



GCRF demonstrate impact in developing countries: round
2, phase 1

Project 73108

**“Innovative Access to Healthcare for Impact in Remote
Communities”**

Human Centered Design of Telehealth System

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Executive Summary

This report details the human-centered design approach taken by STI4D and OMASI to design the Telehealth system. This document does not stand alone, and is supported by numerous reports describing the research questions the HCD process seeks to answer, and the outcomes and learning from the 10 community engagement activities carried out alongside desk-based research, practical tests, and drawing on local partners' knowledge. It also describes how the research informed the design of the alpha telehealth system, which was trialled in the remote village of Loswaki, the learning from which has informed the design priorities of the beta system which sets the roadmap for the future iterative development of the telehealth concept.

Human Centered Design Approach and Activities

The approach used for this project drew on principles of human-centered design, focusing both on the end users of the system, taking account of their needs, priorities, perceptions, and existing health practices, and understanding the context in which a telehealth system would operate.

End User Groups Definition

We define end users as the following groups, all of which would be part of a telehealth system:

1. Patients who live in rural areas who use the system to seek a medical consultation
2. The operators who assist patients with the telehealth system and run the telehealth centre. What their role entails is one of the aspects of the system that is being designed.
3. Doctors who give medical consultations over the telehealth system.

Visualisation Walk-through to Generate Research Questions

The first activity in the design process involved visualising a walk-through of how the system would work, from the perspective of each end user type, in order to come up with the research questions that needed to be answered. This activity also enabled the design team to think as if they were the end user groups, and start to get an impression of how end users would think about, or approach the system. These research questions are documented in:

- *'HCD - Use Case and Research Questions' Report.*

Given the vast number of research questions generated, they were separated into:

1. Research questions about the existing healthcare situation and existing healthcare systems, norms and practices
2. Research questions about the use case of a telehealth system

End-user Engagement Activities

Following this, 11 end user engagement activities were designed such that between them, all of the research questions were answered. These activities were:

Activity	Purpose
Community Health Service Value Tests (SVTs)	SVTs ask participants to suggest important (health) services that they need access to and collect quantitative preference data and qualitative contextual data to understand value judgments. This activity showed what community health priorities are as well as illuminating existing health norms and practices.

Community focus groups for background research	These focus groups asked for detailed data about how communities currently access health services, including time and monetary costs. It also asked for their perceptions of different health sectors and sought to understand how they understood their different health options.
Community focus groups to understand telehealth use-case	These focus groups assessed the perceptions of community members in two remote communities about the idea of a remote telehealth system, asking them to imagine how it might work for them and benefits/challenges.
Interviews with local dispensary doctor	A set of interviews and ongoing interactions to understand the current healthcare situation; understand perceptions of the use case from the perspective of a doctor at a remote dispensary who treats the type of patients who the system would serve.
Interview with Arusha doctor	Understand the current healthcare situation; understand perceptions of the use case from the perspective of a city doctor.
Interviews with District Health Officials	Understand the current healthcare situation and future priorities; feedback about use-case from experts.
A roundtable discussion with volunteer doctors for CACHA, a Canadian NGO who runs health missions in the area	Understand the current healthcare situation as perceived by foreign health professionals and gain feedback from their experiences providing care for the remote communities the system would serve. This activity gave an international perspective on the situation which was useful to compare to local perspectives, given the doctors were very experienced with running health missions for the end users.
Baseline health survey	A rigorous survey on current state of health and existing health practices, conducted on 132 households.
Interview pharmacists in Terat	Interviews to investigate the potential role of pharmacies that could supply medications prescribed by a doctor over the telehealth call, and how this could integrate into the system.
Interviews with disabled individuals	Four interviews with disabled individuals from two remote communities, covering their perceptions of their disability, community life, and how they accessed health care.
Interview with a nurse in a sub-dispensary	An interview to understand how dispensaries who are staffed by nurses and don't have a doctor would perceive the system, and whether or not they would integrate into it. This activity was not performed and is part of the future work plan.

Ten of these activities were carried out within the project timeframe. These activities were supplemented by desk research to increase background contextual understanding, technical tests of various video calling solutions conducted by SVRG and OMASI staff, and the first hand knowledge of OMASI.

Tables 2 and 3 track which activities were used to answer the research questions about 1) the existing healthcare situation and systems, and 2) the use case of a telehealth system respectively. Note that the two Tanzanian doctor interviews have been put together as they mostly answered the same research questions, and only those activities that contributed towards understanding and designing the use case are listed in Table 3.

