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WHITE PAPER

Investing in Digitalizing Healthcare: The UNCDF Way

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White Paper

Preface

UNCDF, through its 'Leaving no one behind in the digital era' strategy, is supporting the growth of an inclusive digital economy with a focus on key sectors, including the health sector. This whitepaper outlines the UNCDF approach to digital health and its implications for the general health sector. The viewpoint is that digital health is critical to improving the quality of service, performance, efficiency, and health outcomes in rural healthcare services.

There is strong recognition among leaders in healthcare that the role of digital health is rapidly shifting from driving marginal efficiency to becoming an enabler of fundamental innovation and disruption within the sector. The purpose of this paper, therefore, is to promote and stimulate discussion about what works in digital health in limited-resource settings. We will be glad to receive your comments and feedback.

Julio Malikane
Technical Specialist, Digital Health, and Education, UNCDF

Acknowledgements

We would like to thank the many partners and collaborators who are contributing to our efforts in the development and roll out of digital tools and guides to improve the quality of service, and performance, and health outcomes in the healthcare sector.

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Foreword

It gives me great pleasure to introduce this white paper, 'Investing in Digitalizing Healthcare: The UNCDF Way' which presents the UNCDF approach to leveraging technology to address some of the most challenging constraints in healthcare for rural communities of Uganda.

Health is one of the key sectors the UNCDF focuses on as part of our digital strategy, 'Leaving no one behind in the digital era', which aims at enabling people in developing countries to use innovative digital services in their daily lives to improve their wellbeing.

The premise of this agenda is simple: digital technologies are now integral to the day-to-day lives of more than half of the world's population. From connecting with loved ones, transacting business, and trading, to accessing the much-needed healthcare, digital technology has simplified and improved the way we live.

Nonetheless, for many people, especially in developing economies, the digital economy is yet to make any significant impact. Unfortunately, these are fragile communities where essential services such as healthcare and education are not easily accessible. While digital technologies in the health sector have demonstrated potential for improving health outcomes worldwide, some communities with delicate health systems are at risk of being left behind.

To explore how innovative digital models could help mitigate the constraints within the social and economic sectors in Uganda, including health, UNCDF carried out a market assessment study in Northern Uganda in 2019. Based on this study's findings, UNCDF identified strategic priority areas that we believe will enhance access to healthcare in underserved communities.

This paper presents UNCDF's approach to harnessing the power of digital technologies and health innovation to accelerate the attainment of positive health outcomes for rural Ugandans through partnership with some of the leading healthcare implementing partners in Uganda.

The models are:

- Digitalization of operations of Village Health Teams (VHTs) using Community Health Information Systems (CHIS) to improve their quality of service, performance, and motivation, and thereby engender efficiency and positive health outcomes
- Digitalization of health inventory management in resource-constrained health facilities to address issues related to frequent drug stock-out and drug visibility.
- Piloting the use of emerging technologies, notably medical drones, to overcome geographical constraints in providing last mile health emergency response to the COVID-19 pandemic

In this paper, UNCDF and partners present the approach used to design, deploy, and scale these innovative digital models, to inform work by other stakeholders in the digital health services space.

Chris Lukolyo
UNCDF Digital Lead, Uganda

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List of Abbreviations

CFL-U
Call for Life Uganda

CHIS
Community Health Information System

CHP
Community Health Promoters

CHT
Community Health Toolkit

CHW
Community Health Workers

COVID-19
Coronavirus 19

DHI
Division of Health Information Management

DHIS
District Health Information System

eCHIS
Electronic Community Health Information System

EMHS
Essential Medicines and Health Supplies

ERPS
Enterprise Resource Planning Systems

HC
Health Centre

HCD
Human Centred Design

HIIRE TWG
Health Information, Innovation and Research Technical Working Group

HMIS
Health Management Information Systems

iCCM
Integrated Community Case Management

IDI
Infectious Diseases Institute

LDCs
Low Developing Countries

MAUL
Medical Access Uganda Limited

MNCH
Maternal, Newborn and Child health

MOH
Ministry of Health

MSD
Market System Development

NGO
Non-Governmental Organization

PHC
Primary Health Care

PPP
Public-Private Partnerships

SDG
Sustainable Development Goals

SDK
Software Development Kit

UNCDF
United Nations Capital Development Fund

VHTs
Village Health Teams

WHA
World Health Assembly

WHO
World Health Organization

1. Background

Technology is fast becoming a critical component in the provision and support of primary healthcare and health emergency preparedness in rural and vulnerable communities. Yet, the World Health Organization (WHO) reports that while innovation within the digital sphere is at an unprecedented scale, its application to improve the health of populations remains largely untapped[1].

The World Health Assembly in 2005 resolved that all Member States should draw up long-term strategic plans for the development and implementation of eHealth services in the health sector. These plans would include appropriate legal frameworks, and infrastructure, and encourage public and private partnerships[2].

As a member of the Assembly, Uganda has since provided a suitable environment for digital health innovations to thrive both in the public and private sectors. This can be attributed to the policies, legislations, and strategies such as the National e-health Policy and Strategy, Community Health Strategy (2018 - 2022), and Data Protection and Privacy Act (2019).

However, Uganda still faces numerous challenges in the delivery of healthcare services especially in rural areas. For instance, the MoH has supported the Village Health Team (VHT) model since 2001. VHTs work in a voluntary capacity and act as a link between the formal health sector and their communities. As such, their motivation and thereby performance remains generally low. Moreover, VHTs are only given basic training on major health issues including pregnancy complications, childhood immunization, diarrhea, malaria, and pneumonia, etc., and yet play a key role in data collection and reporting.

Additionally, lower-level health facilities continue to face challenges in the delivery of Essential Medicine and Health Supplies (EMHS), manual and paper-based stock and inventory management systems that result in stock-outs and drug expiries.

1 https://www.who.int/health-topics/digital-health#tab=tab_1

2 'Global strategy on digital health 2020-2025', World Health Organization, Geneva, 2021, 4.

As such, challenges in the availability, analysis, and use of data, which remain critical to improving the quality of healthcare service, continue to affect the sector. Leveraging the power of digital technologies is seen to offer an opportunity to address some of the highlighted bottlenecks.

UNCDF, in coordination with other partners, is strengthening its support to the Government of Uganda to use digital health technologies to strengthen health service delivery, improve health outcomes and achieve health goals. UNCDF's 'Leaving no one behind in the digital era' strategy aims at harnessing the power of digital tools in building sustainable livelihoods for underserved communities.

1.1 The Uganda Health Sector

The Ministry of Health is responsible for the health sector and is charged with promoting a healthy and productive life for the Ugandan population. The MoH oversees health service delivery, promotion, and prevention, curative, palliative, and rehabilitative services at all levels. It also monitors and provides clinical support functions, regulatory functions and research activities related to health[3].

