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

A System Approach to Digital Health

#ICT4SDG

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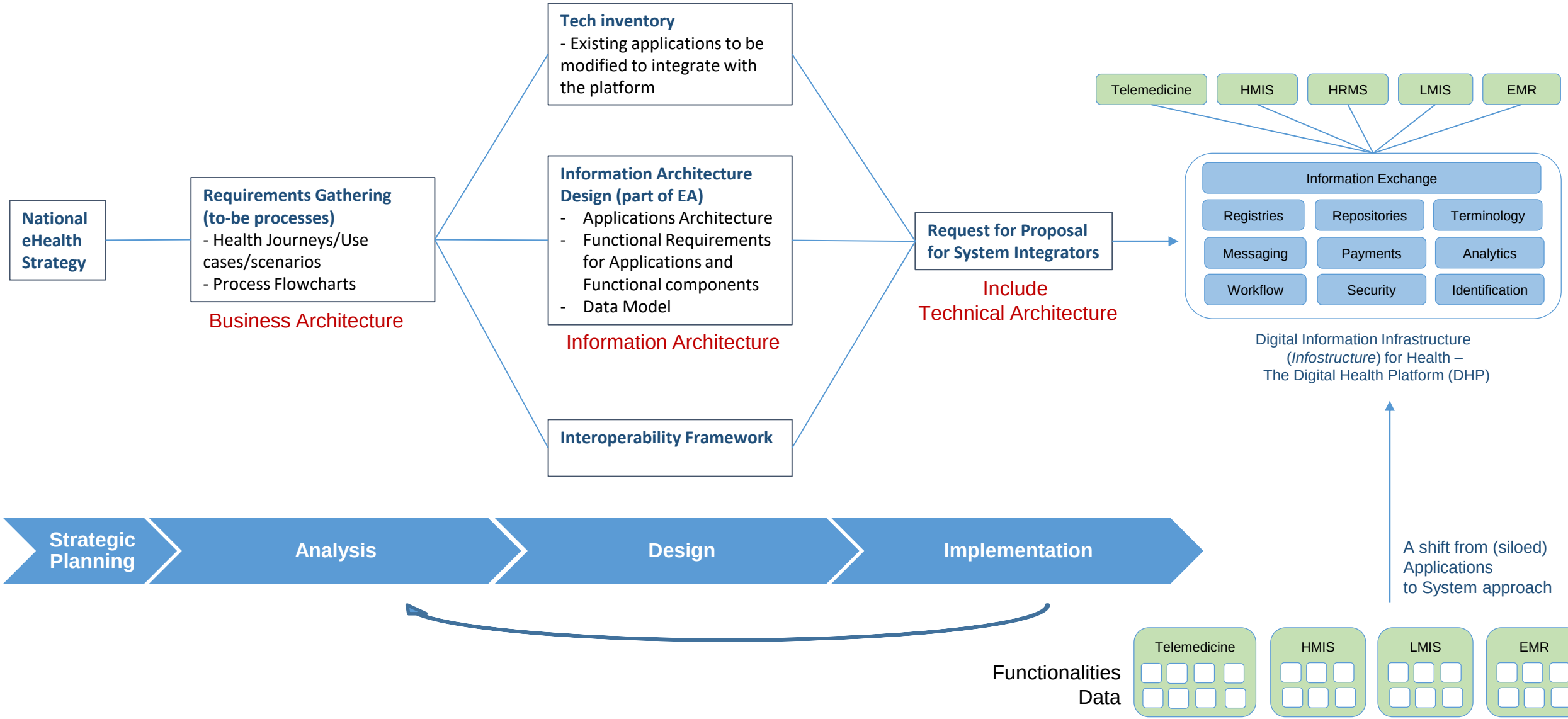
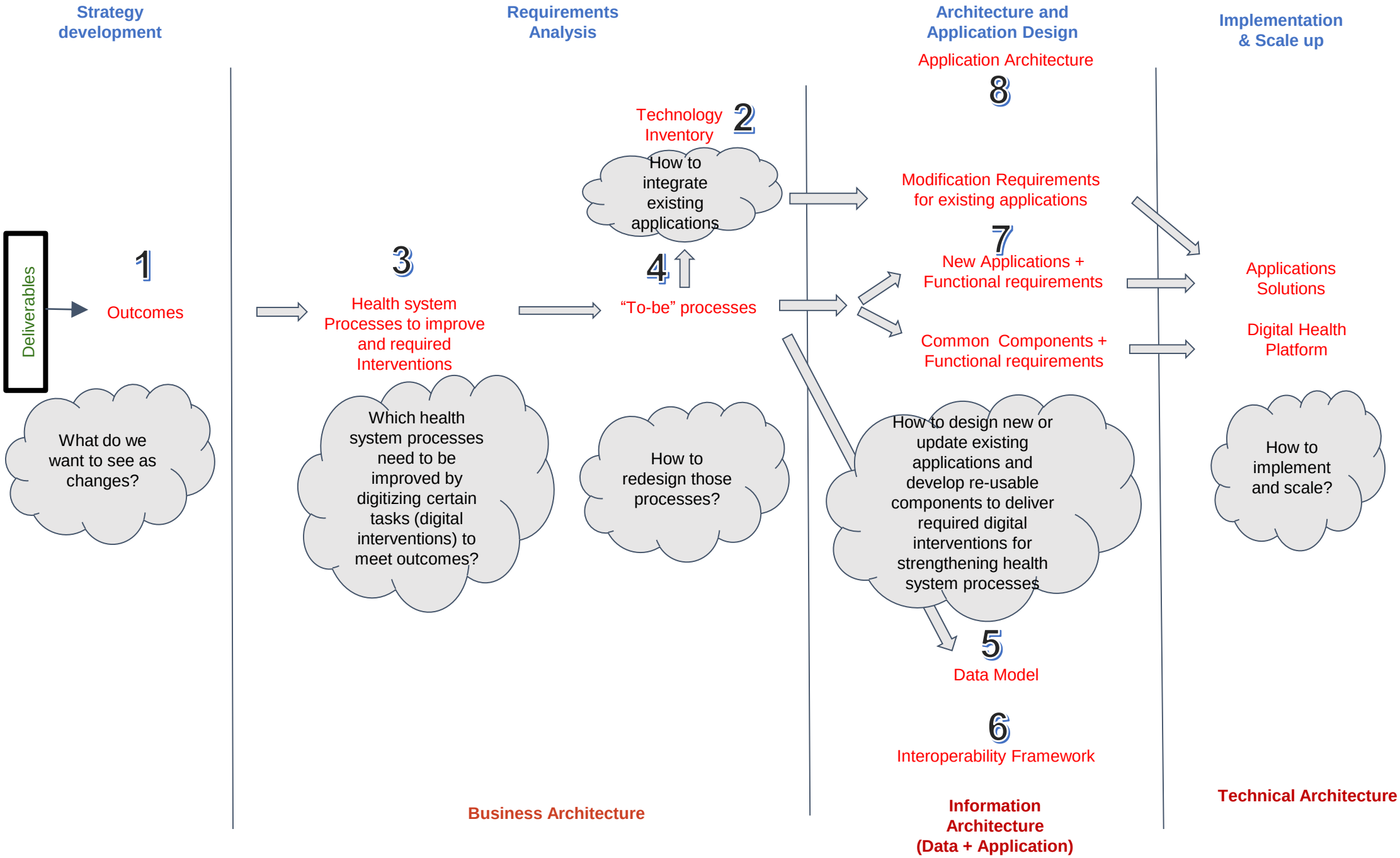
System Approach to Digital Health