Technical Feasibility Test

The above 10 activities contributed to an in-depth understanding of the current health system and existing practices and community perceptions, norms, and health priorities, as well as how end

user groups envisioned using a telehealth system. Alongside this research, on the 10th October 2020, a preliminary remote consultation test was run at the Terat Dispensary. The aim was to identify any early challenges relating to remote diagnosis, to ensure that these could be addressed during subsequent research and development, and before further detailed tests in the later months of the project.

In the Terat dispensary, the local doctor spoke to two patients over a video call, while physically located in different rooms in the dispensary. After each call, we sought feedback about the experience conducting the consultation over the phone from both the doctor and the patient. Skype was used to video call between the two devices. The doctor gave very positive feedback about the system, giving detailed comments such as suggesting that, for the patient with a cut on his hand, a ruler would be helpful in order to get a more precise understanding of the size of the cut. However he was happy with how clear the video was, and he could tell how the wound was doing in terms of the level of infection and healing status due to the clear video picture. Both patients were excited to have experienced the system, with one saying that he had not tried a video call ever before. They were both happy to see the local doctor on the video call and were happy to discuss their problems on it. Both struggled initially with the technology, but were happy when shown how to change the camera direction or point the phone/tablet at the correct place.

For a more detailed account of the technical feasibility test and the end user feedback and learning gained, see the following report:

- *'Preliminary Remote Consultation Feedback' Report*

Test of the Alpha System

Towards the end of the project, collating the learning from the community engagement activities and the technical feasibility test, the alpha system was developed and trialled during two days in the remote community of Loswaki. A telehealth hub was set up in Loswaki and active during specified hours over 2 days, during which time 34 patients came to have a telehealth consultation with the local doctor. This trialled multiple aspects of the system, such as how the doctor would manage to fit in telehealth consultations alongside his normal work at the dispensary; the taking of patients' health data as they arrived, and how this was communicated to the doctor; the perceptions of the patients before and after; the performance of the video calling platform chosen. Details of how the trial was run and its outcomes, including key learning acquired, can be found in the following report:

- *'Loswaki Remote Telehealth Consultation Trial Report'*

HCD Activities: Background Research Questions (Table 2)

Research Questions	Research Activity										
	Community Health SVT	Community Background Research Focus group	Doctor interview	Health Official interview	Desk research	Discussion: Canadian doctors NGO	Baseline Survey	OMASI/ Partners knowledge	Discussion: pharmacist	Discussion: nurse, small dispensary (planned)	Interviews: disabled individuals
General Health needs/concerns											
What health services do you currently use? (as a whole, for each community group, and for health professional?)	x	x	x		x			x		x	x
What health issues do you suffer from the most? Rank top 10? (as a whole, and for each community group?)		x	x	x	x	x	x			x	
What equipment is needed to diagnose the most common health issues			x			x				x	
What are biggest health priorities? What do they believe is important to stay healthy? (Community as a whole, for each community group, and health professional)	x	x	x		x					x	
How would doctors disaggregate different demographic groups in terms of health needs? (e.g. maternal/elderly etc.)			x			x				x	
Are mental health issues a concern? What is meant by a mental health issue to the community and to the doctors in the health system?		x	x	x		x		x		x	
Are sexual health issues a concern and how are these approached		x	x	x		x				x	
What health services do you most require?	x					x					
How often do community members self-identify as suffering from illness/disease? How often does this stop them undertaking their usual activities?							x				

How often do community members seek medical treatment when ill? Why would they not seek medical treatment?			x					x			x	
Prescriptions & Paperwork												
How do rural prescriptions work? Payment/validation/where medicines can be claimed?		x	x	x						x	x	
Are there pharmacies in rural areas. Can medicines be obtained closer to rural community than health centre?		x	x							x	x	
Are there statistics on prescriptions for Simanjiro e.g. what is most commonly needed? This will inform if we could stock a lot of a particular medicine at the rural health consultation room.												x
What are the legal requirements to dispense drugs. If we wanted to set up a pharmacy area next to the consultation room, would this be possible.				x	x					x	x	
What records does doctor need to keep following each consultation?				x	x							x
Data protection requirements?				x	x							x
Costs/Payment												
How do community members currently pay for doctor's appointments? Quantity and method (mPesa/cash etc.)		x	x							x		x
Can people default on payments? is there insurance and if so, how does it work?		x	x	x								x
What would patients be willing to pay for a video conferencing appt/service? Would they be willing to pay extra, or need it included in current insurance etc.		x										