The sector features a private and public arm whose focus is on the delivery of quality health services. The private arm of the sector comprises private health providers, private not-for-profit organizations, and other complementary health providers[4]. The public arm on the other hand comprises national referral hospitals, regional referral hospitals, district hospitals, HC IVs, HC IIIs, HC IIs, and VHTs. Private not-for-profit organizations have also emerged as important service providers, especially in rural communities. As such, healthcare delivery in economically marginalized communities like Northern Uganda is supported by a range of local and international organizations including private for-profit and private not-for-profit organizations, development partner institutions, and social enterprises.

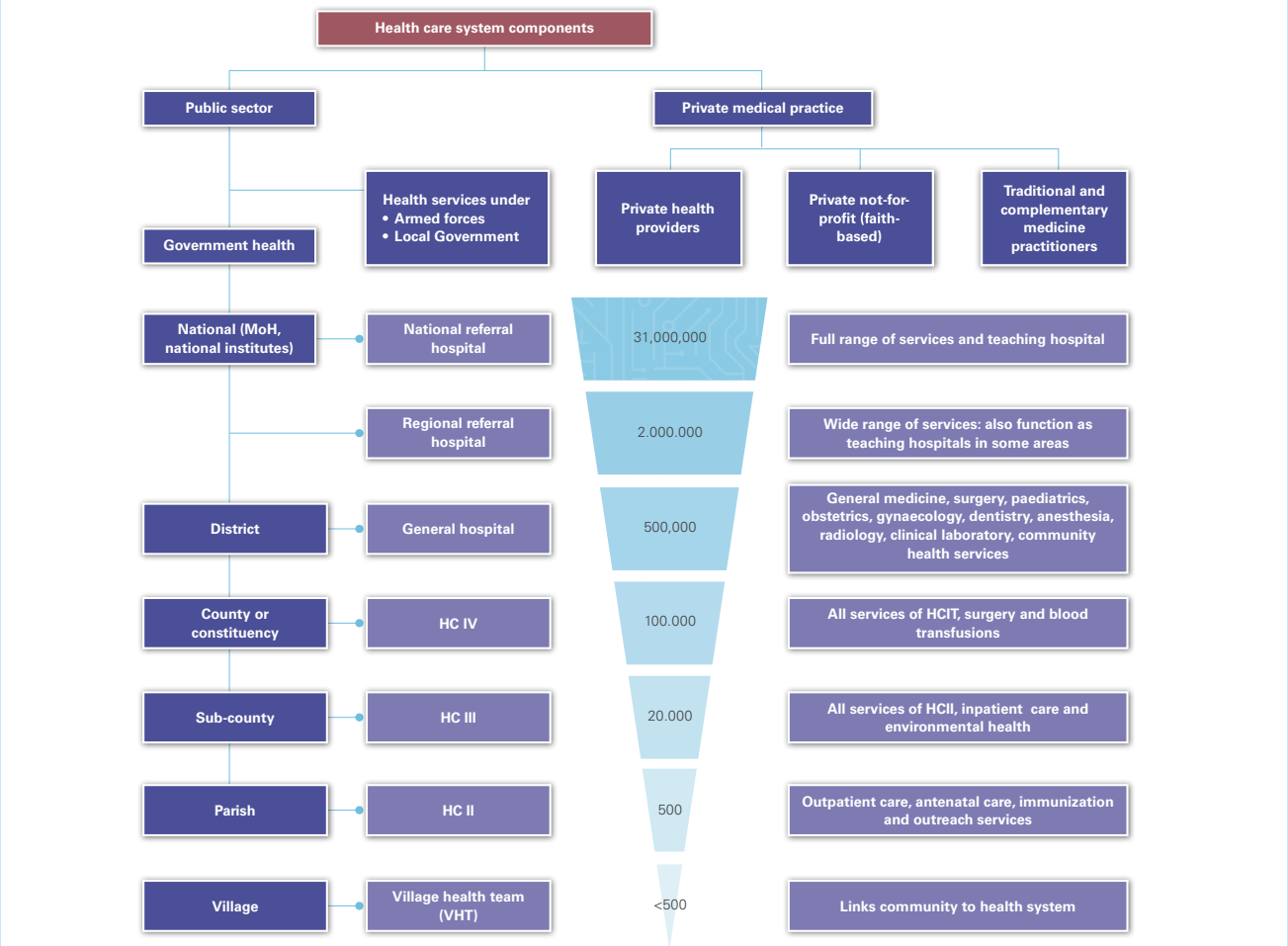
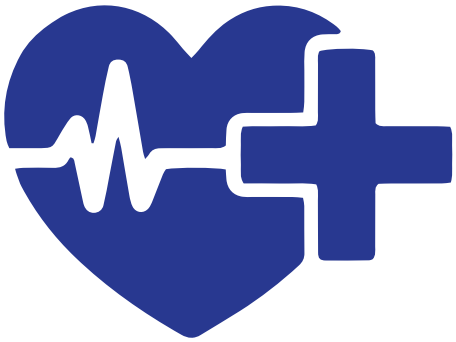


Figure 1.1: The setup of Uganda's healthcare system–from the central to the most decentralized entity

3 https://www.gou.go.ug/ministry/ministry-health

4 UNCDF Subsector Strategy



Communicable diseases account for the highest percentage of the country's disease burden, with malaria, HIV, and tuberculosis making up a third of this. Additionally, maternal, and infant mortality are still high with many children dying before reaching their first birthday. In Uganda, most pregnant women attend at least one antenatal care visit but only a few have their first visit during the first trimester. Furthermore, only a few children complete their routine immunization.

1.2 Digital Health

Digital health, or digital healthcare, is a broad, multidisciplinary concept that includes concepts, ideas, innovations, and solutions from an intersection between technology and health[5]. As a concept, digital health merges software, hardware, and services to remodel healthcare. It is a medical and public health practice supported by digital and emerging technologies, such as mobile phones, personal digital assistants, and other wireless devices for health purposes to cost-effectively generate information that improves health efficiency, effectiveness, and outcomes.

Digital health has proven to tackle healthcare bottlenecks such as those related to the management and visibility of EMHS as well as improve supply chain and financing management by reducing medicine stock-outs and expiries, coordination of community healthcare delivery e.g., linking CHWs/VHTs to their clients, peers, and supervisors, to new data, learning resources, and the national health reporting systems.

Emerging technologies like drones, artificial intelligence, geospatial and big data provide opportunities such as innovative transportation, mapping of services, digital registry, and data analytics to innovatively bridge health information and delivery gaps and support decision making.

In Uganda, digital health is coordinated by the MoH on behalf of the government and largely supported by donor funding. The MoH believes in and supports the use of digital solutions in the different interventions that enable the sector to address its challenges. In 2013, the Ministry launched an eHealth policy to guide the use of IT to access health services and share personal information for purposes of quality care and improved health outcomes.