Strategy development
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Implementation & Scale up
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How to implement and scale?
Business Architecture
Information Architecture (Data + Application)
Technical Architecture

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

The «to-be» process identifies digital health interventions that will aim at addressing system bottlenecks Such as: **«Schedule Client Appointments»**

Step	Digital Interventions at the Digital Health moments	DHP Components and their corresponding functional requirements
A.1	**Find New Family Physician**: • 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.	- 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. - Once the provider is selected, the web site pulls the physician's practice address by accessing the **DHP-Health-Service-Delivery-Location-Service**.
A.2	**New Appointment Request**: • Cyril clicks on a link in the SMS message to go to the website to request an appointment with Dr Martin.	- The web site links to the **DHP-Appointment-Request-Broker** and presents an interactive appointment request form. - The request form asks for both a public identifier from Cyril as well as sufficient demographic information to ensure that Cyril is uniquely identified. - The request is placed in a queue for Dr Martin
A.3	**Appointment Request Response**: • 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.	- The **EMR application** polls the **DHP-Appointment-Request-Broker** for new requests. - The **EMR application** passes the public identifier to the **DHP-Client-Registry** service to verify Cyril's identity. - If there is any ambiguity, a list of candidate matches is provided back to the office application for selection of the correct match. - 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. - 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. - The **EMR application** pushes the SMS formatted content directly to the telecom network using **DHP-Messaging-Service.**
A.4	**Select Preferred Appointment**: • Cyril receives the scheduled appointment notification SMS. He responds with the number of the appointment he prefers.	- The **DHP-Appointment-Request-Broker** receives the SMS response, and confirms preferred appointment time with a message to Dr Martin's EMR application. - The **EMR application** sends an SMS confirmation message to Cyril, along with a link to the D**HP-Referral-Service** for Cyril to complete his Health History Questionnaire (HHQ).

