Digital
Public
Goods
Alliance

Health DPGs
Immunization
Delivery Management
Final Report

June, 2021

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Executive Summary

Advancements in healthcare innovation have always played a critical role in development. This has been underscored by the COVID-19 pandemic which has brought renewed cooperation and attention to the need for open, accessible and effective digital health solutions. While vaccines have provided a light at the end of the tunnel for many, vaccine ubiquity is far from worldwide and the digital solutions necessary for effectively managing immunization delivery are not equally available or accessible.

In recognition of this need, in October 2020, a Community of Practice (CoP) for Health was convened by the Digital Public Goods Alliance (DPGA) and UNICEF Health. This CoP convened experts to identify and assess digital solutions with high potential for addressing critical development needs related to health. Responding to the urgency of the COVID-19 pandemic, the CoP decided to complement and extend existing efforts to showcase digital health solutions by identifying and assessing mature, open source solutions with specific relevance for immunization delivery management. That process culminated in this report.

Guided by the next round of the Health Community of Practice, the DPGA aims to produce subsequent reports highlighting additional open source solutions such as supply chain and surveillance systems, that address additional critical development needs within health.

Through an assessment process that reviewed projects for relevance to: immunization delivery management, the Digital Public Goods Standard, and the Digital Square Global Goods Maturity Model, the DPGA found 13 digital public goods of high relevance to immunization delivery management. They are: CommCare; DHIS2; DIVOC; Global Healthsites Mapping digital solution (Healthsites.io); GOFR; KoBoToolbox; Community Health Toolkit; mHero; ODK; OpenMRS; OpenSRP; RapidPro; and SORMAS.

This report provides a detailed overview of the assessment process used by the DPGA to review and highlight these 13 digital public goods/global goods.

Based on this assessment the DPGA concludes that 13 digital public goods meet the criteria to be considered **mature digital health global goods**.

Introduction
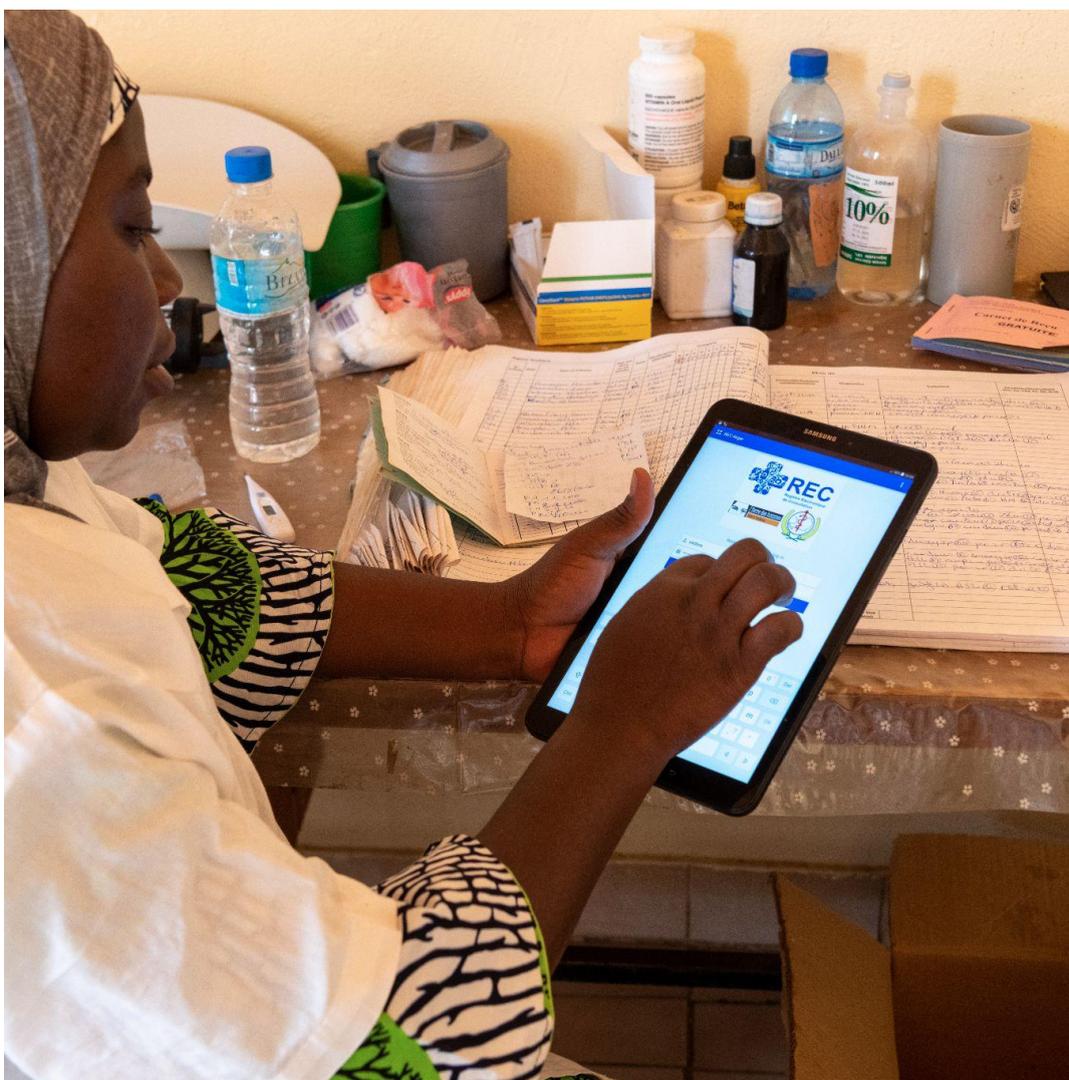
This report details an assessment undertaken in June 2021 as part of the Digital Public Goods Alliance's Health Community of Practice (CoP) co-chaired by UNICEF Health, whose efforts have focused on identifying and highlighting mature digital public goods/global goods that are relevant to immunization delivery management.

Digital public goods are defined in the UN Secretary General's 2020 Roadmap for Digital Cooperation as, "open source software, open data, open AI models, open standards and open content that adhere to privacy and other applicable laws and best practices, do no harm, and help attain the SDGs."

The Digital Public Goods Alliance's mission is to accelerate the attainment of the sustainable development goals in low- and middle-income countries by facilitating the discovery, development, use of, and investment in digital public goods as defined above.

This report combines both publicly available information and information provided by the digital solutions assessed to demonstrate relevance to immunization delivery management at the time of writing this report. In addition, the DPGA team has reviewed these digital health solutions against the [DPG Standard](#) and Digital Square's [Global Goods Maturity Matrix](#). For more details see the methodology section below.

Limitations of this research approach include: reliance on information provided by the solutions themselves; the longevity of the conclusions of this report are dependent on the time of assessment; the assessment is limited to generic solutions and how they were designed and does not review specific country implementations of the solutions; and the assessment was limited to digital solutions identified by the CoP members and is not an exhaustive overview of all health-related digital public goods.

The assessment presented in this report includes 13 digital public goods identified by the Health CoP as relevant to immunization delivery management and meet the relevant maturity indicators to be considered **mature digital health global goods**. They are: *CommCare; DHIS2; DIVOC; Global Healthsites Mapping digital solution (Healthsites.io); GOFR; KoBoToolbox; Community Health Toolkit; mHero; ODK; OpenMRS; OpenSRP; RapidPro; and SORMAS.*

How to navigate this report

This report is meant to complement existing catalogues of digital health solutions such as Digital Square's [Global Goods Guidebook](#) and Digital Impact Alliance's (DIAL) [Catalog of Digital Solutions,](#) by combining assessment criteria from the DPG Standard and Digital Square's Maturity Model to identify and highlight mature digital public goods that are specifically relevant to immunization delivery management. Relevance for immunization delivery management was determined as addressing one or more of the functions described by WHO-UNICEF COVID-19 Vaccination Delivery Innovation Team.

The introduction provides insight into what [digital public goods](#) are, and the efforts the Digital Public Goods Alliance has undertaken to ensure this report's highlighting of mature digital public goods/global goods that are relevant to immunization delivery management compliments and strengthens existing initiatives that can collectively foster digital transformation in low- and middle-income countries through the adoption of digital solutions.

The methodology section explains the function of the Health Community of Practice, what determines how a potential solution is relevant to immunization delivery management, the role the DPG Standard plays defining what a digital public good is, how the Digital Square Global Goods Maturity Model is used to understand the maturity of the solution, and therefore whether it can be considered a global good. Finally, it concludes with an overview of the limitations of this report.

Based on the criteria set in the methodology, the Highlighted Solutions section provides an overview and assessment of each solution being highlighted, noting its relevance to WHO digital health interventions and immunization delivery management, how they meet the DPG Standard, their

Global Goods Maturity Model, and final high level considerations that readers of this report may find helpful.

The concluding section indicates how the Digital Public Goods Alliance intends to continue working with stakeholders including Digital Square, WHO and members of the Health Community of Practice to continue promoting and advancing relevant open source solutions.

Intended audiences and use of the report

This report is written to support individuals and institutions who work with countries to evaluate, promote and propose open source digital solutions for health. As well, this report may be a valuable tool for digital health practitioners, funders, decision-makers and technical assistance providers, exploring digital health solutions relevant to immunization delivery management. All readers are encouraged to look at the highlighted solutions and the assessments provided when considering potential solutions for funding, development, or deployment. Future reports by the DPGA will include assessments of additional open source solutions that also address critical development needs within health.

For those considering implementing and deploying digital public goods for immunization delivery management we see this report as a starting point. We encourage further assessment to ensure each solution meets specific localized implementation needs. This report reviews the generic solution and does not assess or review specific local implementations of the highlighted solutions.

For further information and assessments of these tools, please note the considerations section found under each highlighted solution.

Methodology

Community of Practice

The DPGA convenes expert CoPs to support the discovery, assessment and advancement of digital public goods (DPGs) with high potential for addressing critical development needs in low- and middle-income countries. CoPs are convened around areas such as climate change adaptation, education, financial inclusion, and health. Within these broad topics, each CoP scopes and defines a particular focus area by considering relevance and potential impact of DPGs. CoPs then source a large number of potentially relevant digital solutions. Members convene and discuss the merits and needs of particular considerations and identify additional assessment criteria and processes that should be part of an assessment process in this area.

Based on the input and feedback from the members, the DPGA releases a list of highlighted digital solutions that meet the DPG Standard as well as additional assessment criteria.

We are grateful for the participation of the following members of this Health Community of Practice (2020/2021) as well as for the contributions of a number of other stakeholders who provided thoughtful input to this report:

- Adele Waugaman, USAID
- Ahmed El Saeed, UN Global Pulse - Finland
- Alain Labrique, John Hopkins
- Alvin Marcelo, Asia eHealth Information Network (AeHIN)
- Amanda BenDor, PATH
- Austen Peter Davis, Norweigan Agency for Development (NORAD)
- Benjamin Grubb, UNICEF
- Carl Kinkade, CDC
- Chris Seebregts, Jembi Health Systems NPC
- Eric Gaju, UNICEF
- Garrett Livingston Mehl, WHO
- Jai Ganesh Udayasankaran, Sri Sathya Sai Central Trust
- Joaquin Andres Blaya, the World Bank
- Karin Källander, UNICEF
- Kanisha Katara, PATH
- Kate Wilson, DIAL
- Manisha Bhinge, Rockefeller Foundation
- Mark Landry, WHO
- Max Schumann, German Agency for International Cooperation (GIZ)
- Merrick Schaefer, USAID
- Michael Downey, DIAL
- Peter Benjamin, Health Enabled
- Sean Blaschke, UNICEF
- Tessa Lennemann, German Agency for International Cooperation (GIZ)
- Tim Wood, Bill & Melinda Gates Foundation

This final report represents the opinions and conclusions of the DPGA, and does not represent an endorsement by the individuals and organizations who contributed to this report.

Assessments

The assessment includes an overview of each digital solution, their relevance to immunization delivery management and their assessment against the DPG Standard and the Digital Square Global Goods Maturity Model.

Immunization Delivery Management

Based on a number of rounds of voting within the CoP, members chose to identify tools for immunization delivery management. Future iterations of the Health CoP may focus on different areas or use cases within health. Relevance for immunization delivery management was determined as addressing one or more of the functions described by WHO-UNICEF COVID-19 Vaccination Delivery Innovation Team. These functions are being regularly updated and evolving.

How it is applied in this report:

For this report, WHO-UNICEF COVID-19 Vaccination Delivery Innovation Team helped identify relevant dimensions for each solution. Specific details on the functionality of each solution were provided by the solutions and not verified by the DPGA.

At the time of assessment these dimensions included:

Dimension	Functionality Details
Infodemic Management	Digital solutions that equip individuals and their communities with the knowledge and tools to promote accurate health information (upstream) and mitigate the harm that misinformation and disinformation causes (downstream).
Microplanning	Digital microplanning tools enable a data-driven environment based on geospatial data on health infrastructure, distribution of target population, satellite imagery, and travel-time estimation to assess whether a health care or other facility can serve the population and subgroups within its catchment area equitably.
Counterfeit detection	Digital solutions that allow serialized COVID-19 vaccine packs to be verified via a mobile application and through other standard interfaces to scanning systems.
Vaccination Status Tracking	Digital solution for vaccination authentication that supports continuity of care and providing proof of vaccination, available on paper and electronic systems in offline and online environments, conform to interoperability standards outlined by the Smart Vaccination Certificate working group, and conform to principles outlined by the Smart Vaccination Certificate working group.
Vaccination Monitoring	Digital solutions for the data collection, storage, analysis, and dissemination needs of COVID-19 vaccine coverage and uptake monitoring.
Safety Monitoring	Digital solution to bridge national AEFI data from heterogenous data sources into the global database in an E2B (R3) format.

The DPG Standard

The Digital Public Goods Standard is a set of specifications and guidelines designed to maximise consensus about whether the design of an open solution conforms to the definition of digital public goods (DPGs) set by the UN Secretary-General in the 2020 Roadmap for Digital Cooperation: *"open source software, open data, open AI models, open standards and open content that adhere to privacy and other applicable best practices, does no harm and are of high relevance for attainment of the UN's 2030 Sustainable Development Goals (SDGs)."*

The DPG Standard establishes a baseline that must be met in order to earn recognition as a digital public good by the Digital Public Goods Alliance and the broader community. The DPG Standard is itself an open project, open to contribution and developed in collaboration with organizations and experts. It is designed to identify DPGs across multiple sectors and the DPGA maintains an ongoing process of screening nominated projects through the DPG Registry. At the time of this report's publishing it is in version 1.1.4.