The policy spells out national eHealth priorities to include leadership and governance, capacity building, investment, access to health services, electronic health information management, advocacy and communication, legal and regulatory frameworks, and eHealth infrastructure[6].

However, like with many other policies in Uganda, implementation of this policy remains a challenge. An assessment of the digital inclusiveness of the country shows that whereas the country scores highly on regulation, its scores on infrastructure, skills, innovations, and inclusiveness are low[7] demonstrating a gap in application of these policies.

Current national digital health systems include the DHIS, adopted in 2010 for the collection and reporting of health data, and others, launched in 2011 for tracking essential medicines and improving the general efficiency and quality of healthcare delivery, and others.

5 https://www.techtarget.com/searchhealthit/definition/digital-health-digital-healthcare#:~:text=Digital%20health%2C%20or%20digital%20healthcare,incorporating%20software%2C%20hardware%20and%20services.

6 http://www.ubts.go.ug/assets/publications/Uganda%20National%20eHealth%20Strategic%20Plan_April%202013.pdf

7 https://ides.uncdf.org/article/7166/inclusive-digital-economy-scorecard-ides-report-uganda-2021

2. UNCDF Approach to Digital Health

UNCDF Uganda's inclusive digital economy programme in health, in line with WHO guidelines on digital health interventions, aims to achieve SDGs 3, 9 and 17.

Inclusivity remains central to the UNCDF strategy of promoting digital economies that leave no one behind[8]. As such, the interventions of UNCDF in the health sector have been focused in Northern Uganda particularly West Nile sub-region.

In the health sector, just like in other sectors of intervention, UNCDF follows a market development approach and aims to play the role of market facilitator. This approach seeks to change the way that markets work so that marginalized communities are included in the gains of economic development. UNCDF, therefore, ensures that the digital models implemented are sustainable through building viable network-based business models with other actors.

Figure 2.1 UNCDF approach to programming in the health sector

8 https://www.uncdf.org/article/4931/global-strategy-leaving-no-one-behind-in-the-digital-era

2.1 UNCDF's Market Systems Prioritization Process

During its market systems assessment of the health sector in Northern Uganda, UNCDF identified key constraints within especially the market systems in which members of vulnerable communities actively participate. These were then prioritized based on impact potential, digital relevance, and required resources. The project implementation team however is cognizant of the fact that markets are continuously affected by the constant social, political, and economic changes.

A funnelling approach was used to prioritize three key areas. First, focus areas were identified and assessed for relevance to the programme target segments, and for the potential to reach large numbers of the target group. The focus areas were then assessed for how best they fit within the priorities of the country, the donor and the programme. Lastly, the focus areas were assessed for the feasibility of UNCDF leveraging digital solutions to stimulate impactful systemic change, and for what potential agents or triggers for change exist. Also taken into consideration at this point was the potential synergies with other interventions already happening in the focus area.

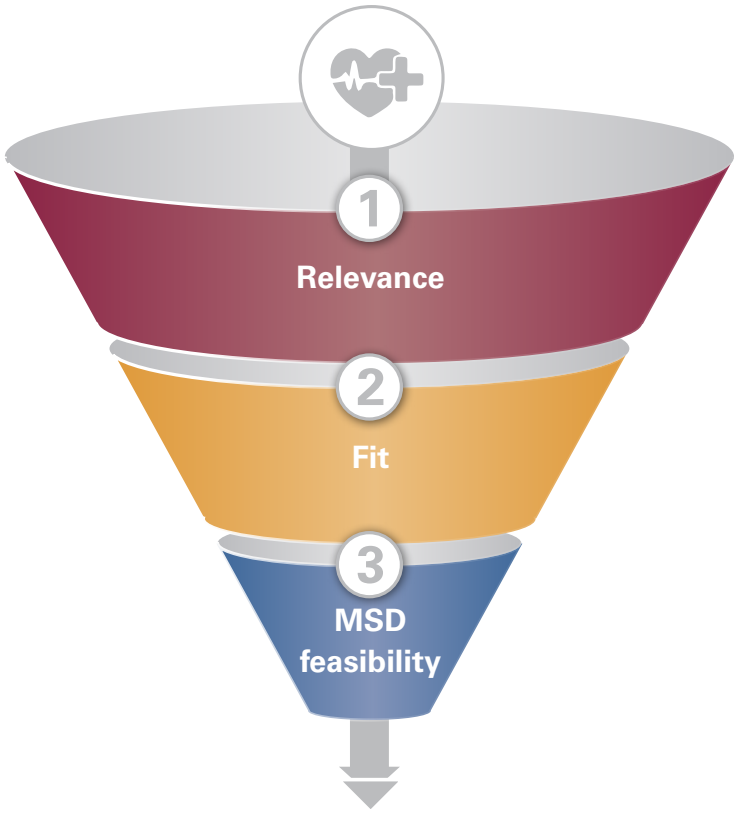


Figure 2.2: Subsector prioritization criteria

Given the complexity and the underlying constraints across the entire sector, UNCDF has adopted a targeted strategy around selected focus areas. As a result, three areas of focus where digital tools could alleviate or address some of the constraints at the community level as well as the lower health facilities level were identified as stipulated in the next chapter.

3. UNCDF Digital Health Interventions

Working closely with the Ministry of Health, UNCDF has teamed up with various implementing partners to address the challenges identified in the three areas of focus.

3.1 Digitalizing service delivery and reporting by Village Health Teams

UNCDF, working with partners BRAC and Medic, is strengthening the skills of community health workers by leveraging the power of digital service delivery and training tools. BRAC is a non-government organization (NGO) dedicated to the alleviation of poverty by empowering the poor to bring about positive change in their own lives. In Uganda, BRAC's approach to increasing access to care is multifaceted. At the heart of their approach are the Community Health Promoters (CHPs).

Medic is a non-profit organization on a mission to advance good health and human flourishing for and with the hardest-to-reach communities. It builds and deploys open-source technology that helps health workers deliver equitable care.

3.1.1 Problem Description

Uganda faces a significant shortage of trained healthcare professionals, especially in the public sector and rural areas. As a result, the MOH has supported the delivery of the VHT model since 2001. VHTs work in a voluntary capacity and act as a link between the formal health sector and their communities. VHTs are given training to educate and sensitize, diagnose, provide healthcare at the community level, and report on major health issues such as diarrhea, malaria, and pneumonia, monitor pregnancies, deliveries, and newborn routine immunization.

The current service delivery and reporting systems of the VHTs remain manual and are encumbered by weak care coordination resulting in challenges in follow-up, and VHT supervision and performance management due to lack of visibility on their activities. As such, there is inadequate availability of timely data to support decision-making for managers of health systems at district and sub-district levels.

