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Harnessing Digital Technology's Potential: Moving Toward Universal Health Coverage

D-tree International Strategic Plan 2020–2025

An app helped identify Sabrina Ally Mohammed's pregnancy-related condition, which could have been fatal if untreated. But the support and care that she and more than 100,000 other women have received goes beyond technology on a smartphone. It stemmed from a strengthened health system.

It started with D-tree.

BEYOND APPS:
STRENGTHENING THE WHOLE HEALTH SYSTEM

When Sabrina Ally Mohammed met Mashaka Peter, a community health volunteer in a rural villiage of Zanzibar, she was pregnant with her fourth child. Her prior three children had been born at home—without a skilled birth attendant.

During visits with Sabrina throughout her pregnancy, Mashaka, as a volunteer with D-tree's Safer Deliveries program, used the Safer Deliveries mobile app to guide Sabrina in screening for danger signs. The app also helped them develop a birth plan, provided education and counseling, and engaged Sabrina's husband in the process, a culturally vital aspect. On one such visit, Mashaka noted Sabrina's swollen feet. Entering this observation in the app, it was flagged as a danger sign. The app identified that Sabrina may have had hypertension and was at increased risk for complications during pregnancy and delivery. It prompted a referral to a health facility where Sabrina received additional care.

After continued interactions with Mashaka and others, Sabrina delivered a baby in a hospital with skilled care for the first time and received a birth certificate for her child. Interactions with Mashaka in the Safer Deliveries program may have saved Sabrina's life.

The design of the app and the broader digital system that supports health workers, supervisors and health system managers has led to the expansion of D-tree's program to aid more than 100,000 other women—and counting. Based on partnerships with community and government leaders, the foundation of this program was formally adopted by Zanzibar's government as the model for its national digital community health program. Working with the Ministry of Health, D-tree will support 2,200 digitally-enabled community health volunteers by 2020 to provide comprehensive, community-based services to the islands' 1.5 million people. This is just one example of D-tree's success in facilitating thoughtful, integrated, data-driven digital health solutions in low-income countries.

Sabrina Ally Mohammed

"Harnessing the power of digital technologies is essential for achieving the Sustainable Development Goals, including universal health coverage . . . Such technologies are no longer a luxury; they are a necessity."

Dr. Tedros Adhanom Ghebreyesus,
Director-General,
World Health Organization

OUR VISION
A world in which everyone, no matter who they are or where they are from, has access to high-quality healthcare

OUR MISSION
To improve lives by strengthening health systems through digital technology

Half the world lacks access to basic healthcare. Around the world in low- and middle-income countries, more than 15 million people die each year from otherwise preventable causes.[1] There is a strong opportunity for digital technology to reduce incidence of such deaths and improve people's lives. Digital technology can help goverments task shift more efficiently so health workers who have not traditionally been trained, managed or supported can deliver high-quality care. This saves health systems money as it decentralizes services, expands preventive care, and identifies health issues earlier.

The release of the World Health Organization (WHO) guidelines for digital health in the first quarter of 2019 emphasized the critical role that digital health must play in strengthening health systems.[2] However, as the WHO acknlowedges, developing the technology alone is not sufficient. Digital interventions will only succeed if they:

- Integrate into the broader health system and take into account local context and capacity from the outset.

- Focus on ways in which digital technology can improve service delivery in addition to collecting data.

- Emphasize behavior change and human processes that are critical to adoption of digital health systems in addition to the technology.

- Support capacity building on data analysis and data use rather than simply making data available.

This is where D-tree turns the traditional digital health approach on its head. We understand the problem first and define solutions with local stakeholders that take into account the local context and global best practices. We identify and foster an enabling environment for adoption and accompany our partners throughout the design, implementation and monitoring process. This leads to digital technology that can strengthen health systems from the ground up, uplifting health workers, benefiting patients and progressing toward the vision of universal health coverage where "everyone—irrespective of their ability to pay—gets the health services they need in a timely fashion without suffering any undue financial hardship because of receiving care."[2]

D-tree's approach demonstrates how digitally supported health workers, guided by context-appropriate mobile apps, can deliver accessible, high-quality care. Data generated in real-time by the system is used for supervision, timely decision-making and continuous health system improvement.

WHAT IS D-TREE?

In a literal sense, D-tree stands for decision tree. Dr. Marc Mitchell, a pediatrician, founded D-tree in 2004 after witnessing the failure of health systems to provide high-quality care, especially in poor, underserved areas.

One of the main challenges D-tree addressed during its early years was the development of electronic clinical decision support systems to replace traditional, bulky, expensive and largely unused paper-based algorithms.

