Digital Health Platform Implementation Handbook:
Building a digital Information Infrastructure (Infostructure) for health

A System Approach to Digital Health

#ICT4SDG

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System Approach to Digital Health

- **National eHealth Strategy**
  - Requirements Gathering (to-be processes)
    - Health Journeys/Use cases/scenarios
    - Process Flowcharts
  - Business Architecture

- **Information Architecture Design (part of EA)**
  - Applications Architecture
  - Functional Requirements for Applications and Functional components
  - Data Model
  - Interoperability Framework

- **Tech inventory**
  - Existing applications to be modified to integrate with the platform

- **Request for Proposal for System Integrators**
  - Include Technical Architecture

- **Digital Information Infrastructure (Infostructure) for Health – The Digital Health Platform (DHP)**
  - Information Exchange
    - Registries
    - Repositories
    - Terminology
  - Messaging
    - Payments
    - Analytics
  - Workflow
    - Security
    - Identification

- **A shift from (siloed) Applications to System approach**
Strategy development

1. Deliverables → Outcomes

2. Requirements Analysis

3. Health system Processes to improve and required Interventions

4. “To-be” processes

5. Application Architecture

6. Data Model

7. Modification Requirements for existing applications

8. New Applications + Functional requirements

Business Architecture

Application Architecture

Information Architecture (Data + Application)

Technical Architecture

Implementation & Scale up

Applications Solutions

Digital Health Platform

How to implement and scale?

What do we want to see as changes?

Which health system processes need to be improved by digitizing certain tasks (digital interventions) to meet outcomes?

How to integrate existing applications?

How to redesign those processes?

How to design new or update existing applications and develop re-usable components to deliver required digital interventions for strengthening health system processes?
### From Business Processes to Functional Requirements

**Business Process Redesign** describing the «to-be processes» using a narrative (called Health Journey) of user experience

A digital health moment is when some tasks can be implemented digitally (a digital intervention) to deliver specific functionality that addresses a system bottleneck or problem.

<table>
<thead>
<tr>
<th>Step</th>
<th>Digital Interventions at the Digital Health moments</th>
<th>DHP Components and their corresponding functional requirements</th>
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<tbody>
<tr>
<td>A.1</td>
<td><strong>Find New Family Physician:</strong></td>
<td>- Web site uses an interface to the DHP-Provider-Directory-Service to retrieve the list of family physicians that have designated that they are accepting patients.</td>
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<td>• Cyril consults a medical association website for physicians accepting new patients, and determines Dr Martin’s practice is just a few minutes away by public transit.</td>
<td>- Once the provider is selected, the web site pulls the physician’s practice address by accessing the DHP-Health-Service-Delivery-Location-Service.</td>
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<td>A.2</td>
<td><strong>New Appointment Request:</strong></td>
<td>- The web site links to the DHP-Appointment-Request-Broker and presents an interactive appointment request form.</td>
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<td>• Cyril clicks on a link in the SMS message to go to the website to request an appointment with Dr Martin.</td>
<td>- The request form asks for both a public identifier from Cyril as well as sufficient demographic information to ensure that Cyril is uniquely identified.</td>
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<td>- The request is placed in a queue for Dr Martin.</td>
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<td>A.3</td>
<td><strong>Appointment Request Response:</strong></td>
<td>- The EMR application polls the DHP-Appointment-Request-Broker for new requests.</td>
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<td>• Dr Martin’s office administrator reviews the request, notes that Cyril is not currently a patient. The administrator responds to Cyril with 3 proposed dates and times.</td>
<td>- The EMR application passes the public identifier to the DHP-Client-Registry service to verify Cyril’s identity.</td>
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<td>- If there is any ambiguity, a list of candidate matches is provided back to the office application for selection of the correct match.</td>
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<td>- Upon verification of Cyril, the DHP-Client-Registry current demographics for Cyril are copied to the EMR application to initialize him as a new patient.</td>
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<td></td>
<td>- The DHP-Client-Registry also returns Cyril’s preferred communication channel for this type of interaction, in this case his SMS address for his mobile phone.</td>
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<td></td>
<td></td>
<td>- The EMR application pushes the SMS formatted content directly to the telecom network using DHP-Messaging-Service.</td>
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<td>A.4</td>
<td><strong>Select Preferred Appointment:</strong></td>
<td>- The DHP-Appointment-Request-Broker receives the SMS response, and confirms preferred appointment time with a message to Dr Martin’s EMR application.</td>
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<td></td>
<td>• Cyril receives the scheduled appointment notification SMS. He responds with the number of the appointment he prefers.</td>
<td>- The EMR application sends an SMS confirmation message to Cyril, along with a link to the DHP-Referral-Service for Cyril to complete his Health History Questionnaire (HHQ).</td>
</tr>
</tbody>
</table>

The «to-be» process helps identifying:

1. Applications and their functional requirements
2. DHP Components (that need to be reusable and sharable) and their functional requirements

**A digital health moment** is when some tasks can be implemented digitally (a digital intervention) to deliver specific functionality that addresses a system bottleneck or problem.
### Deliverable 7: Business Process Redesign describing the «to-be processes» using a narrative (called Health Journey) of user experience