3.1.2 The Solution: A Digital Community Health Toolkit

In order to resolve the challenges in follow-up, and VHT supervision and performance management, UNCDF and implementing partners BRAC and Medic have rolled out the Community Health Toolkit (CHT). The toolkit is a collection of open-source technologies and open access resources developed by a community focused on global equity. Maintained by Medic, its core framework is highly configurable and makes it easier to build scalable digital health apps. It runs offline, works on multiple devices, supports multiple hierarchies and users in a health system with integrated care workflows, and is interoperable with digital systems such as the District Health Information Software 2 (DHIS2) and other digital public goods.

At the community level, community health workers (CHWs)/VHTs use apps built with the CHT to register patients, conduct guided health assessments, screen for specific conditions and danger signs, and refer patients to health facilities.

Figure: 3.1: How the CHT works on multiple devices supporting multiple users in a health system

Digitally empowered CHWs can respond to the needs of their communities with more accuracy and efficiency through efficient task management and scheduling. Digital empowerment for CHWs increases the district's ability to access, receive and use healthcare data for decision support more routinely, and more accurately. This increases the local communities' resilience to address healthcare challenges at the lowest level of the healthcare service delivery chain.

Cohorts of participating communities are now forming local communities of practice, sharing knowledge on digital tools, and empowering each other on the benefits of access to digital tools including digital literacy and increase in financial inclusion using mobile money.

3.1.3 Case Study: Empowering VHTs through Digital

BRAC and Medic are implementing a 3.5-year public sector project funded by UNCDF targeting 400 VHTs in Lira, Koboko, Maracha and Nebbi districts. It aims at piloting and scaling a sustainable mHealth solution that aims at improving service quality, the productivity and motivation of VHTs, hence, effectiveness and health outcomes of rural and vulnerable communities. The key outcomes expected include:

- Improved quality of service, performance, and motivation of VHTs
- Improved health efficiency and outcomes
- Improved adoption and usage of digital health services
- Improved collection of real-time data in key health indicators

Activities and Process

The primary objective of this project was to deploy a digital system to promote integrated community healthcare coordination, and performance management, including ICCM and MCH in Maracha, Koboko, Lira and Nebbi.

To implement the project, varied and often distinct teams at the district, and ministry level had to coalesce around the same vision in a standardized manner. As such, the partners engaged all stakeholders early, often, and consistently.

A presentation of the solution was made to the DHI and Health Promotion, Education and Communications divisions, Community Health Department, and the Health Information, Innovation and Research Technical Working Group (HIIRE TWG) at the MOH to secure government buy-in and support. A sensitization meeting was also held from the onset to secure buy-in from the district leadership.

The project implementation process was guided by the human-centered design process. A series of engagements were held including with VHTs and their supervisors. The project designers and developers documented early experiences, needs and features required for the product prior to completing the launch. A total of 300 VHTs from Maracha, Koboko, and Nebbi have been trained. Another 100 from Lira are yet to be trained.

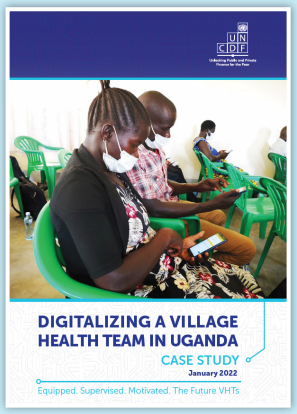
This has promoted increased system deployment, usage and adoption and thereby improved efficiency of VHTs.

Learnings

- Partnership and collaboration with public and private stakeholders remain vital to the project's success.
- Early and continuous involvement of both health facility and district leaders creates local ownership for the community to participate in government programming.
- Strong working relationships with community leaders accelerate awareness of digital inclusion.
- Paper-based reporting system is costly and leads to inaccurate and untimely reporting and cumbersome data validation.
- Districts lack evidence of monitoring, supervision, and coordination of the VHT programme.
- There are also inconsistencies and inaccuracies in the diagnosis of Integrated Community Case Management diseases due to lack of a tool to guide VHTs on the chronology of questions that they should ask a client to arrive at an accurate diagnosis.

Hence, the CHT app is being tested to reduce the costs related to paper-based reporting and inaccuracies and promote efficiency through timely reporting and easy data validation. The app, as well, will provide a chronological approach for CHWs to arrive at a diagnosis in line with government guidelines.

If these volunteers are to stay relevant in the fight against diseases in the community, they need to adapt to digitalization, and a community health information system offers such an opportunity. A facility-based approach works best in supervising VHTs. VHTs are highly motivated to digitalize their reporting as the solution makes data collection and service delivery more efficient. *Refer to the case study for more details.*



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3.2 Digitalizing inventory management of medical supplies in lower-tier health facilities

To address the challenge of stock management in health facilities, UNCDF sought to pilot and scale up a digital solution to improve stock management of EMHS in Uganda. To this end, UNCDF has partnered with MAUL and Signalytic. MAUL is a non-profit organization that provides cost-effective and sustainable healthcare supply chain management solutions. Signalytic, on the other hand, is a Canadian-based organization that provides access to digital services.

3.2.1 Problem Description

A facility's ability to respond to patients' needs is directly linked to the availability of the medicines required for the specific level of care, which is a function of the facility's funding allocation and their capacity to place EMHS orders and adequately manage their medicines.

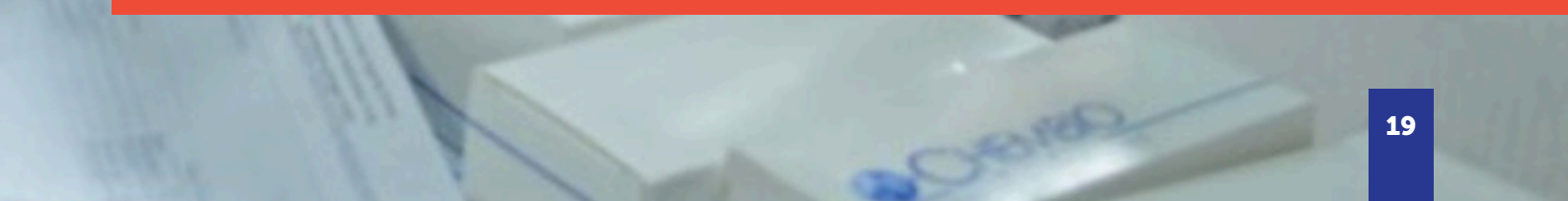
Since 2010, Uganda's MoH has been implementing a Primary Health Care (PHC) policy that involves the procurement, supply, and distribution of EMHS using a dual pull-push system. While the pull system was maintained for Health Centre (HC) IVs and hospitals, the push system was adopted for rural and hard-to-reach lower-level HC II and III health facilities. This was intended to reduce delays in requisition and procurement of EMHS, minimize risks of corruption in the procurement of medicines, and address chronic drug stock-outs at the primary care levels. It was also intended to reduce the burden on frontline health workers associated with the requisition of medicines and other health supplies.