The «to-be» process helps identifying:
1- Applications and their functional requirements

The «to-be» process helps identifying:
2- DHP Components (that need to be reusable and sharable) and their functional requirements

Deliverable 7: Business Process Redesign describing the «to-be processes» using a narrative (called Health Journey) of user experience

The «to-be» process list digital health interventions that will aim at addressing system bottlenecks Such as:
«Verify Client unique identity»

Intervention: «Manage client structured record»

Intervention: «Enroll client for health clinical care plan »

Step	Digital Interventions	DHP Components
D.1	**Chest x-ray findings** • 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.	- 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**
D.2	**Radiology Report** • 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.	- 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**.
E.3	**Initiate COPD Care Plan**: 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.	- 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**.

The «to-be» process helps identifying: DHP Components (that need to be reusable and sharable) and their functional requirements

The «to-be» process helps identifying: Minor or major modifications that might be required for applications to interact and integrate with the DHP

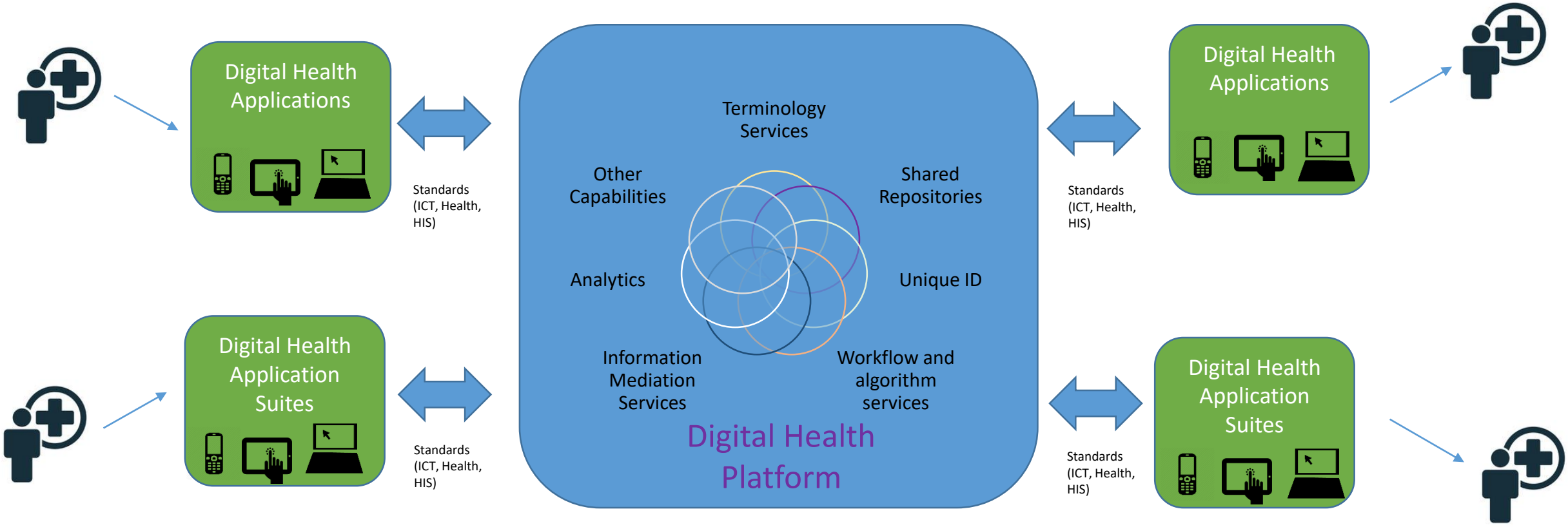
The «to-be» process helps identifying: Applications and their functional requirements

Identifying Standards from Use cases/Scenarios

Antenatal care	
Scenario	**Applicable IHE Interoperability Profiles**
Pinkie **Ntshoni** 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. She tells the clerk, Sarah, that she is pregnant and would like to see the nurse or doctor.	
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.	Identify patient: **PIX,PDQ**
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.	Create new patient record: **PAM, BPPC** Add demographic details: **PAM**
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.	
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.	Identify patient: **PIX**
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.	Add medical history: **XDS-APS** Add clinical observations: **XDS-APS** Add "doctor's notes": **XDS-APS** Add and update care plan: **XDS-APS**
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.	Scan and upload paper document: **XDS-SD**
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 finger prick HIV test using a test kit	

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

Relevant Interoperability Standards: IHE Profile


Digital Health Applications
Standards (ICT, Health, HIS)
Terminology Services
Other Capabilities
Shared Repositories
Analytics
Unique ID
Information Mediation Services
Workflow and algorithm services
Digital Health Platform
Standards (ICT, Health, HIS)
Digital Health Applications
Digital Health Application Suites
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