How it is applied in this report:

For this report, individuals with authority to speak on behalf of the solution provided information to the DPGA that was used to assess whether a project meets the minimum requirements to be considered a digital public goods according to the indicators set out in the DPG Standard. For indicators 1-6 in the Standard (see below) the DPGA takes steps to verify the information for accuracy by comparing it to publicly accessible information such as the code, documentation, and license. For indicators 7-9, this information is self-reported and is not verified by the DPGA.

Below is an overview of the DPG Standard, the full standard is visible here.

Digital Public Goods Standard:

Indicators	Requirements
SDG Relevance	1) SDG Relevance
Open Source	2) Use of Approved License 3) Clear Ownership 4) Platform Independence 5) Technical and Operational Documentation 6) Mechanism for Extracting Data
Adherence to Laws, Standards, & Best Practices	7) Adherence to Privacy and Applicable Laws 8) Adherence to Standards & Best Practices
Steps Taken to Mitigate & Avoid Harm in Product Design	9a) Data Privacy & Security 9b) Inappropriate & Illegal Content 9c) Protection from Harassment

Global Goods Maturity Model

The DPG Standard and definition, by design, has no maturity requirement. However, within the definitions of digital global goods for health there is broad alignment (as described in this paper) on the need for digital health solutions to demonstrate maturity through indicators such as scale, funding, and evidence of effectiveness. As there is currently no certifying body for global goods, based on the definitions of global goods outlined in the paper above, many solutions beyond those recognized in this report may be considered global goods.

The Digital Square - Global Goods Maturity Model was developed with input from the digital health community, and while Digital Square does not certify solutions as global goods, the maturity model is a recognized tool for helping projects and investors understand the maturity of digital health software. At the time of this report's publishing, it isin version 1.3.

How it is applied in this report:

For this report, solutions are considered global goods when they report at least 'medium' maturity on the select sub-indicators identified by WHO-UNICEF COVID-19 Vaccination Delivery Team. These sub-indicators are; *country utilization, digital health interventions, source code accessibility, user documentation, multi-lingual support, technical documentation, software productization, interoperability, and data accessibility and security*.

For the digital solutions included in this report that have been previously assessed by Digital Square, the DPGA has included a copy of the table that reflects the maturity model baseline assessments and the latest reassessment as it appeared on the Digital Square Wiki at the time of this report's publication. For solutions that had not been assessed by Digital Square at the time of this report, the DPGA have included a table that reflects the information provided to the DPGA for those same global goods maturity indicators. All maturity model assessments are self-reported by the organization leading the software development of the global good.

Below is an overview of the maturity model, the full model is visible here.

Digital Square Global Goods Maturity Model:

Indicators	Sub-Indicator
Global Utility	Country Utilization Country Strategy Digital Health Interventions Source Code Accessibility

	Funding and Revenue
Community Support	Developer, Contributor and Implementer Community Engagement Community Governance Software Roadmap User Documentation Multi-Lingual Support
Software Maturity	Technical Documentation Software Productization Interoperability and Data Accessibility Security Scalability

Considerations & Limitations of this Report

An effort was made to consider all of the digital solutions suggested by members, inevitably some relevant digital solutions were not captured in our discussions. Some digital solutions didn't respond to our request for information, and some opted not to participate because of their own assessment of their licensing and/or maturity. Only solutions that were deemed relevant to immunization delivery management were included in this report, and this report is not inclusive of all health-relevant DPGs or global goods. This is a living document and the DPGA will periodically review and update this report with relevant solutions.

This report only evaluates the intention and design of the generic open source digital solution and not specific country or regional implementations or deployments. As a result, especially on dimensions such as compliance with laws, adherence to standards, and doing no harm, which are key components of the UNSG's definition of digital public goods, much is dependent on how the digital solution is implemented and adapted to the local context. Acknowledging this as a limitation with the report, we asked digital solution owners to describe the steps they have taken in the design and development of the digital solution to address and ensure good practices for these questions.

Another limitation is that while indicators such as license and documentation can be objectively verified by DPGA staff, many other indicators are at least partially reliant on self-reporting by the digital solution owners. As a result, this information is subject to inaccuracies in reporting.

Lastly, the nature of open source software digital solutions is that they are constantly developing and changing. This report is clearly time-stamped, and each of these digital solutions is re-assessed against the DPG Standard on an annual basis. The DPGA is exploring innovative ways to rapidly update digital solution information. It will be important to consider the evolving nature of digital solutions when utilizing this report.

To try and mitigate these limitations, all of the information provided by the digital solutions is published transparently, in full, alongside our assessments and we urge those considering implementations, investments, and development to use this as a starting point for additional critical evaluation of these digital solutions.

Highlighted Solutions

This section presents the assessment summaries for each of the digital solutions.

CommCare

URL: https://www.dimagi.com/commcare/

Description:

> An open source, offline-first digital health platform that allows users to rapidly configure and deploy mobile applications to support data collection, service delivery, and complex case management. Using their application builder, users can customize data collection forms, and build service delivery support applications which feature case management for frontline workers. More than 2,000 projects across 80 countries use CommCare for their data collection and reporting needs, and more studies have assessed CommCare's impact than any other mobile platform for frontline workers.

Potential impact of the digital solution on health systems and ultimately health outcomes:

> Commcare allows users to build flexible solutions for a wide range of health related activities. CommCare has the capacity to track and support every client before, during, and after they are vaccinated, help facilities and health care workers prepare for vaccination distribution, provide analytics and visualizations to monitor the progression of vaccine delivery. In addition, CommCare facilitates long term tracking, decreases wastage of vaccine supply, and pushes vaccine protocol down to the front line to reduce training costs. The goal is ultimately to increase vaccination rates and increase data driven decision making.

Use:

> A service to manage, transmit, or analyze health-related data that can be freely accessed as a software service and adheres to open data principles

Category: Open Source Software

Github Repository: https://github.com/dimagi/commcare-hq

WHO Digital Health Interventions

- 1.0 Client: 1.1 Targeted client communications
- 2.0 Healthcare Providers: 2.1 Client identification and registration; 2.2 Client health records; 2.3 Healthcare provider decision support; 2.5 Healthcare provider communication; 2.6 referral coordination; 2.7 Health worker activity planning and scheduling; 2.8 Healthcare provider training; 2.9 Prescription and medication management;
- 3.0 Health System Managers: 3.2 Supply chain management ; 3.6 Equipment and asset management
- 4.0 Data Services: 4.1 Data collection management and use

Relevance to Immunization Delivery Management:

- COVID-19 Vaccine Functions: Infodemic management, counterfeit detection, vaccination status, vaccination monitoring, safety monitoring

Maturity:

- Global Goods Maturity Summary: Reports high maturity for global utility, high maturity for community and high maturity for software.
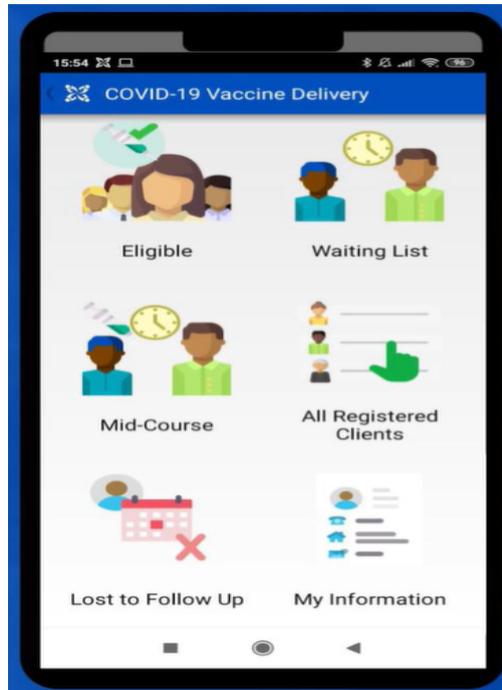
Commcare for vaccine delivery mobile client interface
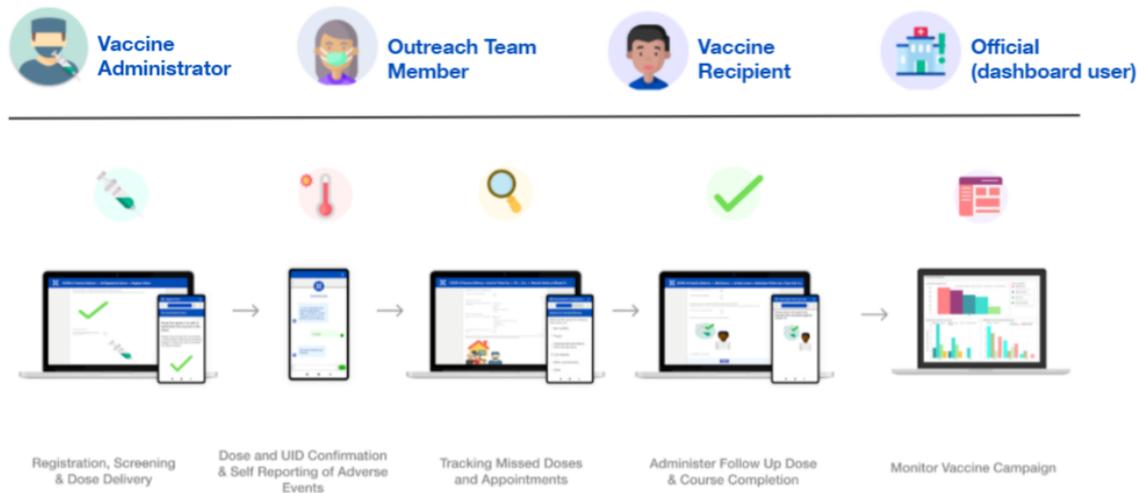
Immunization Delivery Management Functions:

Dimension	Relevance	Specific Functionalities
Infodemic Management	Y	CommCare allows administrators to rapidly release new app content as new evidence becomes available or protocols so that programs can be assured that frontline workers (FLWs) are referencing accurate information as they deliver services.

		The platform supports many multimedia types (image, video, audio, etc.) and many partners utilize this functionality so that FLWs can easily share content with their communities. It also supports many languages so all information can easily be conveyed in a way that users can understand. Advanced logic can be configured in forms so that content can be selectively displayed based on user information or data that has been entered. CommCare also enables turnkey integration with messaging platforms so that it's case management capabilities can be coupled with info or chatbots traditionally used to combat disinformation.
Microplanning	N/A	
Counterfeit Detection	Y	CommCare enables in-app barcode scanning and because of the open APIs can easily integrate with external systems.
Vaccination Status	Y	CommCare allows for offline case management and can enable the tracking of an individual vaccine recipient through the course of a multi-dose vaccination campaign onwards. CommCare can record details on the delivery of doses and verify the course of a vaccine was completed. The CommCare COVID-19 Vaccine Delivery solution collects all core data elements as described by the Smart Vaccination Certificate working group.
Vaccination Monitoring	Y	CommCare allows for data collection, data storage, data analysis, and easy data extraction. It offers out of the box workforce management reports to help support planning and management. The CommCare COVID-19 Vaccine Delivery solution helps to facilitate the tracking of vaccine recipients before, during, and after vaccination. The solution features CommCare applications for vaccinators, CHWs or outreach team, and vaccine site managers. Vaccinators can use the application to register recipients, assess their eligibility, deliver doses, follow up with recipients who miss vaccination appointments, and record adverse events. CHWs or outreach team members can use it to record the results of community engagement sessions and as a tool to follow up with community members who have missed appointments or have low vaccine confidence. Finally, vaccine site managers can use the application to assess their site's readiness for the COVID-19 vaccination campaign. The solution also features a direct to recipient messaging component which will guide recipients through the vaccination process by providing appointment reminders, and allowing for bi-directional messaging regarding adverse events. The application can be linked to dashboards to assist campaign managers from the national level down to the local level manage campaigns.
Safety Monitoring	Y	CommCare's robust case management allows users involved in vaccine delivery to record and investigate adverse events following immunization. The CommCare for COVID-19 vaccine delivery template solution allows vaccinators to record adverse events, link them to specific doses, and to follow up on them over time.

DPG Standard Assessment:

Indicators	Requirements	Response	Details, Reference
Digital Health Relevanc	SDG Relevance	Yes	SDGs 3, 10, Commcare Overview

e			
Open Source	Use of Approved License	Yes	BSD 3-Clause CommCare License on GitHub
	Clear Ownership	Yes	CommCare for Vaccine Delivery CommCare for Equitable Vaccine Delivery
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and Operational Documentation Maturity Rating	Yes High	Source code is documented to the point that new adopters can customize and add new functionality without relying on significant help from core developers. Online courses and tutorials are available to address common development and deployment tasks. Core business workflows and functional requirements are fully documented using use cases, user stories, or other equivalent methodology. Documentation
	Mechanism for Extracting Data (Non-PII)	Yes	Data can be exported using several data tools. https://confluence.dimagi.com/display/commcarepublic/The+CommCare+Ecosystem
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	GDPR, HIPPA, 1. Terms of Service 2. Privacy Policy 3. Business Agreement 4. Acceptable Use Policy
	Adherence to Standards & Best Practices	Yes	Standards: Openrosa, W3C Introduction to OpenRosa Standards - W3C Best Practices: WCAG AA, Section 508 and European Standards Practices /
Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	Demographic and health data collected and stored. Data is not shared with third parties
	Inappropriate & Illegal Content	N/A	Does not distribute content
	Protection from Harassment	Yes	Organizations who use CommCare are to comply with applicable laws regarding minimum age requirements of end users

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessments and the latest reassessment as it appears on the Digital Square Wiki. All maturity model assessments are *self-reported*. For the latest updates please visit:
https://wiki.digitalsquare.io/index.php/Global_Goods_Maturity

Category	Baseline (May 2019)	Update (Jun 2020)
Global Utility		
Country Utilization	High	High
Country Strategy	High	High
Digital Health Interventions	Medium	High
Source Code Accessibility	High	High

Funding and Revenue	High	High
Community		
Developer, Contributor, and Implementer Community Engagement	High	High
Community Governance	High	High
Software Roadmap	High	High
User Documentation	High	High
Multi-lingual Support	High	High
Software		
Technical Documentation	High	High
Software Productization	High	High
Interoperability and Data Accessibility	High	High
Security	Medium	High
Scalability	High	High

Considerations:

- This digital solution is also a Digital Square Approved Global Good which means it has been funded by Digital Square. You can find more information about it in Digital Square's Global Goods GuideBook.
- Additional information on this project is available in the DIAL Catalogue of Digital Solutions.

DHIS2

Project URL: https://dhis2.org/

Project Description:

> District Health Information Software 2 (DHIS2) is an open source, web-based platform that is highly generic and configurable supporting web and Android clients. It is used as a health management information system (HMIS), used by 73 low- and middle-income countries (including 45 countries who have integrated immunization program data into the system). The DHIS2 tracker data model is used in more than 60 countries for individual, longitudinal data collection and analysis.