While stock status reporting is done routinely through the district biostatisticians, and SMS-based reporting is prevalent with limited use of the RxSolution software, the majority of HC IIs and IIIs continue to suffer stock-outs and non-availability of EMHS. This, in part, is largely due to the use of paper-based inventory management systems that serve more as reporting mechanisms than a basis for decision-making.

3.2.2 The Solution: A digital supply chain management solution built to address the connectivity challenges of the last mile

Increased access to essential medicines through an effective digital supply chain management system at the primary health care level is seen as an effective solution for minimizing waste, reducing mortality rates, increasing responsiveness and drug availability, and promoting rational drug usage.

UNCDF and partners MAUL and Signalytic, have developed the S+ platform, an innovative digital solution that combines renewable solar power, powerful signal connectivity, durable hardware, and custom off-grid blockchain technology to connect remote health facilities and health providers to a common decentralized network, even in facilities with no electricity or mobile network coverage.



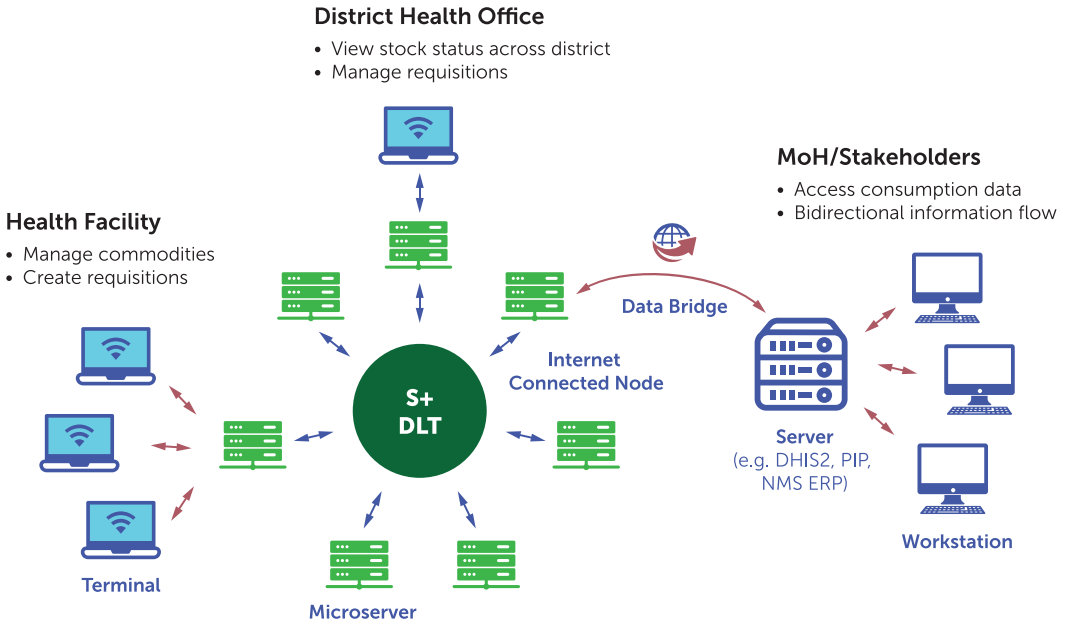


Figure 3.2: How the S+ platform works

The S+ Platform is compatible with the open-source S+ stock management suite and includes interfaces for facility store managers and the district health officers. Its open-source Software Development Kit (SDK) allows developers to build new or existing applications for the platform which can then be made available for deployment by anyone, anywhere. The S+ platform's control center allows MOH staff to simply drag-and-drop applications to selected health facilities. The applications are propagated to all selected facilities within 24 hours.

The solution uses off-grid block technology to store, share and receive information in a way that can be easily connected to existing databases such as DHIS2, pharmaceutical portals and national Enterprise Resource Planning Systems (ERPS), ensuring data is interoperable from its digital inception.

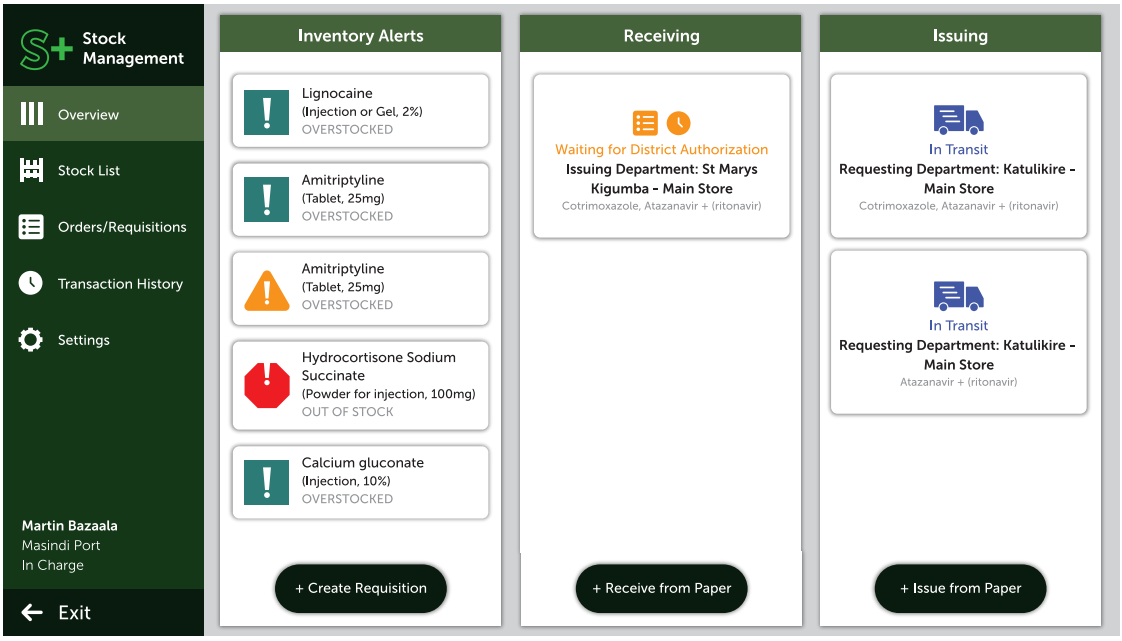


Figure 3.3: A snapshot of the S+ platform

The solution addresses the challenges in determining and maintaining adequate stock levels in a network of resource-constrained health facilities such as frequent occurrences of under and over stocking, and stock-outs.

Health facility store managers complete stock transactions within the health facility aided by the digital solution. The solution further provides visibility of stock data upwards the value chain to the district health office to facilitate informed stock redistributions within the district and the IP level to allow for targeted technical support to sites. The digital solution is interoperable with other digital health systems and the central warehouse to ensure timely read/write capabilities for all stakeholders to strengthen the monitoring systems of pharmaceutical procurement and availability of essential medical supplies up to the lowest level of care.