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<th>Step</th>
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| D.1  | Chest x-ray findings  | - The RIS interacts with the DHP-Client-Registry service to verify Cyril’s identity.  
- The RIS retrieves the diagnostic imaging order from the DHP-Order-Fulfilment service.  
- When digital image is verified, the RIS updates the status of the appointment to “Completed” in the DHP-Appointment-Brokering service. |
|      | • The hospital x-ray department verifies Cyril’s identity in the Radiology-Information-System (RIS)  
• The x-ray technician performs the x-ray and verifies the resulting digital image is readable by the radiologist. | |
| D.2  | Radiology Report      | - When the radiologist records his finding, the RIS updates the status of the diagnostic imaging order to “Completed” in the DHP-Order-Fulfilment service  
- The DHP-Order-Fulfilment service pushes a notification to Dr Martin’s smartphone.  
- The RIS submits a copy of the radiologist report, along with a reference image, to the DHP-EHR-Repository service. |
|      | • The radiologist retrieves the image, and finds evidence consistent with the presence of COPD and asthma and provides this information in his radiology report, along with a reference image from the x-ray scan. | |
| E.3  | Initiate COPD Care Plan: | - The EMR retrieves a COPD Care Plan template from the DHP-Reference-Information service.  
- The EMR retrieves Cyril’s HHQ results from the DHP-Referral service and pre-populates the Care Plan with data from there as well as from the problem lists in the EMR.  
- The information in the completed COPD Care Plan template is copied to the DHP-Collaboration service, where the care plan can be shared with other health and care service providers and Cyril’s PHR application. |
|      | Dr Martin:  
• Selects a COPD care plan to set care goals with Cyril and explain navigation services available to assist Cyril with coordinating his activities and care for this new diagnosis but Cyril declines the services for now;  
• Customizes the order set, including enrolment in a COPD disease program, Peak Flow Monitoring service and COPD education regarding COPD medications and device(s);  
• Submits the Care Plan including the Electronic Orders.  
• Dr Martin prints confirmation of the orders for Cyril. | |
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<th>Scenario</th>
<th>Applicable IHE Interoperability Profiles</th>
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<tr>
<td>Pinkie Nshoni is a 19 year old single mother of one, Bridget who is 10 month old. Pinkie is unemployed. She lives in a two-room shack with her grandmother, Naledi, and two siblings, Piladi (15 years) and Banda (10 years). Pinkie is 5 months pregnant with her 2nd child. Pinkie decides to go to the local CHC to register for antenatal care. On arrival at the CHC, Pinkie reports at the registry desk, tells the clerk, Sarah, that she is pregnant and would like to see the nurse or doctor.</td>
<td>Identify patient: PIX, PDQ</td>
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<td>Sarah asks Pinkie if she has been to the CHC or MOU before. Although Pinkie replies that she has not, Sarah goes ahead and searches the local electronic medical record (EMR) system, which is linked to the national shared electronic health record (EHR) system. She uses Pinkie’s national ID number and when using it that does not find Pinkie on the system, she searches on Pinkie’s name, surname and date of birth. No record matching Pinkie’s details is found.</td>
<td>Create new patient record: PAM, BPIC Add demographic details: PAM</td>
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<td>Sarah then creates a new EMR for Pinkie using the demographic information she provides – her name, surname, date of birth and address. A unique identification number is generated for Pinkie by the national patient master index (PMI) which responsible for the allocation patient identifiers.</td>
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<td>As part of the registration process, Sarah prints a barcoded label and sticks it onto a small card. This label will identify Pinkie to both the EMR and the national shared EHR in future. Sarah then asks Pinkie to wait in the waiting area. After a while, Mary a nurse at the MOU, comes to the waiting area and calls all the pregnant women to follow her to a room for the day’s health talk. The focus of the talk is on breastfeeding and the importance of being tested for HIV.</td>
<td>Identify patient: PIX</td>
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<td>After the talk, each of the pregnant women is called into the consulting room for a one-on-one consultation with Mary. When her turn comes, Pinkie goes in to see Mary, who scans the barcode on Pinkie’s card to retrieve Pinkie’s EMR.</td>
<td>Add medical history: XDS-APS Add clinical observations: XDS-APS Add “doctor’s notes”: XDS-APS Add and update care plan: XDS-APS</td>
</tr>
<tr>
<td>She notes that this is Pinkie’s first antenatal care visit. Mary asks Pinkie questions about her health history, including how many children she has, number of previous pregnancies and any previous health conditions, with dates and outcomes. She also carries out a number of clinical observations (Pinkie’s weight, blood pressure, temperature, urine analysis, fundal height, Pinkie’s heart rate, and the baby’s heart rate). Mary records the information obtained from Pinkie, as well as the clinical observation data in Pinkie’s EMR.</td>
<td>Scan and upload paper document: XDS-SO</td>
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<td>Mary then discusses with Pinkie the importance of being tested for HIV. She explains to her that the result of the test will be confidential, and that disclosure of the result to family members would be Pinkie’s choice. After the counselling, Pinkie agrees to do the HIV test. Mary asks Pinkie to sign a standard HIV consent form, so that her consent is documented. Pinkie signs the consent form as requested. The signed form is later scanned and uploaded to Pinkie’s EMR.</td>
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<td>Mary cleans Pinkie’s finger with an alcohol swab and does a finger prick HIV test. She asks Pinkie to wait outside for the result. After 20 minutes Mary calls Pinkie to the consulting room; she tells Pinkie that the test is positive, but that a second test is required to be sure. Mary performs a second HIV test using a test kit</td>
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Identifying Standards from Use cases/Scenarios

Functional Requirements within a «Functional Component»: Identification and Authentication

Relevant Interoperability Standards: IHE Profile

National Health Normative Standards Framework for Interoperability in eHealth in South Africa