Potential impact of the project on health systems and ultimately health outcomes:

> DHIS2 is the world's largest HMIS platform, used by 73 low and middle-income countries, providing health related data for decision making. Approximately 2.4 billion people live in countries where DHIS2 is used.

Project Use:

DHIS2 is a tool for collection, validation, analysis, and presentation of aggregate and patient-based statistical data, tailored (but not limited) to integrated health information management activities , clinical management, and vaccination campaigns among others.

Category: Open Source Software

Github Repository: https://github.com/dhis2

WHO Digital Health Interventions

- 1.0 Client: 1.1 Targeted client communications
- 2.0 Healthcare Providers: 2.1 Client identification and registration; 2.2 Client health records; 2.3 Healthcare provider decision support; 2.5 Healthcare provider communication; 2.6 referral coordination; 2.7 Health worker activity planning and scheduling; 2.9 Prescription and medication management;
- 3.0 Health System Managers: 3.2 Supply chain management
- 4.0 Data Services: 4.1 Data collection management and use

Immunization Delivery Management:

- Covid-19 Vaccine Functions: micro planning (GIS tools), vaccination status (tracker), vaccination monitoring (tracker & aggregate), safety monitoring (Tracker)

Maturity:

- Global Goods Maturity Summary: Reports high maturity for global utility, high/medium for community and high maturity for software.

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	N/A	
Microplanning	Y	Native GIS functionality in DHIS2 (Maps app which supports user creation of thematic maps as well as the use of external map layers such as GRID3 or WorldPop data to provide denominator estimates for various coverage areas). Enables users to analyze their own data captured in DHIS2 (e.g. official population estimates by various sub groups) and geographical boundaries (health facility catchment areas, districts, administrative boundaries). Support for importing coordinates, exporting GIS data for analysis in other tools.
Counterfeit detection	N/A	
Vaccination Status	Y	Longitudinal tracking module that maintains a record linked to an individual entity. Core data elements from Smart Vaccination Certificate working group. incorporated into the DHIS2 Tracker for COVID-19 Immunization Registry Dashboard for the patient/record indicates on web or on DHIS2 Android App the vaccination status of an individual. Analytics aggregated from vaccination sites and upward for monitoring vaccination status of communities or groups of individuals. This tool supports monitoring, reporting, planning & management (e.g. through working lists to facilitate follow up on missed doses, etc).
Vaccination Monitoring	Y	Allows for data collection, storage, analysis & dissemination. DHIS2 has a robust built-in analytics engine to facilitate calculated indicators on the fly and broad support for data visualization types.

		Dashboards that can be access controlled via user groups and dynamically altered to drill down (e.g. view data at sub-national or facility levels) and through a period of time (daily, weekly, monthly, annual). Dashboard charts can be toggled between tables, charts and maps Indicators calculated on-the-fly. Includes the possibility for monitoring coverage based on different types of denominator estimates to facilitate data triangulation. Supports the triangulation of stock, vaccination, and population data to facilitate iterative planning and adaptive management of the national vaccine delivery plan. Supports stock data capture at facility level, allowing for data transfer with upstream eLMIS to provide facility level stock visibility and analysis This tool can be used for monitoring, reporting, planning & management. Metadata package for vaccination monitoring is aligned to the reporting & monitoring framework produced by WHO and is used to facilitate reporting from AFRO Member States using DHIS2 to AFRO.
Safety Monitoring	Y	WHO approved Adverse events following immunization (AEFI) metadata package. User roles and authorities allowing access to adverse event notification, district-level investigation and national level investigation according to protocols (can be adapted in country). Support for exporting data in the E2B format for exchange with global Vigibase (WHO global database for adverse events reporting maintained by Uppsala University). This tool supports monitoring, reporting, investigation workflows and management.
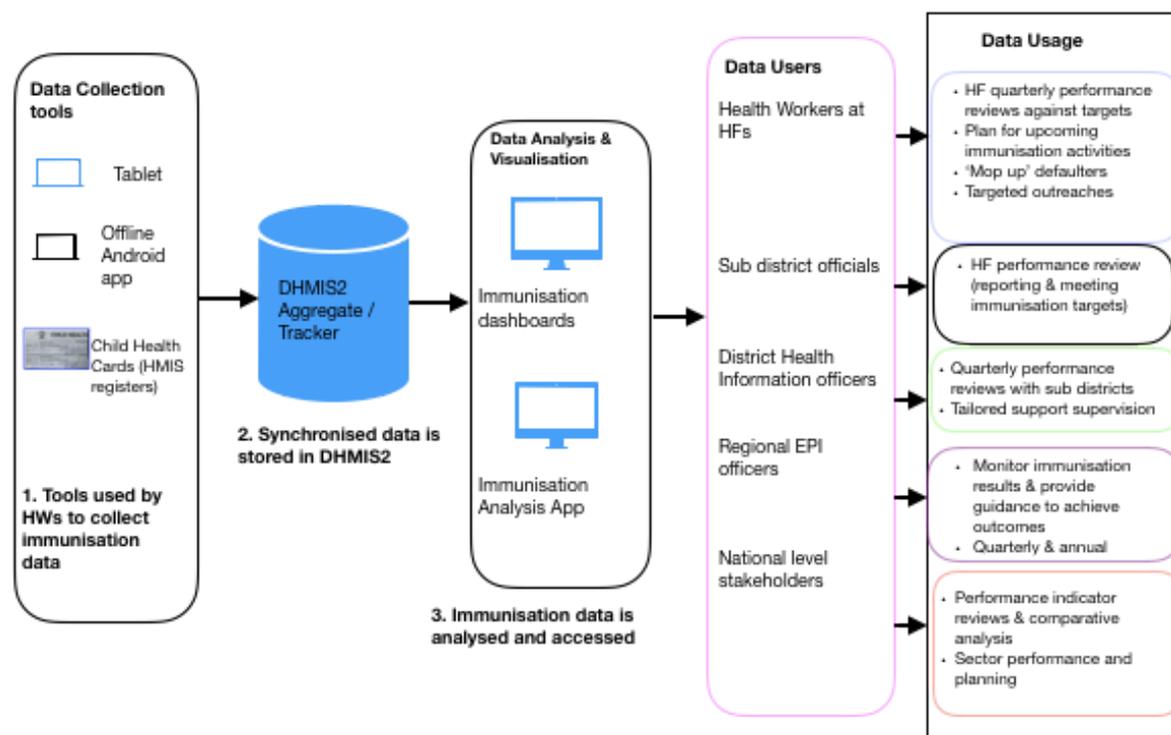
DHIS2 immunization data use (example from Ghana implementation)

DPG Standard Assessment:

Indicators	Requirements	Response	Details, Reference
SDG	SDG Relevance	Yes	SDGs 3, 4, 17 *DHIS2 and Covid-19*, *Research on DHIS2 for Education* *Publications*

Relevance			
Open Source	Use of Approved License	Yes	BSD 3-Clause, License
	Clear Ownership	Yes	Ownership
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and Operational Documentation	Yes, High	Source code is documented to the point that new adopters can customize and add new functionality without relying on significant help from core developers. Online courses or tutorials are available to address common development and deployment tasks. Core business workflows and functional requirements are fully documented using use cases, user stories, or other equivalent methodology DHIS2 Documentation: Home
	Mechanism for Extracting Data (Non-PII)	Yes	Non-PII data can be extracted and/or imported using the DHIS2 Web API, DHIS2 Documentation: Home
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	All activities pertaining to data collection, storage and analysis in the European region are governed by the General Data Protection Regulation (GDPR) and relevant Norwegian legislation. Countries using the DHIS2 software in other regions are responsible for complying with local legislation.
	Adherence to Standards & Best Practices	Yes	FHIR, SNOMED GPS,LOINC,CVX, ADX, ICD-10, ICD-11,mCSD, SVCM Integration & Interoperability DHIS2 Documentation: Home Best Practices: Principles of Digital Development, agile development Process
Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	For example name, DoB, address, contact info, ID Number, data are not shared with third party
	Inappropriate & Illegal Content	N/A	Content not distributed
	Protection from Harassment	Yes	Interactions between users / contributors on this digital solution are managed through an online forum, the DHIS2 Community of Practice. The target audience for this community is skilled users of the DHIS2 software (expected age 20+), and discussion is limited to topics relating to software implementation and use. The age limit for participation on the forum is 13 or older: FAQ

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessments and the latest reassessment as it appears on the Digital Square Wiki. All maturity model assessments are *self-reported*. For the latest updates please visit: https://wiki.digitalsquare.io/index.php/Global_Goods_Maturity

Category	Baseline (Sept 2018)	Update (March 2020)
Global Utility		
Country Utilization	High	High

Country Strategy	High	High
Digital Health Interventions	Medium	High
Source Code Accessibility	High	High
Funding and Revenue	High	HIgh
Community		
Developer, Contributor, and Implementer Community Engagement	Medium	Medium
Community Governance	Medium	Medium
Software Roadmap	High	High
User Documentation	High	High
Multi-lingual Support	High	High
Software		
Technical Documentation	High	High
Software Productization	Medium	High
Interoperability and Data Accessibility	High	High
Security	Medium	High
Scalability	High	High

Considerations

- This digital solution is also a Digital Square Approved Global Good which means it has been funded by Digital Square. You can find more information about it in Digital Square's Global Goods GuideBook.
- Additional information on this project is available in the DIAL Catalogue of Digital Solutions.

Global HealthSites Mapping project

Digital Solution URL: https://healthsites.io/

Digital Solution Description:

Building a global baseline of health facility data with OpenStreetMap.

Potential impact of the digital solution on health systems and ultimately health outcomes:

Accurate baseline health facility data has a variety of positive impacts on health systems and health outcomes. Understanding the status of health facilities is vital when planning a vaccination roll-out campaigns or assessing the capacity of a facility to contain a disease outbreak.

Digital Solution Use:

As a service to manage, transmit, or analyze health-related data that can be freely accessed as a software service and adheres to open data principles.

Category: Open Data

Github Repository: https://github.com/healthsites/healthsites

WHO Digital Health Interventions:

- 1.0 Client: 1.5 Citizen based reporting; 1.6 On-demand information services to clients;
- 3.0 Health System Managers: 3.7 Facility management;
- 4.0 Data services: 4.1 Data collection management and use ; 4.3 Location mapping

Immunization Delivery Management:

- COVAX Functions: Microplanning

Maturity:

- Global Goods Maturity Summary: Reports high/medium maturity for global utility but low for funding/revenue, high/medium for community and high/medium for software

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	N/A	
Microplanning	Y	Publication and maintenance of health facility data. Knowing the geolocation and capacity of health facilities is vital for planning a vaccination campaign. By sharing data to OpenStreetmap stakeholders in the health cluster including the Ministry of Health are able to support the maintenance of baseline health facility data.
Counterfeit detection	N/A	
Vaccination Status	N/A	
Vaccination Monitoring	N/A	
Safety Monitoring	N/A	

Healthsites Architecture

DPG Standard Assessment:

Indicators	Requirements	Response	Details, Reference
Digital Health Relevance	SDG Relevance	Yes	SDG 3.8 - Through open publication and maintenance of baseline health facility data Global Health Sites Mapping Project
Open Source	Use of Approved License	Yes	Free BDS License *License*
	Clear Ownership	Yes	*IP policy*
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and Operational Documentation	Yes, Medium	Some technical documentation exists of the source code, use cases, and functional requirements.
	Mechanism for Extracting Data (Non-PII)	Yes	All health facility data is saved to OpenStreetmap and made available for download from the healthsites.io platform. Users are able to access and export data in a variety of formats,

			including JSON, GEOJSON, CSV, SHP, REST, #HXL In addition the data is published to the Humanitarian Data Exchange and available in the Humanitarian Exchange Language (HXL)
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	GDPR, _GDPR Reference_
	Adherence to Standards & Best Practices	Yes	GEOJSON, CSV, SHP, REST, #HXL Best Practices : Principles for Digital Development, Agile development approach
Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	No PII collected
	Inappropriate & Illegal Content	N/A	Only baseline health facility data collected
	Protection from Harassment	Yes	No interaction between users

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessments and the latest reassessment as it appears on the Digital Square Wiki. All maturity model assessments are *self-reported*. For the latest updates please visit:
_https://wiki.digitalsquare.io/index.php/Global_Goods_Maturity_

Category	Update (March 2021))
Global Utility	
Country Utilization	Medium
Country Strategy	Medium
Digital Health Interventions	High
Source Code Accessibility	High
Funding and Revenue	Low
Community	
Developer, Contributor, and Implementer Community Engagement	High
Community Governance	High
Software Roadmap	Medium
User Documentation	High
Multi-lingual Support	Medium
Software	
Technical Documentation	Medium

Software Productization	Medium
Interoperability and Data Accessibility	High
Security	High
Scalability	High

Considerations:

- This digital solution is also a Digital Square Approved Global Good which means it has been funded by Digital Square. You can find more information about it in Digital Square's Global Goods GuideBook.
- Additional information on this project is available in the DIAL Catalogue of Digital Solutions.

KoBoToolbox

Digital Solution URL: https://www.kobotoolbox.org/

Digital Solution Description:

KoBoToolbox is a free & open source suite of tools for field data collection in humanitarian, development, research, and global health settings.

Potential impact of the digital solution on health systems and ultimately health outcomes:

KoBoToolbox is an easy to use software that has advanced features for professional data collection efforts. It is widely used for collecting health indicators, registering attitudes and perceptions, and for gathering feedback from affected people in health emergencies. It is meant to save organizations time and resources while also facilitating increased data quality and accountability.

Digital Solution Use:

A service to manage, transmit, or analyze health-related data that can be freely accessed as a software service which adheres to open data principles.

Category: Open Source Software

Github Repository: https://github.com/kobotoolbox

WHO Digital Health Interventions

- 2.0 Healthcare Providers: 2.1 Client identification and registration; 2.3 Healthcare provider decision support; 2.8 Healthcare provider training;
- 3.0 Health System Managers: 3.2 Supply chain management; 3.4 Civil registration and vital statistics; 3.6 Equipment and asset management
- 4.0 Data Services: 4.1 Data collection management and use; 4.2 Data coding; 4.3 Location mapping

Immunization Delivery Management:

- COVAX Functions: Microplanning, Vaccination Monitoring, Safety Monitoring

Maturity:

- Global Goods Maturity Summary: Reports high/medium for global utility, high maturity for community and high maturity for software.