3.2.3 Case Study: The S+ Solution in Action

A pilot project to roll out the S+ platform was rolled out by MAUL and Signalytic in Kiryandongo District for two years targeting 25 health facilities. These facilities had previously not been digitally connected to the health system.

The S+ solution aims to provide the following benefits:

- Improved commodity management i.e., reduction in pilferage and expiries
- Increased stock accuracy
- Improved tracking of EMHS in facilities and communities
- Digitalization and computerization of existing commodity and supply chain management processes, including existing health management information system (HMIS) tools
- Increased reporting data quality (availability, timeliness, accuracy, validity, and completeness)
- Affordable and sustainable digital service provision
- Real-time data visibility across the health structure.

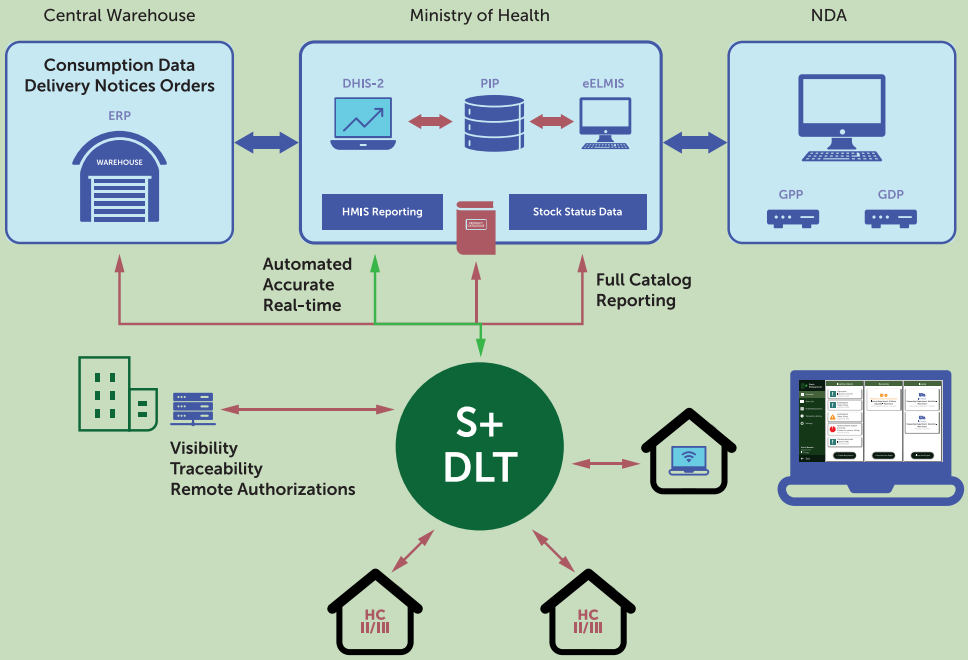


Figure 3.4: Information flow of the S+ solution in action

Activities and processes

In order to roll out the project, it was important to build buy-in from the key stakeholders who included the MoH, Kiryandongo District leadership, health facilities' leadership, and users of the solution.

The project team made a presentation to the DHI and Pharmacy divisions, and the HIIRE technical working group at the MoH. The main objective of this was to carry out a demo of the solution, present project objectives and activities and get feedback in terms of alignment with national interests.

A meeting was held with the Kiryandongo District leadership comprising of the Resident District Commissioner, District Health Officer, and Chief Administrative Officer to present the system, its benefits, and value proposition. This was in acknowledgment of their supervisory role in drug distribution within the district.

Several engagements were also held with facility leadership and store managers not only to emphasise the benefits of the system in inventory management but also to train the system end-users. User feedback was especially important in ensuring that the final product is user-friendly.

These engagements were undertaken to promote increased system usage and adoption and thereby improve efficiency in EMHS inventory management within HC IIs and IIIs in Kiryandongo District.

Learnings

- The digital health inventory management solution is a singular component of this multi-faceted medicines supply chain equation.
- Full integration of the digital solution to the holistic national health systems through interoperability with platforms like DHIS2 is critical to effecting a real and lasting impact on medicines availability at lower levels.
- Human-centred design approaches that effectively address user needs ensure easy usage and adoption of digital technologies at all levels.

Establishing strategic partnerships within the national and local context with actors like ministry, district, and health facility leadership helps to foster system adoption and increase usability.

Whereas the importance of initial and follow up training in ensuring the inclusion of all stakeholders cannot be overemphasized, it has been helpful, in our experience, to focus not only on the training of the target users but also on a small number of backup users to fill in, in case the target user is unavailable.

Despite poor infrastructure noted at most of the lower-level health facilities in Kiryandongo, the system was able to register 100% uptime at facilities, 100% data sync between facilities, ability to pick up signals from various service providers (MTN, Airtel, Uganda Telecom & Africell) and connect to the strongest network thereby eliminating any possible connectivity drops.

Digital technologies also require great investment in mobile equipment, hardware, support, and transaction costs which get higher as systems scale and increase in complexity. Moreover, not anticipating scale-up appropriately is a critical issue that many digital projects face. Scale-up should be understood during the design phase. The trade-off between developing for scale-up and developing lightweight applications for field-testing must be communicated to all stakeholders and funders. Developing systems for scale-up is a difficult task, requiring serious investment in time, funds, and resources. A strong investment commitment from the government and other key stakeholders is therefore crucial for the scale-up of the solution from the pilot phase.

