unique, accurate, complete, and consistent information about their digital health projects. By following the guidelines, project owners can ensure that the information entered is reliable and aligned with the desired standards.

Adhering to the data quality guidelines throughout the platform's usage promotes a high level of data accuracy, consistency, and integrity. This, in turn, enhances the visibility of digital health projects, facilitates directed monitoring and evaluation, and strengthens the impact of digital health investments.

By consistently adhering to the data quality guidelines, users and project owners contribute to the overall effectiveness and success of the DHA platform, fostering a global ecosystem of collaboration, knowledge sharing, and improved management of digital health initiatives.

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