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	Y	KoBoToolbox has been used to track, verify, and address rumors and misinformation during infectious disease outbreaks.
Microplanning	Y	The tool allows registering very detailed geographic information (GPS points, polygons, etc.) for analysis and/or integration into existing GIS systems (including ArcGIS, QGIS, or OpenStreetMap). One of the central use cases of the tool is the reliable collection of detailed data about facilities, potential project participants, baseline population statistics, etc. for project planning, monitoring, or evaluation purposes.
Counterfeit detection	Y	The tool includes a feature for allowing project administrators or other staff to validate submissions in order to spot potential "fake" data.
Vaccination Status	Y	The tool is being used to monitor and track vaccination rollouts, e.g. by scanning barcodes of vaccine batches and participants, registering relevant details about the patient or nurse, metadata about the time and location of the vaccination.
Vaccination Monitoring	Y	The tool is being used to monitor and track vaccination rollouts, e.g. by scanning barcodes of vaccine batches and participants, registering relevant details about the patient or nurse, metadata about the time and location of the vaccination.
Safety Monitoring	Y	Data from existing sources can be collected (or transcribed from paper) with the tool to match existing data structures by specifying the intended variable names expected by the final database.
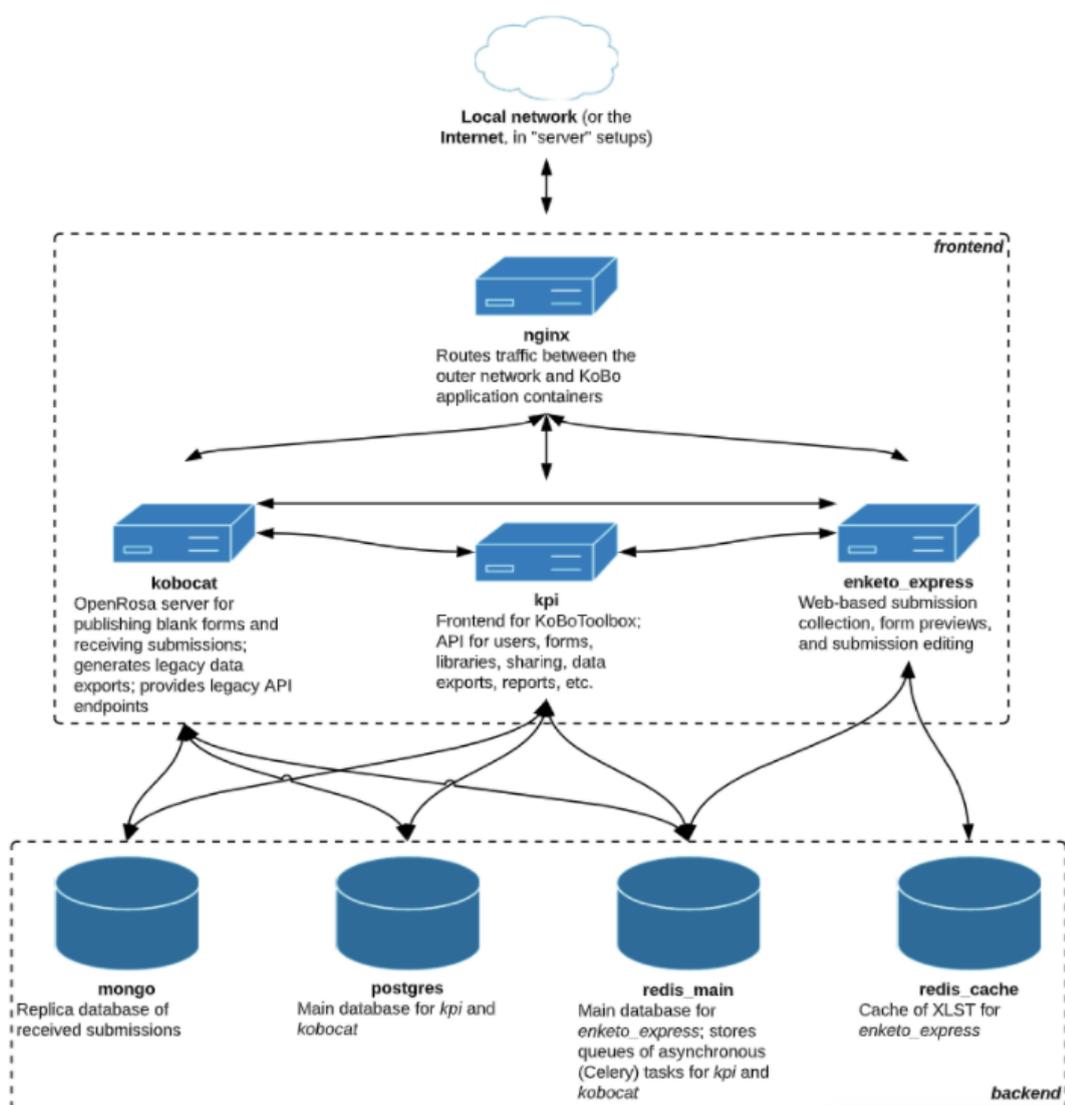
KoBoToolbox system architecture

DPG Standard Assessment:

Indicators	Requirements	Response	Details, Reference
SDG Relevance	SDG Relevance	Yes	SDGs 1 through to 17 - supported indirectly
Open Source	Use of Approved License	Yes	AGPL-3.0 License
	Clear Ownership	Yes	Ownership
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and	Yes	Online documentation and courses exist to guide beginners as

	Operational Documentation	High	well as advanced users on creating, managing, and analyzing data collection projects. Technical documentation exists for the source code, use cases, and functional requirements. KoBoToolbox documentation Training instal Docker Contributing
	Mechanism for Extracting Data (Non-PII)	Yes	Users are able to access and export their data in a variety of formats, including JSON, CSV, XLS, geoJSON.
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	GDPR, adherence Terms Privacy policy: KoboToolbox Data Privacy Policy
	Adherence to Standards & Best Practices	Yes	Support for W3 accessibility standards is being applied progressively. KoBoToolbox is built on the XLSForm and XForm standards that are also used by ODK and other tools. Best practices: User interface design principles
Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	User's email addresses are mandatory when creating accounts. Users may voluntarily provide other details. Users further use KoBoToolbox to collect any data that they require for their own purposes, which may include PII; only users have access to this data. It is possible to batch-delete any variables containing PII.
	Inappropriate & Illegal Content	N/A	Users may collect text data, audio files, images, or video files as required by their digital solutions. None are available for public distribution
	Protection from Harassment	Yes	No interaction between users

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessment conducted by the DPGA using the Digital Square's Global Goods Maturity Model. All maturity model assessments are *self-reported*.

Category	Update (Jun 2021)
Global Utility	
Country Utilization	High
Country Strategy	Medium
Digital Health Interventions	High
Source Code Accessibility	Medium
Funding and Revenue	High
Community	
Developer, Contributor, and Implementer Community Engagement	High
Community Governance	High
Software Roadmap	High
User Documentation	High

Multi-lingual Support	High
Software	
Technical Documentation	High
Software Productization	High
Interoperability and Data Accessibility	High
Security	High
Scalability	High

Considerations:

● Additional information on this project is available in the DIAL Catalogue of Digital Solutions.

Community Health Toolkit

Digital Solution URL: https://communityhealthtoolkit.org/

Digital Solution Description:

The Community Health Toolkit (CHT) is a collection of free and open-source technologies; open-access design, technical, and implementer resources; and a community of practice for advanced community health systems. Medic, a nonprofit organization with a mission to advance good health, human flourishing, and equitable care for and with the hardest-to-reach communities, serves as the technical steward and core contributor of the CHT.

Potential impact of the digital solution on health systems and ultimately health outcomes:

Provide support to health workers as they deliver care in reimagined community health systems – where care begins at home, services are delivered through proactive visits, and health workers are supported with offline-first algorithms, connections to health facility teams, and data-driven performance management.

Digital Solution Use:

As a service to manage, transmit, or analyze health-related data that can be freely accessed as a software service and adheres to open data principles.

Category: Open Source Software

Github Repository: https://github.com/medic/cht-core

WHO Digital Health Interventions:

● 2.0 Healthcare Providers: 2.1 Client identification and registration; 2.2 Client health records; 2.3 Healthcare provider decision support; 2.5 Healthcare provider communication; 2.6 Referral coordination; 2.7 Health worker activity planning and scheduling; 2.8 Healthcare provider training; 2.9 Prescription and medication management; 2.10 Laboratory and diagnostics imaging management

- 3.0 Health system managers: 3.2 Supply chain management ; 3.3 Public health event notification; 3.4 Civil registration and vital statistics; 3.7 Facility management
- 4.0 Data Services: 4.1 Data collection management and use

Immunization Delivery Management:

- COVAX Functions: Infodemic management, microplanning, vaccination status, vaccination monitoring, safety monitoring

Maturity:

- Global Goods Maturity Summary: Reports high maturity for global utility, high maturity for community, high maturity for software.

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	Y	The Community Health Toolkit enables partners to develop and release new app content for user learning and care, which enables programs to create and deploy modules for CHWs, supervisors, and managers. The CHT has the ability to include different types of media, including images and videos, to ensure that users are able to learn and share educational content with members of their communities. In the context of COVID, the CHT supports workflows associated with remote learning & care, particularly around community and CHW education on disease transmission, home-based care, and vaccine delivery. This work has been co-developed with other members of the CHT community and in alignment with UNICEF.
Microplanning	Y	The CHT has product features associated with GPS data collection, distribution of registered households within a given catchment area, and the ability to engage in estimation around distance to care. By employing an equity lens approach to data-driven decision-making, the CHT uses data to enable microplanning with attention to complex dynamics within specific subsets of the population. Functionality within the CHT allows for data science initiatives, monitoring, and routine reporting.
Counterfeit detection	N/A	
Vaccination Status	Y	The CHT has co-developed workflows for vaccination support at the scale of the community, which include status, monitoring and vaccine safety. These workflows emphasize the role of CHWs as advocates within the community health system. Through offline first integrated community case management, the CHT is well positioned to ensure vaccine status, eligibility, and broader community engagement around COVID vaccine education.
Vaccination Monitoring	Y	The CHT has co-developed workflows for vaccination support at the scale of the community, which include status, monitoring and vaccine safety. These workflows emphasize the role of CHWs as advocates within the community health system.
Safety Monitoring	Y	The CHT has co-developed workflows for vaccination support at the scale of the community, which include status, monitoring and vaccine safety. These workflows emphasize the role of CHWs as advocates within the community health system.

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Community Health Toolkit for COVID-19
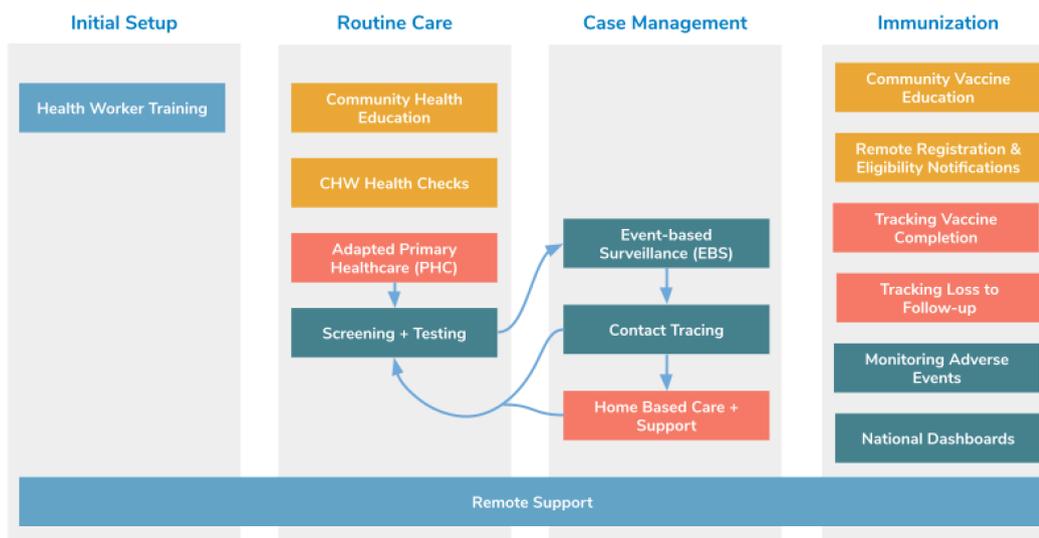
Example CHT COVID-19 Workflow

DPG Standard Assessment:

Indicators	Requirements	Response	Details, Reference
Digital Health Relevance	SDG Relevance	Yes	SDGs 3,5,17 CHT Principles, Prioritizing the role of community healthcare workers, Global Goods: The Community Health Toolkit video
Open Source	Use of Approved License	Ye	AGPL-3.0, CHT Core
	Clear Ownership	Yes	Core Framework Overview
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and Operational Documentation	Yes, High	Source code is documented to the point that new adopters can customize and add new functionality without relying on significant help from one of the core developers. Online courses or tutorials are available to address common development and deployment tasks. Core business workflows and functional requirements are fully documented using use cases, user stories, or other equivalent methodology
	Mechanism for Extracting Data (Non-PII)	Yes	Interactions with DHIS2
Adherence	Adherence to Privacy and Applicable Laws	Yes	GDPR and GDPR-inspired data regulations such as the Uganda Data Protection Regulation and the Kenya

to Laws, Standards & Best Practice			Data Protection Regulation
	Adherence to Standards & Best Practices	Yes	Standards supported HTML & CSS, JS web APIs Mobile Web, SVGs Best Practices: Principles for Digital Development Responsive design, offline-first progressive web apps
Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	No PII collected directly, but CHT apps do collect data. Common examples include: name, age, phone number, geolocation, personal health information including care encounters and test results, highly sensitive health information including HIV status, and data relevant to the social determinants of health such as level of education and wealth quintile.
	Inappropriate & Illegal Content	N/A	No collection of distributable content
	Protection from Harassment	Yes	Specialized tool for health workers. No other data collected, the data is not accessible to the public

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessments and the latest reassessment as it appears on the Digital Square Wiki. All maturity model assessments are *self-reported*. For the latest updates please visit:
https://wiki.digitalsquare.io/index.php/Global_Goods_Maturity

Category	Baseline (June 2018)	Update (Jun 2020)
Global Utility		
Country Utilization	Medium	High
Country Strategy	High	High
Digital Health Interventions	Medium	High
Source Code Accessibility	High	High
Funding and Revenue	High	High
Community		
Developer, Contributor, and Implementer Community Engagement	Medium	High
Community Governance	Medium	Medium
Software Roadmap	High	High
User Documentation	High	High
Multi-lingual Support	High	High
Software		
Technical Documentation	Medium	High
Software Productization	High	High
Interoperability and Data Accessibility	Medium	Medium
Security	Medium	High

Scalability	Medium	High

Considerations:

- This digital solution is also a Digital Square Approved Global Good which means it has been funded by Digital Square. You can find more information about it in [Digital Square's Global Goods GuideBook](#).
- Additional information on this project is available in the [DIAL Catalogue of Digital Solutions](#).

mHero

Digital Solution URL: https://www.mhero.org

Digital Solution Description:

> mHero is a two-way, mobile phone-based communication system that connects ministries of health and health workers, by using data from existing local health information systems to deliver messages via locally popular communication channels. As an official channel for communication between central-level health officials and frontline health workers, it can play a crucial role in immunization delivery management. Drawing information from existing local health information systems, such as data in human resources records, makes it possible to reach all health workers or communicate with targeted groups of health workers (i.e. vaccinators in a certain region).