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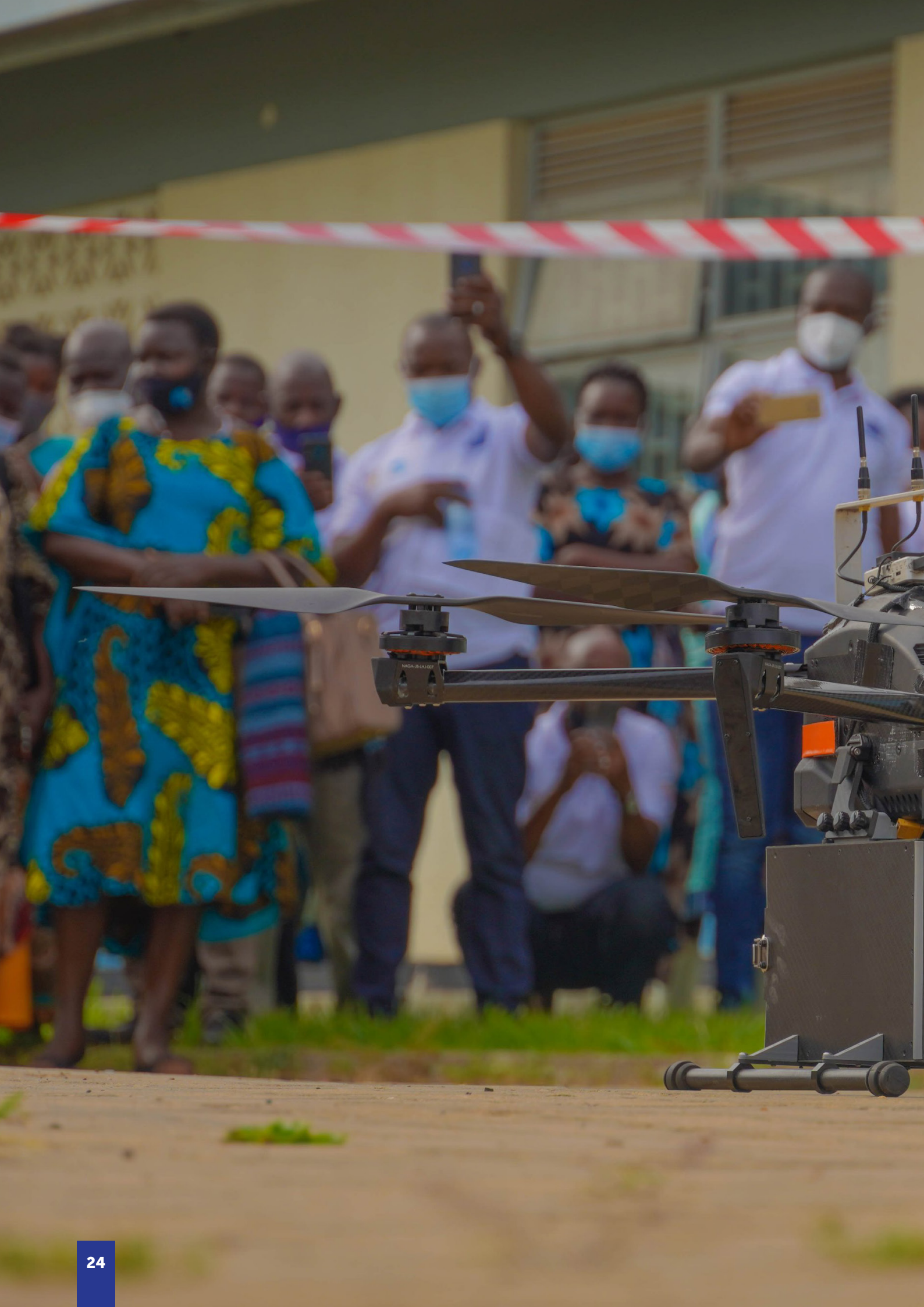
COMBIART
Ibuprofen
Tablets BP 200 mg
MINISTRY OF HEALTH



3.3 Piloting drone health deliveries in last-mile geographies

UNCDF has partnered with the Infectious Diseases Institute (IDI) of Makerere University, a non-profit-organization that aims at strengthening health systems in Africa through research and capacity development in a medical drones diagnostic project. The project, Overcoming Geography with Technology, used medical cargo drones to deliver COVID-19 samples.

3.3.1 Problem Description

West Nile is a sparsely populated area and is underserved in terms of health services. Access to COVID-19 testing kits was limited while traveling further increased risk of transmission.

Porous South Sudan and DRC borders, plus vulnerable refugee settlements increase the risk of COVID-19 outbreaks. Efficient tracing and testing of COVID-19 cases was essential to ensuring that COVID-19 does not overwhelm the health system in the West-Nile region. Due to challenging geography and poor infrastructure, sample transport delays and complexities were leading to sample results turnaround times of up to 48 hours. This had negative implications for patients and healthcare workers in the management of COVID-19.

Figure 3.5: Transport system for COVID samples in West Nile

3.3.2 The Solution

UNCDF and IDI rolled out a pilot project to deploy drones to address the challenges of geography, poor infrastructure, and delays in the transportation of samples in hard-to-reach areas in West Nile. The project combines two innovations that are currently being evaluated and implemented by IDI. The innovations include the use of medical cargo drones to transport diagnostic samples and the Call for Life Uganda (CFL-U) application. CFLU is an online based application which works with an interactive voice response system to support patients with COVID-19 to report symptoms. The project will enhance access to COVID-19 testing for those in hard-to-reach areas and support automated patient follow-up in areas of sparse healthcare workers.

Figure 3.6: Flight testing Multi-rotor drone with cargo box (L) Fixed wing drone being loaded with COVID-19 swabs (R)