How does doctor get paid? Is it by number of hours/number of patients/number of trips to rural communities? Paid by government? How much?			x	x							x	
Cost to doctor for travelling to rural communities? Does he have to bring all the medicines with him when he goes? (Potential scope to save money if he doesn't have to travel as frequently)			x								x	
Technology												
What internet access is currently available in your area? (H+, 3G, 4G, etc.)		x										
Do you all own mobile phones with mPesa functionality?		x					x					
Investigation into existing apps that might benefit our system (e.g. NHS symptom checker, Babyl Rwanda)						x						

HCD Activities: Telehealth System Use Case Research Questions (Table 3)

Research Questions	Research Activities						
	Community Use Case Focus Group	Doctor interview	Health Official interview	Desk research/ SVRG tests	Discussion: Canadian doctors NGO	Discussion: nurse, smaller dispensary (planned)	Discussion: pharmacist
Appointments/personnel							
Would patients prefer appointment booking or turning up in a specified time slot and waiting?	x	x		x			
How would it be best to structure appointments for doctors: Regular slots, e.g. Monday 10-12, or specific 10 minute slots		x	x	x		x	
How would emergency cases work?		x	x			x	
What cleaning required between appointments?		x			x	x	
Translator required?	x	x		x		x	
How many operators required?		x		x	x	x	
What training required for operator?	x	x		x		x	
What tier of doctor is best for this system? Clinician, accredited doctor etc?		x	x			x	
Is it best for doctor to be the same local doctor they would usually visit?		x				x	
How often do villagers expect to need to use the service? (Try and anticipate demand)	x						
How much demand does doctor anticipate there being?		x				x	
Potential use of system for workshops/education?	x	x	x		x	x	
Location: Where would system be set up? In rural village or existing smaller dispensaries where nurses can assist? Or in pharmacies? Costs of land if wanting to build a new small health point?	x	x		x	x	x	
How to prove patient is who they say they are		x				x	
Do nurses in smaller dispensaries without qualified doctors think this system would benefit them to call a more qualified doctor, or would they prefer to run it as a separate telehealth system?						x	

Diagnostics/Equipment							
What diagnostic/biometric equipment is needed for appointments?		x			x	x	
Is it preferable for diagnostics to be taken prior to consultation or during?		x		x		x	
How would doctors wish to receive diagnostic information? Read out during call/typed to them/sent to system		x				x	
What records does doctor need to keep following appointment. Does anything need to be sent to patient? How can this be done?		x				x	
Can operator assist with any treatment?		x				x	
Prescriptions and Follow-ups							
What is the preferred method of community members to be informed of follow-up appointments?	x						
How to prescribe medicines remotely? Send prescription/send medicine/collect both/official prescription given by operator		x	x	x		x	x
Where can patients get treatment? Can medicines be sent from Terat/doctor to the tele-health point?		x	x	x			x
What are the steps to set up a pharmacy? What licensing required etc. (Potentially a good place for a tele health shop?)							x
Comfort/trust in remote system							
Would patients feel comfortable disclosing medical information via video conference	x	x		x		x	
Would patients feel comfortable disclosing medical information via telephone	x	x		x		x	
Would patients feel comfortable disclosing medical information with operator present? Does whether or not they know the operator/gender/status make a difference?	x	x		x		x	
Would patients trust doctors diagnosis if done via video or done via telephone call?	x			x			
General likes/dislikes of remote diagnostic method	x	x		x		x	

Costs							
What do people think is a fair price for a video consultation?	x			x			
Would taking time to do video consultations fit with doctors work? Would he need additional payment?		x	x			x	
Cost of required remote equipment for diagnosing				x			
What payment required for operator?		x		x		x	
How would community members pay for prescriptions/appointments?	x	x	x	x		x	
Would government support the scheme and put money towards it?			x				
General							
How could this system fit into the existing village, ward and district infrastructure to complement and enhance existing activities and healthcare system?			x				
Physical security concerns of having expensive equipment in tele-health point. How to protect against theft and vandalism etc.	x	x	x				x
Technical Tests: To be done in multiple different areas (H+, 3G, 4G, Habari node)							
Speed of photo sending				x			
Quality of video and voice calls with different internet conditions.				x			