Potential impact of the digital solution on health systems and ultimately health outcomes:

> mHero supports health sector communication or communication between organizations and associations and the cadres of health workers they oversee. It enables delivery of timely, informative communication to frontline health workers as well as collection of information from health workers about the conditions in their facilities and communities. This real-time communication, which is particularly useful in the context of an outbreak/pandemic, facilitates decision making to ensure health workers have the information, materials, and support to perform their work.

Digital Solution Use:

> As a service to manage, transmit, or analyze health-related data that can be freely accessed as a software service using open data principles.

Category: Open source software

Github Repository: [mhero (Marco) · GitHub](#)

WHO Digital Health Interventions:

- 2.0 Healthcare providers: 2.5 healthcare provider communication; 2.7 health worker activity planning and scheduling; 2.8 healthcare provider training;
- 3.0 Health system managers: 3.1 human resource management; 3.3 public health event notification
- 4.0 Data services: 4.1 data collection management and use ; 4.4 data exchange and interoperability

Immunization Delivery Management:

- COVAX Functions: Infodemic Management, Microplanning, Vaccination Status, Vaccination Monitoring, Safety Monitoring

Maturity:

- Global Goods Maturity Summary: Reports medium maturity for global utility but low for country strategy, low/medium maturity for community (high maturity of user documentation) and medium maturity for software with low maturity for scalability.

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	Y	mHero can be used to deliver accurate information to health workers who can then pass that information on to their patients, coworkers, communities, etc. This can be done through one-off messages, information campaigns, learning modules, knowledge checks, and more. mHero can also be used as a rumor tracker, with health workers reporting via mHero rumors they have heard from their patients/communities which can then be addressed with correct information shared via mHero or other communication channels. The advantage of using mHero for rumor tracking and disseminating information to dispel rumors is that it makes it possible to either know the location of where different rumors are spreading based on the location of the health worker who reports the rumor, and it is possible to send accurate information to locations where rumors have been reported.
Microplanning	Y	mHero can be used to collect any kind of health data, from stock levels to service provision, and this information can be analyzed at various levels of the health system for the purposes of micro planning. There are reports built into mHero and customized reports can be added. In addition, data collected via mHero can be automatically pushed to other FHIR-compliant health information systems or can be exported for analysis or inclusion in other systems and tools. mHero can also be used to validate data contained in health information systems so that data in health information systems is accurate for the purposes of micro planning. For example, validating the facility or community location of health workers who could administer vaccines can be used to make decisions related to distribution of these health workers to ensure there are enough vaccinators at the time when vaccines are scheduled to be delivered to a certain facility or other location.
Counterfeit detection	N/A	
Vaccination Status	Y	mHero can be used to collect information about the vaccination status of health workers (individually or aggregate) which can then be noted in their human resources records to monitor vaccination among health workers.
Vaccination Monitoring	Y	mHero workflows can collect any data related to vaccine monitoring, such as tracking deliveries of doses and supplies for vaccination, supply and stock levels, uptake, and more. The data collected via mHero can be analyzed within mHero and automatically pushed to other FHIR-compliant health information systems for the purposes of monitoring and planning.
Safety Monitoring	Y	In the same way that mHero can be used for disease surveillance and rumor tracking, the platform can also be used for reporting adverse events following immunization. AEFIs reported via mHero can be automatically be pushed to other FHIR-compliant health systems which can trigger processes to collect further information about individual AEFIs or alerts at any level of the health system to prompt vigilance of other AEFIs or the progression of reported AEFIs.

mHero Architecture

DPG Standard Assessment:

Indicators	Requirements	Response	Details, Reference
Digital Health Relevance	SDG Relevance	Yes	SDG 3, Users and Use Cases
Open Source	Use of Approved License	Yes	GPL 3.0, License
	Clear Ownership	Yes	FAQ | Intrahealth mHero
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and Operational Documentation	Yes, Medium	Some technical documentation exists of the source code, use cases, and functional requirements mACM implementation for mHero,
	Mechanism for Extracting Data (Non- PII)	Yes	No - exportation of data is possible but all reports include PII (however the PII could be removed from the exported reports)
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	Country-level data regulations such as the Uganda Data Protection Regulation and the Kenya Data Protection Regulation
	Adherence to Standards & Best Practices	Yes	FHIR, mACM, mACM implementation t iHRIS Best Practices: Principles for Digital Development (specifically: Design with the user, Understand the existing ecosystem, Design for scale, Build for sustainability, Be data-driven, Use open standards/open data/open source/open innovation, Address Privacy and Security, Be collaborative
Steps Taken to Mitigate	Data Privacy & Security (PII data)	Yes	Name as well as phone number or email are the only PII required for use of mHero, all of which come from official human resources records. No data privacy policy is shared with health workers who choose to

& Avoid Harm in Product Design			use mHero but health workers can opt out of receiving messages via mHero. The components of mHero, including data collected via mHero, are typically installed/stored on a server with the same security standards and following the same measures as the system containing HR records which is accessible only by designated system users. Data sharing agreements are established when necessary.
	Inappropriate & Illegal Content	N/A	Exchanges via mHero are between the system and individual health workers, so the system can reach many health workers through broadcast messages; however health workers cannot send broadcast messages to other health workers via the system. Therefore a health worker could send inappropriate and illegal content through mHero but it would only be seen by designated system users/administrators who would presumably take appropriate action if this occurs.
	Protection from Harassment	Yes	As an official channel for health worker communication, system users/administrators who send out communication would be held accountable for any harassment that could take place via mHero communication. If a health worker receiving messages via mHero feels harassed by the content of messages, they can opt out of future messaging. mHero can be used by health workers to report harassment that occurs in the workplace.

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessments and the latest reassessment as it appears on the Digital Square Wiki. All maturity model assessments are *self-reported*. For the latest updates please visit:
https://wiki.digitalsquare.io/index.php/Global_Goods_Maturity

Category	Baseline (May 2019)	Update (Jun 2020)	Update (Dec 2020)
Global Utility			
Country Utilization	Low	Medium	Medium
Country Strategy	Low	Low	Low
Digital Health Interventions	Medium	Medium	Medium
Source Code Accessibility	Medium	Medium	Medium
Funding and Revenue	Low	Medium	Medium
Community			
Developer, Contributor, and Implementer Community Engagement	Low	Low	Low
Community Governance	Low	Low	Low
Software Roadmap	Low	Low	Low
User Documentation	Medium	High	High
Multi-lingual Support	Low	Low	Medium

Software			
Technical Documentation	Medium	Medium	Medium
Software Productization	Medium	Medium	Medium
Interoperability and Data Accessibility	Medium	Medium	Medium
Security	Medium	Medium	Medium
Scalability	Low	Low	Low

Considerations:

- This digital solution is also a Digital Square Approved Global Good which means it has been funded by Digital Square. You can find more information about it in Digital Square's Global Goods GuideBook.
- Additional information on this project is available in the DIAL Catalogue of Digital Solutions.

OpenSRP

Digital Solution URL: https://smartregister.org/

Digital Solution Description:

OpenSRP is a digital health platform for frontline health workers.

Potential impact of the digital solution on health systems and ultimately health outcomes:

Digitizes health workflows and provides support to frontline health workers to provide better clinical care and ensure all patients get the care they deserve.

Digital Solution Use:

As a tool to manage, analyze, or transmit health-related data.

Category: Open source software

Github Repository: https://github.com/opensrp/opensrp-server-core

WHO Digital Health Interventions:

- 2.0 Healthcare Providers: 2.1 Client identification and registration; 2.2 Client; 2.5 Healthcare provider communication: 2.6 Referral coordination; 2.7 Health worker activity planning and scheduling; 2.9 Prescription and medication management;
- 3.0 Health System Managers: 3.2 Supply chain management
- 4.0 Data Services: 4.1 Data collection management and use

Immunization Delivery Management:

- COVAX Functions: microplanning, vaccination status, vaccination monitoring, safety monitoring

Maturity:

- Global Goods Maturity Summary: Reports high maturity for global utility, high maturity for community, medium/high maturity for software

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	Y	In order to communicate with beneficiaries directly, OpenSRP supports integrations with a range of SMS messaging tools to enable targeted behavioral change campaigns. To support health workers in their interactions with their catchments or communities, OpenSRP's workflows and forms also allow for configurable content - including video and image assets - to support health worker training and guide patient counseling.
Microplanning	Y	OpenSRP offers robust geospatial tools to enable the equitable delivery of vaccinations. Program managers can use satellite imagery and other location data, such as structure counts, to generate vaccination campaigns with specific tasks and goals. These campaigns can be configured to support a range of activities (educational outreach, vaccination delivery, coverage assessment) and follow either a distributed or centralized approach. Practitioners and teams can be created and assigned to those plans based on geography. And progress against campaign goals can be monitored in real time, providing data on both coverage and health/campaign worker capacity.
Counterfeit detection	Y	OpenSRP supports both in-app QR code and barcode scanning for enhanced identification and verification protocols. The platform is also integrated with biometric and NFC card identity system to allow for mobile proof of presence.
Vaccination Status	Y	One of OpenSRP's core use cases is an offline first, multi-language electronic immunization registry (EIR). The platform supports configurable vaccine logic and corresponding end user workflows throughout the cycle of data collection, client management, and reporting. From patient registration through the course of care and beyond, OpenSRP allows health workers to identify and prioritize at-risk patients, track vaccination status of individuals and related persons, manage schedules, and target defaulters. By utilizing care teams and referrals, the platform supports continuity of care between facilities and the community. Additionally, the OpenSRP Covax application has been configured to align with the Smart Vaccination Certificate working group's standards. And proof of vaccination can also be extended to the beneficiary via the features and integrations mentioned above.
Vaccination Monitoring	Y	OpenSRP offers both monitoring and reporting tools for both frontline health workers and program owners. Healthcare workers in facilities and the community can access in-app reporting indicators on vaccination coverage and stock management. Outreach planning tools also allow for vaccinators to plan for supply and staff by calculating expected doses per catchment. Canopy Analytics provides a suite of tools to clean and transform, store, ingest, analyze, and visualize data. Information such as vaccine coverage rates by demographics and location, dropout rates, and health worker activity can be monitored in real time dashboards. Additional features around planning and management mentioned above in the microplanning section.
Safety Monitoring	Y	OpenSRP supports the capture of adverse reactions following immunization events. These adverse reactions are linked to patient encounter data, enabling the system to surface and report on any relevant trends linked to demographics, vaccines, locations, etc.P
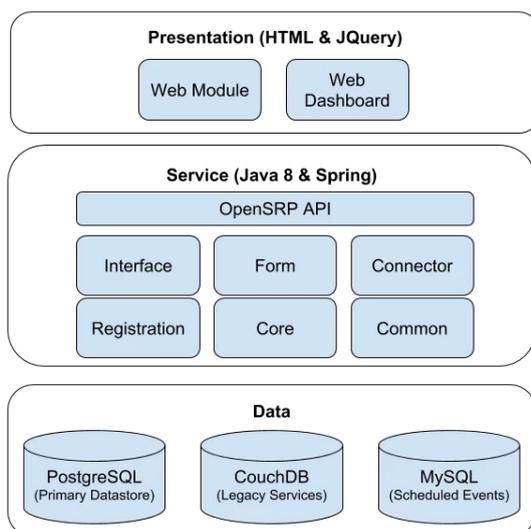
OpenSRP system architecture

DPG Standard Assessment:

Indicators	Requirements	Response	Details, Reference
Digital Health Relevance	SDG Relevance	Yes	SDGs 2,3, 10 Impacts
Open Source	Use of Approved License	Yes	Apache 2.0, License
	Clear Ownership	Yes	USA in classes 09 and 42 (Trademark reference number: 90301382)
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and Operational Documentation	Yes, Medium	Some technical documentation exists of the source code, use cases, and functional requirements Documentation
	Mechanism for Extracting Data (Non-PII)	Yes	Using Beam connectors, a unified model for defining both batch (data at rest) and streaming (data in motion) data-parallel processing pipelines
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	Measure in place to support GDPR compliance, adherence left to implementers Ona-News
	Adherence to Standards & Best Practices	Yes	Core Best practices: Agile Methodology
	Data Privacy & Security	Yes	Collects Health information on people. Not

Steps Taken to Mitigate & Avoid Harm in Product Design	(PII data)		shared with third party, data is encrypted
	Inappropriate & Illegal Content	N/A	No distributable content collected
	Protection from Harassment	Yes	No interaction between users

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessments and the latest reassessment as it appears on the Digital Square Wiki. All maturity model assessments are *self-reported*. For the latest updates please visit:
https://wiki.digitalsquare.io/index.php/Global_Goods_Maturity

Category	Baseline (Jan 2018)	Update (Jun 2020)
Global Utility		
Country Utilization	Medium	High
Country Strategy	Medium	High
Digital Health Interventions	High	High
Source Code Accessibility	High	High
Funding and Revenue	Medium	Medium
Community		
Developer, Contributor, and Implementer Community Engagement	High	High
Community Governance	Medium	High
Software Roadmap	Medium	High
User Documentation	Medium	High
Multi-lingual Support	Medium	High
Software		
Technical Documentation	Medium	Medium
Software Productization	Low	Medium
Interoperability and Data Accessibility	Medium	Medium
Security	Medium	High
Scalability	Medium	High

Considerations:

This digital solution is also a Digital Square Approved Global Good which means it has been funded by Digital Square. You can find more information about it in Digital Square's Global Goods GuideBook.

Additional information on this project is available in the [DIAL Catalogue of Digital Solutions](#).

OpenMRS

Digital Solution URL: https://openmrs.org

Digital Solution Description:

A collaborative generic medical record system platform that can support the care of patients, gathering observations, encounters, notes, and other data from the healthcare system and rendering those in summaries, reports, and data views to improve service delivery. The OpenMRS platform provides the technology to design and build customized EMR systems that meet local needs of health facility providers, from clinics to hospitals. Implementers have the option to add functionality to the OpenMRS reference application via their own *customized* modules in response to specific use cases.