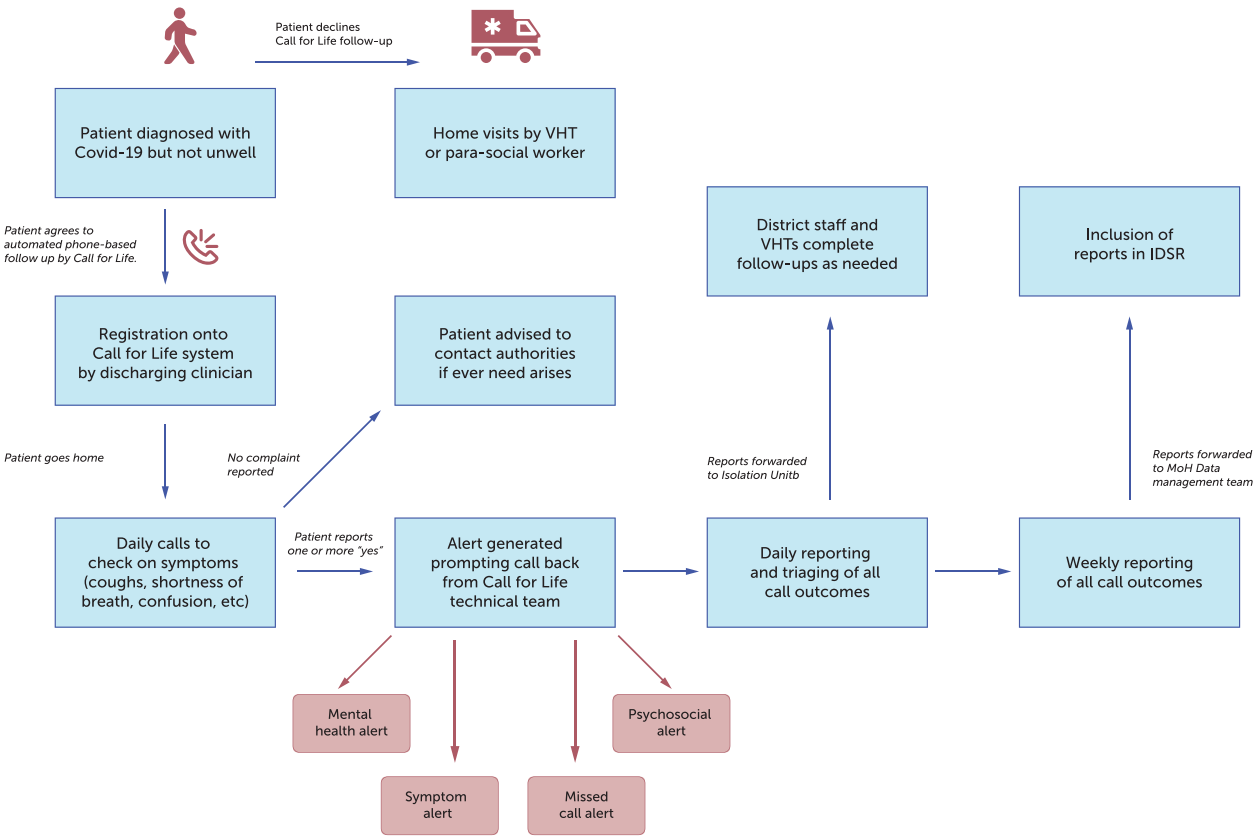


Figure 3.6: Schema for CFL-U home-based care

The technology enabled access to COVID-19 testing more rapidly and closer to home, by leveraging drones onto the existing MOH testing supply chain. Customers gained clarity on COVID-19 status quicker and with less out of pocket expenses. They avoided travel and reduced further transmission of the disease. After COVID testing, those with COVID were linked to CFL-C IVR so they could be supported to comply with self-isolation and monitor for worsening symptoms.

3.3.3 Implementation

This complex project had strong involvement of the MoH, Ministry of Defence, Ministry of Science, Technology and Innovation, Ministry of ICT, Uganda Civil Aviation Authority, and local district authorities to provide oversight through steering committee meetings and field visits to the drone project area. The project included a research protocol that was approved by the Makerere School of Public Health, and the Uganda National Council of Science and Technology.

The project aimed to assess the:

- Feasibility of drone health deliveries in the specific region, including ascertaining operational aspects like flight range, payload, speed, and connectivity (Mobile, GPS)
- Acceptability of drones by the local community and the medical community
- Viability of drone deliveries in terms of cost-benefit comparison with other available means of delivery of medical supplies and drugs.

Ongoing Activities

Supported by our partners, 3D Drone Mapping/ Yamasec, the first step of the project was mapping suitable flight paths between suitable health facilities. Adjumani was chosen as the medical hub as it was the first facility to process COVID-19 samples in the West Nile region. Other health facilities covered by the project include Moyo Hospital, Pachala HCIII and Arra HCIII.

Following the mapping was the roll out of pilot flights. This was followed by validating the COVID-19 samples to ensure that the test results achieved from samples traveling in the drone were as accurate as those traveling by land. The next phase, which is currently ongoing is implementing regular flights and analyzing the benefits of the use of drones to health facilities and patients with respect to sample turnaround time and costs.

Results thus far

So far, the project has undertaken 77 drone flights, trained 155 health workers, moved 675 COVID-19 samples and 1100 dry COVID-19 swabs, and reduced the delivery time of samples from over three hours by car and ferry, to less than 25 minutes by medical drone. The project has moved a total weight of 22,155g in these flights, with an average load of 481g, and average distance of 21km.

Testing delivery of medication and other samples using the medical drones to extend the use case beyond COVID-19 samples has also been carried out.

The project is carefully evaluating the possible benefits of the medical cargo delivery and studying other possible use cases for the medical drones in the region, both in terms of cargo and location, and possible private partnerships. This research will provide the necessary information to determine whether the project should be scaled up.

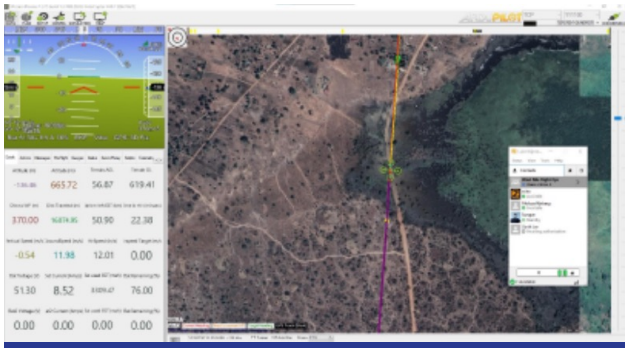


Figure 3.7: Screenshot of live flight

4. Reflections and a Call to Action

At the heart of UNCDF approach to digital health intervention is solid partnerships, collaboration, co-investment, and co-creation. UNCDF plays a catalytic role as a market facilitator for such initiatives that bring together the public and the private sector, to ensure sustainability of these interventions.

Carrying out a sector/market diagnostic was vital in understanding the major constraints towards access to quality healthcare. Since expectedly a myriad of challenges was identified, it was important for UNCDF to put in place a prioritization mechanism to narrow down the major constraints in the sector that could be significantly alleviated by leveraging digital solutions.

Recognizing that digitalization in the health sector, just like in other sectors of the economy, is growing significantly, there is need to approach digitalization better and do it right. By sharing the experiences of UNCDF and its partners, we hope that stakeholders involved and interested in the digitalization of the health sector can benefit from what we have learned along the journey and inform their own interventions accordingly.

LEAVING NO ONE BEHIND IN THE DIGITAL ERA

The UNCDF strategy 'Leaving no one behind in the digital era' is based on over a decade of experience in digital financial inclusion in Africa, Asia, and the Pacific. UNCDF leverages digital finance in support of the Sustainable Development Goals (SDGs) to achieve the vision of promoting digital economies that leave no one behind. The goal of UNCDF is to empower millions of people by 2024 to use services daily that leverage innovation and technology and contribute to the SDGs. To achieve this vision, UNCDF uses a market development approach and continuously seeks to address underlying market dysfunctions that exclude people living in the last mile.

THE UN CAPITAL DEVELOPMENT FUND

The UN Capital Development Fund (UNCDF) makes public and private finance work for the poor in the world's 46 least developed countries. With its capital mandate and instruments, UNCDF offers "last mile" finance models that unlock public and private resources, especially at the domestic level, to reduce poverty and support local economic development. UNCDF's financing models work through two channels: financial inclusion that expands the opportunities for individuals, households, and small businesses to participate in the local economy, providing them with the tools they need to climb out of poverty and manage their financial lives; and by showing how localized investments—through fiscal decentralization, innovative municipal finance, and structured project finance—can drive public and private funding that underpins local economic expansion and sustainable development. By strengthening how finance works for poor people at the household, small enterprise, and local infrastructure levels, UNCDF contributes to SDG 1 on eradicating poverty and SDG 17 on the means of implementation. By identifying those market segments where innovative financing models can have transformational impact in helping to reach the last mile and address exclusion and inequalities of access, UNCDF contributes to a number of different SDGs.

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