Potential impact of the digital solution on health systems and ultimately health outcomes:

Implemented in more than 6,500 health facilities in over 40 countries, OpenMRS has improved health care delivery by coordinating medical records for over 14.6millino patients in resource-constrained environments, where AIDS, tuberculosis, and malaria afflict the lives of millions of people.

Digital Solution Use:

Manage health service delivery through electronic medical record (EMR) storage and retrieval system for treating HIV/AIDS and tuberculosis (TB) patients in LMICs with keen focus on improving data collection, organization, analysis and reporting.

Category: Open source software

Github Repository: https://github.com/openmrs

WHO Digital Health Interventions:

- 1.0 Client: 1.1 Targeted client communications
- 2.0 Healthcare Providers: 2.1 Client identification and registration; 2.2 client health records; 2.6 referral coordination;
- 4.0 Data Services: 4.1 Data collection management and use; 4.2 data coding

Immunization Delivery Management:

- COVAX Functions: Vaccination Status

Maturity:

- Global Goods Maturity Summary: Reports medium/high maturity for global utility, medium/high maturity for community, medium maturity for software

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	N/A	
Microplanning	N/A	

Counterfeit detection	N/A	
Vaccination Status	Y	OpenMRS distributions may include functionalities that support patient vaccination dosage tracking, side effects, and history, etc. Patient reports may be used for vaccine follow up.
Vaccination Monitoring	N/A	
Safety Monitoring	N/A	
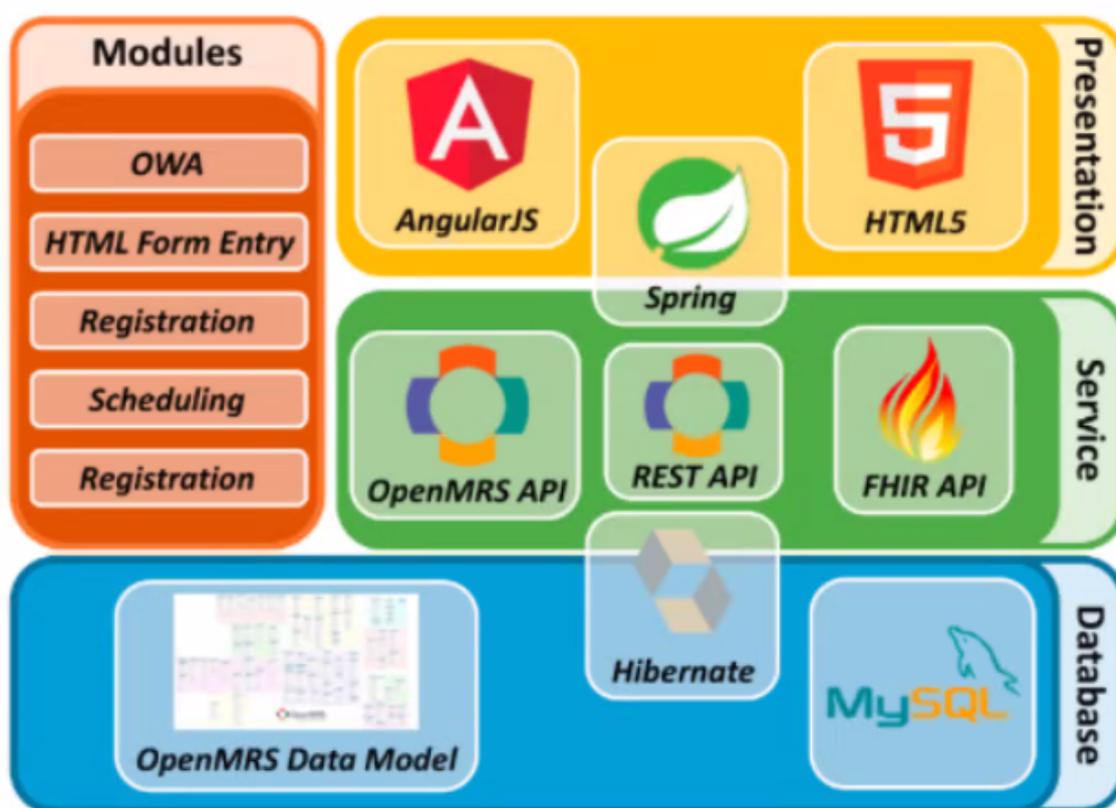
OpenMRS Component Architecture

DPG Standard Assessment:

Indicators	Requirements	Response	Details , Reference
Digital Health Relevance	SDG Relevance	Yes	SDG 3, Mission_Vision_Values/ Prevention gap report Factsheet OpenMRS as a global good:
	Use of Approved	Yes	MPL 2.0, License

Open Source	License		
	Clear Ownership	Yes	Trademark Policy Copyright
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and Operational Documentation	Yes	Documentation, Source code is documented to the point that new adopters can customize and add new functionality without relying on significant help from one of the core developers. Online courses or tutorials are available to address common development and deployment tasks. Core business workflows and functional requirements are fully documented using use cases, user stories, or other equivalent methodology
	Mechanism for Extracting Data (Non-PII)	Yes	Reporting tools are built into the platform to support administrative, aggregated reporting to governments and stakeholders.
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	OpenMRS can be HIPAA compliant in its present form, provided implementers building on the platform have the right monitoring/logging/security business policies in place. OpenMRS supports implementers to periodically review and collaboratively respond to any security issues related to privacy laws
	Adherence to Standards & Best Practices	Yes	HL7 FHIR, REST, LOINC, SNOMED, ICD, Atom standards; REST Web Services moduleServices-rest; OCL for OpenMRSUser Guide; Atom Feed moduleAtom Best Practices : Principles for Digital Development FHIR
Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	The OpenMRS platform maintained by the community does not collect any PII data. Implementers extend the OpenMRS platform and are ultimately responsible for ensuring the privacy and security of PII data.T he customized version of OpenMRS that implementers deploy does collect and store PII data. This data typically includes demographic, identifiers, and private medical information that are inherently collected and stored by any electronic medical record system.
	Inappropriate & Illegal Content	N/A	Only content collected and distributed is documentation and contributor comments
	Protection from Harassment	Yes	digital solution does not identify the target age of our contributors, enforce age limits, or provide any parental/guardian controls

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessments and the latest reassessment as it appears on the Digital Square Wiki. All maturity model assessments are *self-reported*. For the latest updates please visit:
https://wiki.digitalsquare.io/index.php/Global_Goods_Maturity

Category	Baseline (June 2019)	Update (Sept 2020)
Global Utility		

Country Utilization	High	High
Country Strategy	Medium	Medium
Digital Health Interventions	Medium	Medium
Source Code Accessibility	High	High
Funding and Revenue	Medium	Medium
Community		
Developer, Contributor, and Implementer Community Engagement	High	High
Community Governance	High	High
Software Roadmap	Medium	Medium
User Documentation	Medium	Medium
Multi-lingual Support	Medium	Medium
Software		
Technical Documentation	Medium	Medium
Software Productization	Medium	Medium
Interoperability and Data Accessibility	Medium	Medium
Security	Medium	Medium
Scalability	Medium	Medium

Considerations:

This digital solution is also a Digital Square Approved Global Good which means it has been funded by Digital Square. You can find more information about it in Digital Square's Global Goods GuideBook.

Additional information on this project is available in the DIAL Catalogue of Digital Solutions.

Digital Infrastructure for Vaccination Open Credentialing (DIVOC)

Digital Solution URL: https://divoc.egov.org.in/

Digital Solution Description:

Open source digital platform for large scale digital vaccination credentialing programs.

Potential impact of the digital solution on health systems and ultimately health outcomes:

DIVOC is an open source digital platform for large scale vaccination rollouts and management of digitally verifiable credentials associated with such programs. Investing in a scalable testing/vaccination digital health infrastructure is critical for countries to be

self-reliant to conduct population scale COVID-19 vaccinations and to be resilient to absorb future shocks similar to COVID.

Digital Solution Use:

Help rapid rollout of digital credentials for vaccination programs, manage core registries to support vaccination credentialing, and optionally collect post vaccination feedback from citizens.

Category: Open source software

Github Repository: https://github.com/egovernments/DIVOC

WHO Digital Health Interventions:

- 1.0 Client:
- 2.0 Healthcare Providers:
- 3.0 Health System Managers:
- 4.0 Data Services:

Immunization Delivery Management:

- COVAX Functions: vaccination status, vaccination monitoring

Maturity:

- Global Goods Maturity Summary: Reports high maturity for global utility, high/medium maturity for community, high maturity for software

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	N/A	
Microplanning	N/A	
Counterfeit detection	N/A	
Vaccination Status	Y	The DIVOC stack, being modular in nature, can be utilized as a last-mile vaccine administration software; or individual modules can be utilized as stand-alone components that can be integrated with other existing health systems. DIVOC offers the following modules to manage the end-to-end workflows of a last-mile vaccine administration program;
		Enables the setting up of various registries (facility, vaccination, vaccinator, immunization etc) for executing a large vaccination program, as well as integration with any existing national registries.
		Supports citizen pre-enrolment, self-registration and appointment booking functions
		Enables the issuance of digitally-verifiable QR-code based certificates (based on W3C credentialing standard) that acts as an immutable record of vaccination provided to beneficiaries. DIVOC also conforms with interoperability standards and dataset requirements outlined by WHO's Smart Vaccination Certificate (SVC) guidelines. The DIVOC certificate module also supports integration with 3rd party consumer platforms (both, Government and private sector platforms), so

		that beneficiaries can fetch their certificates from a central certificate registry and store them in these consumer platforms. Provides a post-vaccination feedback and side-effect monitoring module that captures structured responses on operational as well as side-effects that can be used for further clinical decision-making.
Vaccination Monitoring	Y	DIVOC has an in-built analytics module that provides a comprehensive and granular view of the various metrics of a vaccination program. The DIVOC dashboard provides a multi-level (e.g. national, state/province and facility levels) aggregated view of the transaction data generated in the program, on a real-time basis. For e.g. some of the KPIs tracked through the DIVOC dashboard include the count of vaccination certificates generated, count of revoked certificates, beneficiaries registered, geographical and age/gender-wise distribution of vaccination coverage. These analytical views enable authorities in better data-driven policy making and allow them to finetune and optimize the program implementation to achieve the envisioned outcomes.
Safety Monitoring	Y	DIVOC's feedback reporting module provides an interface for vaccination recipients to report any side effects, once they leave the vaccination centres. Citizens can self-report any post-vaccination adverse effects, so that they are referred to public health authorities on a timely basis. This data set can also be leveraged to strengthen the Government's overall AEFI monitoring program.
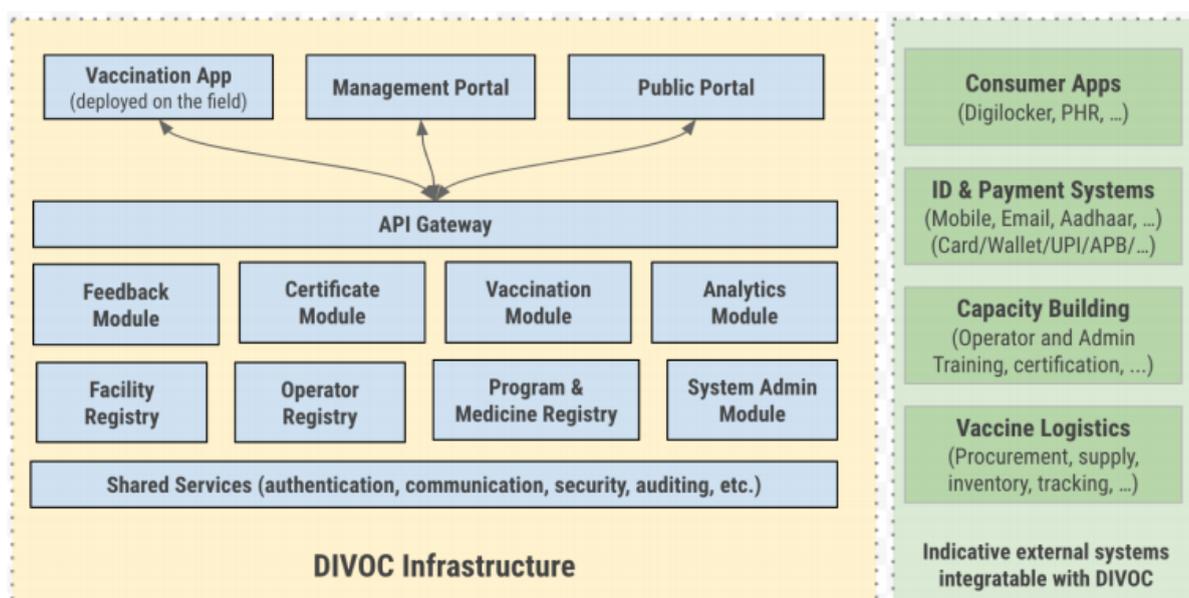
High Level Architecture

DPG Standard Assessment:

Indicators	Requirements	Response	Details , Reference
Digital Health Relevance	SDG Relevance	Yes	SDGs 3, 8, 10 Relevance
Open Source	Use of Approved License	Yes	MIT, License

	Clear Ownership	Yes	Ownership
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and Operational Documentation Maturity Rating	Yes Medium	Some technical documentation exists of the source code, use cases, and functional requirements Tech-Docss eGovernments Discussions
	Mechanism for Extracting Data (Non-PII)	Yes	A masked format can be provided including the usage details and general stats about treatment
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	GDPR & HIPAA for personalised medicines 21 CFR part 11
	Adherence to Standards & Best Practices	Yes	GS1, GTIN, EPCIS and ISO/IEC 12207 Best Practices: EUs Falsified Medicines Directive (FMD) and the USAs Drug Supply Chain Security Act (DSCSA) to track serialised packs of medicines
Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	Data meant for last mile vaccination, administration and credentialing based on data minimalism, privacy and security
	Inappropriate & Illegal Content	N/A	No distributable content
	Protection from Harassment	Yes	No interaction between users

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessment conducted by the DPGA using the Digital Square's Global Goods Maturity Model. All maturity model assessments are *self-reported*.

Category	Baseline (Jun 2021)
Global Utility	
Country Utilization	High
Country Strategy	High
Digital Health Interventions	High
Source Code Accessibility	High
Funding and Revenue	High
Community	
Developer, Contributor, and Implementer Community Engagement	High
Community Governance	Medium
Software Roadmap	Medium
User Documentation	High
Multi-lingual Support	High

Software	
Technical Documentation	High
Software Productization	Medium
Interoperability and Data Accessibility	High
Security	High
Scalability	High

Considerations

- Additional information on this project is available in the [DIAL Catalogue of Digital Solutions](#).

Global Open Facility Registry (GOFR)

Digital Solution URL: https://www.openfacilityregistry.com

Digital Solution Description:

GOFR is an open source federated facility registry platform for reconciling multiple facility lists and managing a primary list.

Potential Impact of the digital solution on health systems and ultimately health outcomes:

Improving the accuracy and speed of developing and maintaining canonical lists of facilities for information systems and applications and provides the public with access to essential information on the location of health services and facility attributes.

Digital Solution Use:

As a tool to manage, analyze, or transmit health-related data.

Category: Open Source Software

Github Repository https://github.com/intrahealth/gofr

WHO Digital Health Interventions:

- 3.0 Health system managers: 3.7 Facility management
- 4.0 Data services: 4.3 Location mapping; 4.4 Data exchange and interoperability

Immunization Delivery Management:

- COVAX functions: Microplanning

Maturity:

- Global Goods Maturity Summary: Reports mixed maturity for global utility - high country utilization and source code accessibility but low country strategy and funding/revenue, medium/high maturity for community, and medium maturity for software

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	N/A	
Microplanning	Y	The Global Open Facility Registry (GOFR) is a facility registry product and suite of tools to track and manage information on facilities that can be used for the COVID response, such as attributes and GIS locations of healthcare facilities , including temporary vaccination sites. Geo-spatial components allow for viewing locations as well as organizational hierarchies. Data can be shared across information systems to ensure data for planning and management is current and consistent across various information systems.
Counterfeit detection	N/A	
Vaccination Status	N/A	
Vaccination Monitoring	N/A	
Safety Monitoring	N/A	

DPG Standard Assessment:

Indicators	Requirements	Response	Details , Reference
Digital Health Relevance	SDG Relevance	Yes	SDG 3, Adoption of facility registries and other core components of the OpenHIE
Open Source	Use of Approved License	Yes	Apache 2.0 , License
	Clear Ownership	Yes	Ownership
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and Operational Documentation	Yes, High	Documentation and Facility Recognition Source code is documented to the point that new adopters can customize and add new functionality without relying on significant help from one of the core developers. Online courses or tutorials are available to address common development and deployment tasks. Core business workflows and functional requirements are fully documented using use cases, user stories, or other equivalent methodology
	Mechanism for Extracting Data (Non-PII)	Yes	CSV & REST are supported
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	GDPR, no personal data stored
	Adherence to Standards & Best Practices	Yes	FHIR and mCSD Profile Best Practices : Principles for Digital Development

Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	PII data not collected
	Inappropriate & Illegal Content	No	Only Facility attributes and GIS data collected
	Protection from Harassment	Yes	No user interactions

Global Goods Maturity Assessment:

*This table reflects the maturity model baseline assessments and the latest reassessment as it appears on the Digital Square Wiki. All maturity model assessments are *self-reported*. For the latest updates please visit:*
https://wiki.digitalsquare.io/index.php/Global_Goods_Maturity

Category	Baseline (May 2019)	Update (Jun 2020)
Global Utility		
Country Utilization	Low	High
Country Strategy	Low	Low
Digital Health Interventions	Medium	Medium
Source Code Accessibility	Medium	High
Funding and Revenue	Low	Low
Community		
Developer, Contributor, and Implementer Community Engagement	Medium	High
Community Governance	Medium	Medium
Software Roadmap	Medium	Medium
User Documentation	Medium	High
Multi-lingual Support	Medium	Medium
Software		
Technical Documentation	Medium	High
Software Productization	Medium	High
Interoperability and Data Accessibility	Medium	Medium
Security	Medium	Medium
Scalability	Medium	Medium

Considerations:

This digital solution is also a Digital Square Approved Global Good which means it has been funded by Digital Square. You can find more information about it in Digital Square's Global Goods GuideBook.

Additional information on this project is available in the <u>DIAL Catalogue of Digital Solutions</u>.

SORMAS

Digital Solution URL: <u>https://sormas.org</u>

Digital Solution Description:

The Surveillance Outbreak Response Management and Analysis System (SORMAS) is an open source mobile and web-based eHealth software for organizing and facilitating disease control, outbreak management procedures, disease surveillance, and epidemiological analysis for all administrative levels of the public health system. SORMAS aims to improve prevention, early detection and control of communicable diseases. SORMAS adheres to the highest data protection standards, good scientific practice, and open access policy.

Potential impact of the digital solution on health systems and ultimately health outcomes:

SORMAS aims to improve prevention and control of communicable diseases in resource-poor settings. SORMAS has proven its usefulness in successfully responding to simultaneous large outbreaks. As of May 2021, 6 countries are using SORMAS in response to COVID-19 or other infectious diseases.

Digital Solution Use:

Digitized notification from health facility to national levels, multi-directional information flow, offline functionality, contact follow-up management, event management, laboratory functionality, analytics, and user-centered design. SORMAS includes disease-specific process models for 54 infectious diseases.

Category: Open Source Software

Github Repository: <u>https://github.com/hzi-braunschweig/SORMAS-digital solution</u>

WHO Digital Health Interventions:

- 1.0 Client: 1.1 Targeted client communications
- 2.0 Healthcare Providers: 2.1 Client identification and registration; 2.3 Healthcare provider decision support; 2.5 Healthcare provider communication; 2.7 Health worker activity planning and scheduling; 2.9 Prescription and medication management; 2.10 Laboratory and diagnostics imaging management;
- 3.0 Health System Managers: 3.3 Public health event notification;
- 4.0 Data Services: 4.1 Data collection management and use; 4.2 Data coding; 4.3 Location mapping; 4.4 Data exchange and interoperability.

Immunization Delivery Management:

- COVAX Functions: vaccination status, vaccination monitoring, safety monitoring

Global Goods Maturity:

- Reports high maturity for global utility, community, and software

Immunization Delivery Management Functionalities:

Dimension	Relevance	Specific Functionalities
Infodemic management	N/A	
Microplanning	N/A	
Counterfeit detection	N/A	
Vaccination Status	Y	Documentation of persons and tracking their vaccination status. Attributes of vaccination tracked consist of disease, date, vaccine name, dose, code, etc. There is an extensive analytic tool called SORMAS-STATS for analysis of this data and presentation of indicators on dashboards, charts, tables and maps.
Vaccination Monitoring	Y	SORMAS allows for the documentation of person data and their associated tracked entities such as immunization, cases, contacts, and event participation. There is a follow-up module for each of the tracked entities of a person. The follow-up module consists of documenting symptoms and other information at each follow-up visit. There are automatic reminders if follow-up is overdue. There is a dashboard to monitor follow-up activities and performance indicators.
Safety Monitoring	Y	The follow-up and management module in SORMAS does not only address adverse events following immunization but any adverse effect of a tracked entity of a person.
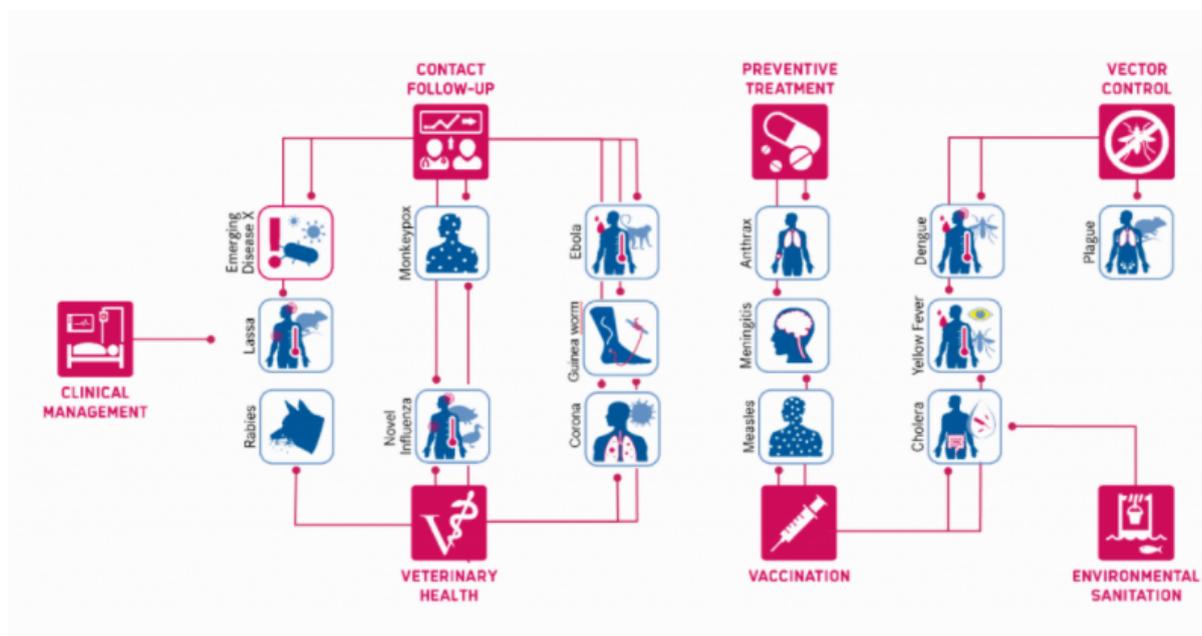
SORMAS Disease Coverage

DPG Standard Assessment:

Indicators	Requirements	Response	Details , Reference
Digital Health Relevance	SDG Relevance	Yes	SDGs 3, <u>SORMAS</u>
Open Source	Use of Approved License	Yes	GPL v3.0 , <u>*License*</u>
	Clear Ownership	Yes	<u>SORMAS-Open · GitHub Ownership</u>
	Platform Independence	Yes	There are no dependencies that create more restrictions than the original license. <u>Development License</u>
	Technical and Operational Documentation	Yes, Medium	<u>Documentation</u> <u>Wiki</u> <u>Docker</u>
	Mechanism for Extracting Data (Non- PII)	Yes	Non personally identifiable information (PII) can be imported or exported using the SORMAS API. The SORMAS API has configurations to permit pseudonymized or anonymized data exchange as well as user right configurations.
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	The data collection and management in SORMAS are governed by the General Data Protection Regulation (GDPR) where it applies. The countries using SORMAS are responsible for complying with regulation and local legislation. <u>Privacy</u>
	Adherence to Standards & Best Practices	Yes	SORMAS adheres to all the principles of digital development <u>Principles</u> Tom-Aba, Daniel, et al. "The surveillance outbreak response management and analysis system (SORMAS): digital health global goods maturity assessment." JMIR public health and surveillance 6.2 (2020): e15860.
Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	The PII data such as names, birth date, addresses, emails, telephone numbers are pseudonymized for users of SORMAS who are not responsible for management of tracked entities of a person. Data transferred throughout SORMAS API or exported can be pseudonymized if needed. SORMAS Keycloak is available as an alternative authentication provider to the default authentication method. SORMAS is checked on a yearly basis by an external security audit. <u>Privacy</u> <u>Keycloak</u>
	Inappropriate & Illegal Content	NA	Not applicable
	Protection from Harassment	Yes	The interactions between users and contributors takes place on the GitHub platform mainly. This ensures transparency of the communication. The SORMAS users and contributors consist of public health professionals who are in the age group of the

			working population (more than 20 years old).
			Issues

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessments and the latest reassessment as it appears on the Digital Square Wiki. All maturity model assessments are *self-reported*. For the latest updates please visit: https://wiki.digitalsquare.io/index.php/Global_Goods_Maturity

Category	Baseline (June 2017)	Update
Global Utility		
Country Utilization	High	High
Country Strategy	Medium	High
Digital Health Interventions	Low	High
Source Code Accessibility	Medium	High
Funding and Revenue	High	High
Community		
Developer, Contributor, and Implementer Community Engagement	Low	High
Community Governance	High	High
Software Roadmap	Low	High
User Documentation	Medium	High
Multi-lingual Support	Low	High
Software		
Technical Documentation	Medium	High
Software Productization	Low	High
Interoperability and Data Accessibility	Low	High
Security	Low	High
Scalability	Low	High

Consideration:

This digital solution is also a Digital Square Approved Global Good which means it has been funded by Digital Square. You can find more information about it in Digital Square's Global Goods GuideBook.

Additional information on this project is available in the DIAL Catalogue of Digital Solutions.

Rapid Pro

Digital Solution URL: https://app.rapidpro.io/

Digital Solution Description:

> Rapid Pro is an open source platform that allows anyone to build interactive messaging systems using an easy visual interface.

Potential impact of the digital solution on health systems and ultimately health outcomes:

> Facilitate communication between clinics and community health workers to significantly reduce the amount of time between collecting blood samples for early infant diagnosis for HIV and the return of test results to the originating health facility.

Digital Solution Use:

> Free and open source framework designed to send and receive data using basic mobile phones, manage complex workflows, automate analysis and present data in real-time.

Category: Open Source Platform

Github Repository: https://github.com/rapidpro/rapidpro

WHO Digital Health Interventions:

- 1.0 Client: 1.1 Targeted client communications; 1.2 Untargeted client communication; 1.3 Client to client communication; 1.5 Citizen based reporting; 1.6 On-demand information services to clients
- 4.0 Data Services: 4.1 Data collection management and use

Immunization Delivery Management:

- COVAX Functions: infomedic management, microplanning, counterfeit detection, vaccination monitoring, safety monitoring

Global Goods Maturity:

- Reports high maturity for global utility, high/med maturity for community, and high/med maturity for software

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	Y	RapidPro is a powerful tool for delivering scalable, on-demand information services that can provide communities and health care workers with on-demand, accurate information from authoritative sources. The platform can be used to deliver one-off blasts, information campaigns, training, on-demand information requests/chatbots, case management follow up, targeted surveys and remote data collection, and other information/messaging service use cases. More than 80 governments used RapidPro last year to deploy new information services to support risk communication and community engagement activities.
Microplanning	Y	RapidPro can support various kinds of health data collection and planning use cases. These range from tracking field vaccine dose administration, facility stock levels, new equipment requests and other service delivery needs. RapidPro is

		also being used to provide real-time monitoring and revised guidance for community vaccination drives, guiding community health workers on community targets.
Counterfeit detection	Y	RapidPro can collect information on vaccination status from target populations and assist with validation through integration with other core health information systems/databases.
Vaccination Status	N/A	
Vaccination Monitoring	Y	RapidPro workflows are being used to support vaccine rollout through the registering of health workers, daily/semi-regular reporting of health workers vaccine administration, and management of vaccine appointment (registration, scheduling, reminders, patient feedback).
Safety Monitoring	Y	RapidPro content packages exist and can be deployed to support various kinds of patient monitoring related to vaccination adverse effects and COVID-19 home care. In addition, patients and caregivers can report directly to the Ministry support channels and receive scheduled follow-ups stipulated by health officials.
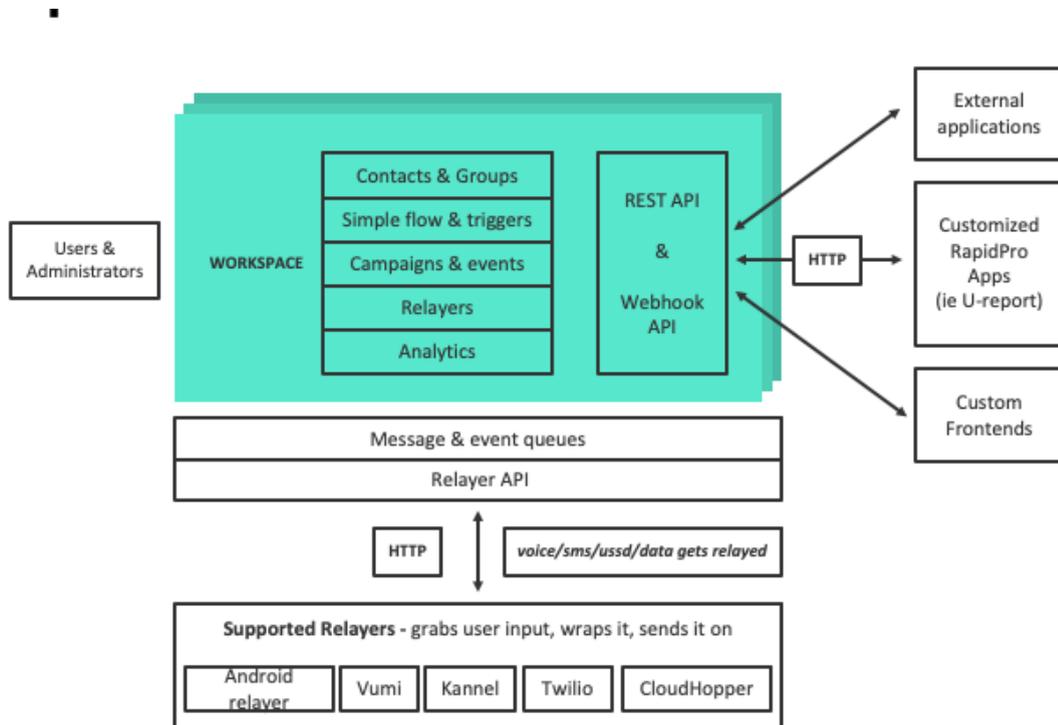
Rapid Pro Architecture

DPG Standard Assessment:

Indicators	Requirements	Response	Details , Reference
Digital Health Relevance	SDG Relevance	Yes	SDGs 1-17 RapidPro is a general-purpose platform that enables teams to design diverse messaging interactions for users that can support information and communication needs across any service delivery and sector vertical.
Open Source	Use of Approved License	Yes	Affero GPL (AGPL) license License
	Clear Ownership	Yes	License-Ownership
	Platform Independence	Yes	There are no libraries/hardware that create more restrictions than the original license
	Technical and Operational Documentation Maturity Rating	Yes, High	Source code is documented to the point that new adopters can customize and add new functionality without relying on significant help from one of the core developers. Online courses or tutorials are available to address common development and deployment tasks. Core business workflows and functional requirements are fully documented using use cases, user stories, or other equivalent methodology
	Mechanism for Extracting Data (Non-PII)	Yes	RapidPro has an extensive API and raw data export (via CSV, JSON) that enables an authorized user or service to extract/access data stored within the platform.
Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	GDPR guidelines have been provided through Nyaruka. Nyaruka is the Product Maintainer for RapidPro and operates a commercialRapidPro hosting service branded as TextIt. GDPR
	Adherence to Standards & Best Practices	Yes	RapidPro adheres to the Principles of Digital Development.
Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	RapidPro is a multipurpose tool that enables the user to create messaging interactions over. Data collected by RapidPro may or may not include PII depending on the use case being deployed. The only data required to operate the platform is a unique identifier specific to the communication channel being used (e.g SMS, WhatsApp, Telegram). However, these unique identifiers are not necessarily PII.
	Inappropriate & Illegal Content	Yes	As a general-purpose platform, RapidPro enables admins to design diverse messaging interactions for users. The platform enables administrators to implement various safeguards to prevent or inhibit the ability of users to distribute or share inappropriate/illegal content. Most importantly, there is no mechanism by which users that participate in or use a RapidPro-enabled programme can distribute content to other users, unless authorized by programme administrators.
	Protection from Harassment	Yes	Same as above.

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessments and the latest reassessment as it appears on the Digital Square Wiki. All maturity model assessments are *self-reported*. For the latest updates please visit: https://wiki.digitalsquare.io/index.php/Global_Goods_Maturity

Category	Baseline (Jun 2020)
Global Utility	
Country Utilization	High
Country Strategy	High
Digital Health Interventions	High
Source Code Accessibility	High
Funding and Revenue	High
Community	
Developer, Contributor, and Implementer Community Engagement	High
Community Governance	High
Software Roadmap	Med
User Documentation	High
Multi-lingual Support	Med
Software	
Technical Documentation	High
Software Productization	Med
Interoperability and Data Accessibility	High
Security	High
Scalability	High

ODK

Digital Solution URL: https://getodk.org

Digital Solution Description:

> ODK lets you build powerful offline forms to collect the data you need wherever it is. It's the global standard for mobile data collection.

Potential impact of the digital solution on health systems and ultimately health outcomes:

> Helps collect data quickly, accurate, online, and at scale. Proven for use within and across a variety of diseases (e.g., COVID-19, polio, malaria, measles, NTDs).

Digital Solution Use:

> As a service to manage, transmit, or analyze health-related data that can be freely accessed as a software service and adheres to open data principles.

Category: Open source software

Github Repository: https://github.com/getodk

WHO Digital Health Interventions

- 2.0 Healthcare Providers: 2.1 Client identification and registration; 2.3 Healthcare provider decision support; 2.8 Healthcare provider training;
- 3.0 Health System Managers: 3.2 Supply chain management; 3.4 Civil registration and vital statistics; 3.6 Equipment and asset management
- 4.0 Data Services: 4.1 Data collection management and use; 4.2 Data Coding; 4.3 Location Mapping

Immunization Delivery Management:

- COVAX Functions: Infodemic management, microplanning, counterfeit detection, vaccination status, vaccination monitoring, safety monitoring

Global Goods Maturity:

- Reports high maturity for global utility, high community maturity, and high software maturity (medium security).

Immunization Delivery Management:

Dimension	Relevance	Specific Functionalities
Infodemic management	Y	ODK can include pictures, audio, and video that are available in multiple languages, can be easily updated, and are playable offline. Organizations combine this multimedia with form branching to provide specific and relevant content based on the information that is entered in the form.
Microplanning	Y	ODK lets organizations collect the geographic data (points, traces, shapes) used to make and update district and health center maps. During data collection, offline basemaps and layers (e.g., with population estimates) can be added to provide data collectors with even more context.
Counterfeit detection	Y	ODK can scan barcodes on vaccine packs and launch external applications that can confirm the provenance of the pack.
Vaccination Status	Y	ODK can collect a person's identifier or certificate and verify the vaccination status through an external application integration. ODK forms can also collect the core data set recommended by Smart Vaccination Certificate Working Group and make that data available to other systems in a standards-compliant manner.
Vaccination Monitoring	Y	ODK is used globally for the data collection, storage, analysis, and dissemination needs of polio, measles, rubella vaccine coverage and uptake. The key functions include geographic data capture, enumerator behavior logging, offline map tiles, external data sets, and integration with widely-used dashboarding and reporting tools.
Safety Monitoring	Y	ODK is used to run vaccine efficacy trials in low-resource settings. The key functions include built-in audit trail, integrations for biometric registration, and support for automated management and analysis pipelines via the ODK API. ODK is also used to document and follow-up on adverse effects for large-scale immunizations. The key functions include barcode scanning and geographic data capture. Once in ODK, the data is available in standard formats that can easily be pulled into other systems.
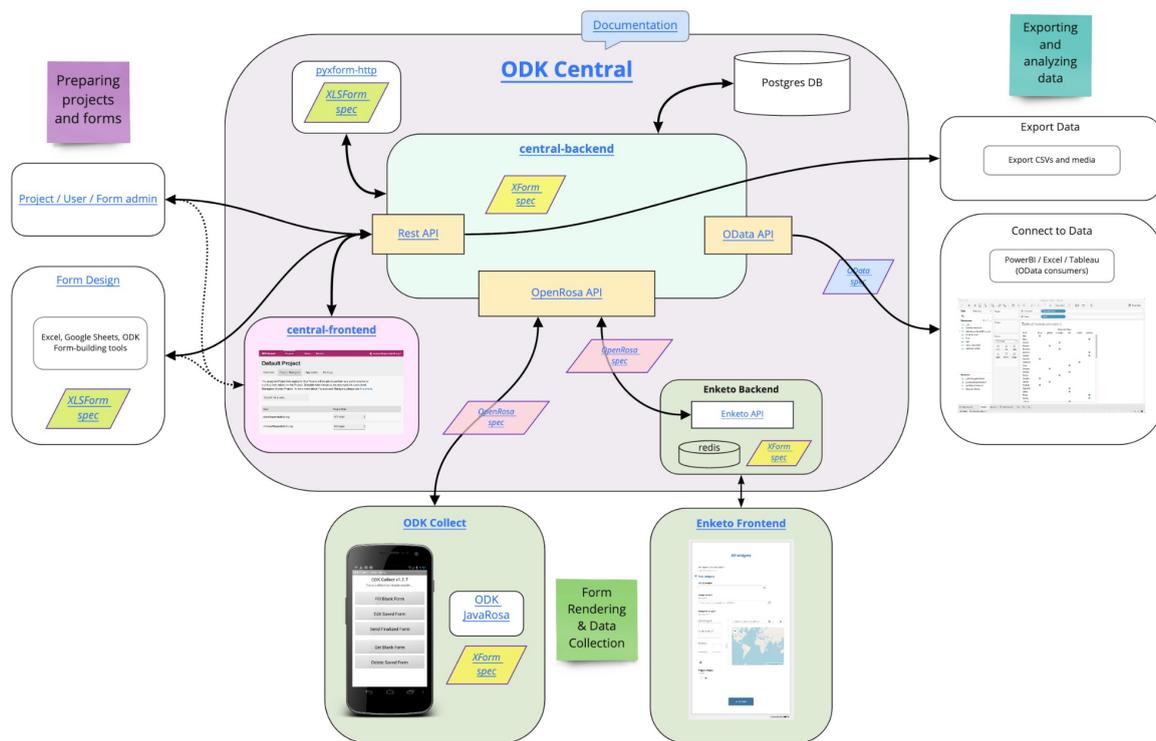
ODK Process Flow

DPG Standard Assessment:

Indicators	Requirements	Response	Details , Reference
Digital Health Relevance	SDG Relevance	Yes	1,2,3,4,5,6,8,11,13,14,15,16,17 ODK - Collect data anywhere
Open Source	Use of Approved License	Yes	Apache 2.0, License Master License
	Clear Ownership	Yes	copyright URL: odk-x/governance and Brand Guidelines
	Platform Independence	Yes	No closed source components used
	Technical and Operational Documentation Maturity Rating	Yes, High	Source code is documented to the point that new adopters can customize and add new functionality without relying on significant help from one of the core developers. Online courses or tutorials are available to address common development and deployment tasks. Core business workflows and functional requirements are fully documented using use cases, user stories, or other equivalent methodology Code: ODK · GitHub Docs: ODK Docs
	Mechanism for Extracting Data (Non-PII)	Yes	Non-PII Data can be exported via the UI and the API in a variety of standard formats

Adherence to Laws, Standards & Best Practice	Adherence to Privacy and Applicable Laws	Yes	GDPR, ODK follows industry-standard best practices to ensure adherence with relevant privacy, domestic, and international laws. Our practices and policies can be found below Terms of Service: Terms Privacy Policy: Privacy Business Agreement : Business Agreement Data Processing Agreement: ODK - Data Processing Agreement Acceptable Use Policy Acceptable Use Policy
	Adherence to Standards & Best Practices	Yes	ODK XForms (built on W3C XForms) XLSForm OpenROSA Ecosystem Best Practice: Principles of Digital Development
Steps Taken to Mitigate & Avoid Harm in Product Design	Data Privacy & Security (PII data)	Yes	Organizations that use ODK determine what PII is collected and stored. These organizations typically collect demographic data, such data is not shared with third parties
	Inappropriate & Illegal Content	Yes	Data collected and distributed is documentation forum posts, there is content filter to detect and moderate illegal content through combination of automated and manual systems as detailed here Acceptable Use Policy and Governance Code
	Protection from Harassment	Yes	There is user interaction and ODK requires that organizations who use the software comply with applicable laws about underage users

Global Goods Maturity Assessment:

This table reflects the maturity model baseline assessment conducted by the DPGA using the Digital Square's Global Goods Maturity Model. All maturity model assessments are *self-reported*.

Category	baseline (Jun 2021)
Global Utility	
Country Utilization	High
Country Strategy	High
Digital Health Interventions	High
Source Code Accessibility	High
Funding and Revenue	High
Community	
Developer, Contributor, and Implementer Community Engagement	High
Community Governance	High
Software Roadmap	High
User Documentation	High
Multi-lingual Support	High

Software	
Technical Documentation	High
Software Productization	High
Interoperability and Data Accessibility	High
Security	Medium
Scalability	High

Conclusion

Based on the assessment, the DPGA is highlighting the current releases of 13 digital solutions : *CommCare; DHIS2; DIVOC; Global Healthsites Mapping digital solution (Healthsites.io); GOFR; KoBoToolbox; Community Health Toolkit; mHero; ODK; OpenMRS; OpenSRP; RapidPro; and SORMAS* as mature digital health software global goods that are relevant to immunization delivery management.

Next Steps

The DPGA, Digital Square, and WHO are fully aligned in the belief that digital health solutions and services are critical for creating a more equitable world. By aligning efforts, these entities and others are better able to increase the discovery, adoption and support for the open source tools that are most needed to ensure better health outcomes for all.

Guided by the next round of the Health Community of Practice, the DPGA aims to produce subsequent reports highlighting additional open source solutions that address critical development needs within health. The DPGA will continue to apply the DPG standard to assess the openness, SDG alignment and steps taken to avoid harm of solutions, and leverage Digital Square's Global Goods Maturity Model to understand the maturity of digital health solutions as global goods. To avoid fragmentation, and will ensure that these assessments are reflected on the Global Goods page of the Digital Square Wiki.

The goal for applying a combined process is to better support individuals and institutions who work with governments, as well as government officials, funders and digital health practitioners with a clear understanding of the digital public goods relevant to immunization delivery management.

www.digitalpublicgoods.net