At a time when apps were just emerging, Dr. Mitchell saw the potential for digital technology on mobile devices to provide step-by-step guidance to frontline health workers as they met with clients. These tools led to improved clinical protocol adherence and better health outcomes—and provided some of the earliest evidence showing the positive impact of adopting digital technologies in the health sector.[3,4]

However, we recognized early on that simply building an app and training health workers doesn't result in consistent technology use among client interactions across a village, let alone integration and adoption at national scale. So D-tree developed an approach that builds holistic digital systems and human capacity to bridge service delivery gaps, improve accountability and increase efficiency with an eye toward national-scale implementation from the start. Our approach, which is fully in line with the **Principles for Digital Development**[5] and the **Principles of Donor Alignment for Digital Health**,[6] involves:

- **Systems thinking.** Our work starts with a "deep understanding of the linkages, relationships, interactions and behaviors"[7] among actors within a health system. This means identifying the barriers, opportunities and threats that impact people's decision to access health services; the motivation and ability of health workers to provide high-quality, respectful care; and the programmatic and policy decisions that influence leaders in resource allocation and accountability.

- **Evidence and learning**. These are central to our approach, because we use data generated from programs to make program enhancements in real time and add to the local, national and global evidence base. Monitoring and evaluation is built into our work to enhance implementation and understanding of impact at all levels within the health system.

- **Innovation**. To us, innovation means creating new solutions or processes, envisioning application of existing technologies in new settings or finding novel ways to create positive disruptions in health service delivery and health system performance.

- **Promoting sustainability and local ownership**. Local capacity building of staff, government and partner organizations not only establishes lasting skills, but it ensures that the approaches are designed by those who know what works and what doesn't in their environment. This capacity building is at the center of D-tree's approach and is built into the implementation of every aspect of our work.

D-tree has grown from a small organization, testing and evaluating new ideas, with seed funding from donors including the Bill & Melinda Gates Foundation, Rockefeller Foundation, USAID and more, to an established thought leader in digital health with three country offices and a core global team who have developed digital health systems for projects in 16 countries. Through our work in Zanzibar, we have developed a model for engagement, leading to the integration of digital health at national scale. We are now poised to deepen this engagement and expand our model to support governments in new geographies as leaders look to integrate digital technology into their health systems.

D-TREE'S REACH

over **10,000** health workers, supervisors and health system managers have been supported by D-tree's programming approach, in **16 COUNTRIES** reaching more than **2 MILLION** families.

Long term programs
Active/upcoming projects
Past projects
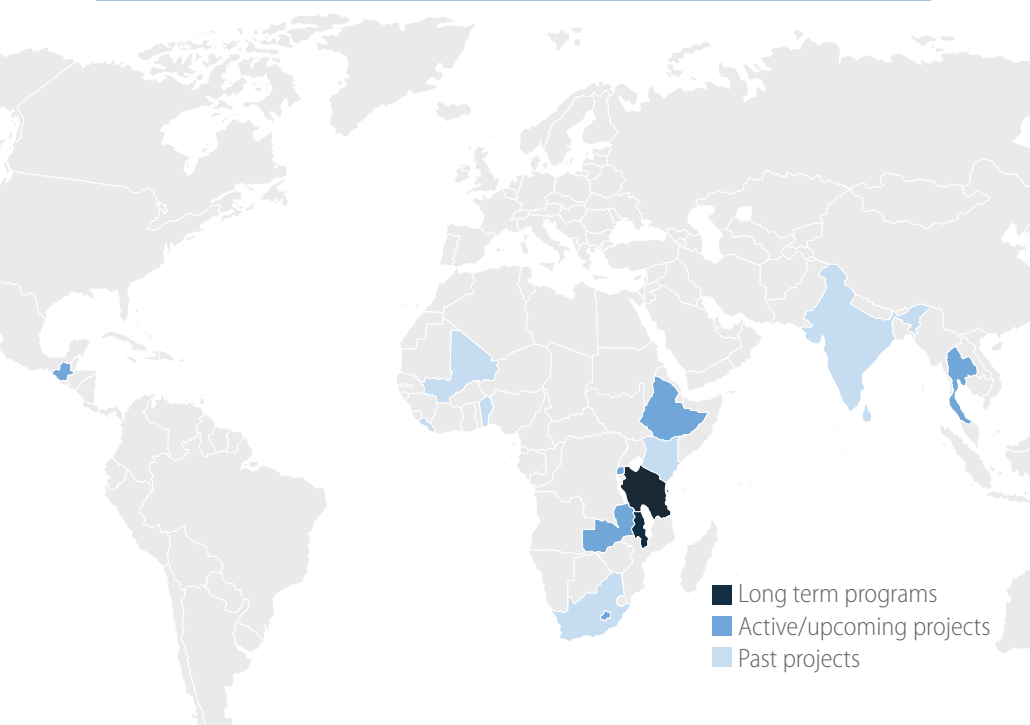
"So much of what we do is not just building the technology. We strengthen human capacity and support change within the health system as a whole so that technology can be used to its fullest potential."

Erica Layer, CEO, D-tree

WHAT SETS US APART?

Systems building approach
We accompany governments and other partners throughout their journey towards integrating digital technology into health systems. We do not solely focus on technology, but look at the entire system and then determine how health systems can be strengthened to deliver results and improve care for people.

Technology agnostic
We aren't tied to one specific software; our team has experience working across software platforms, giving us and our partners the freedom to determine the most appropriate solutions for each context in which we work.
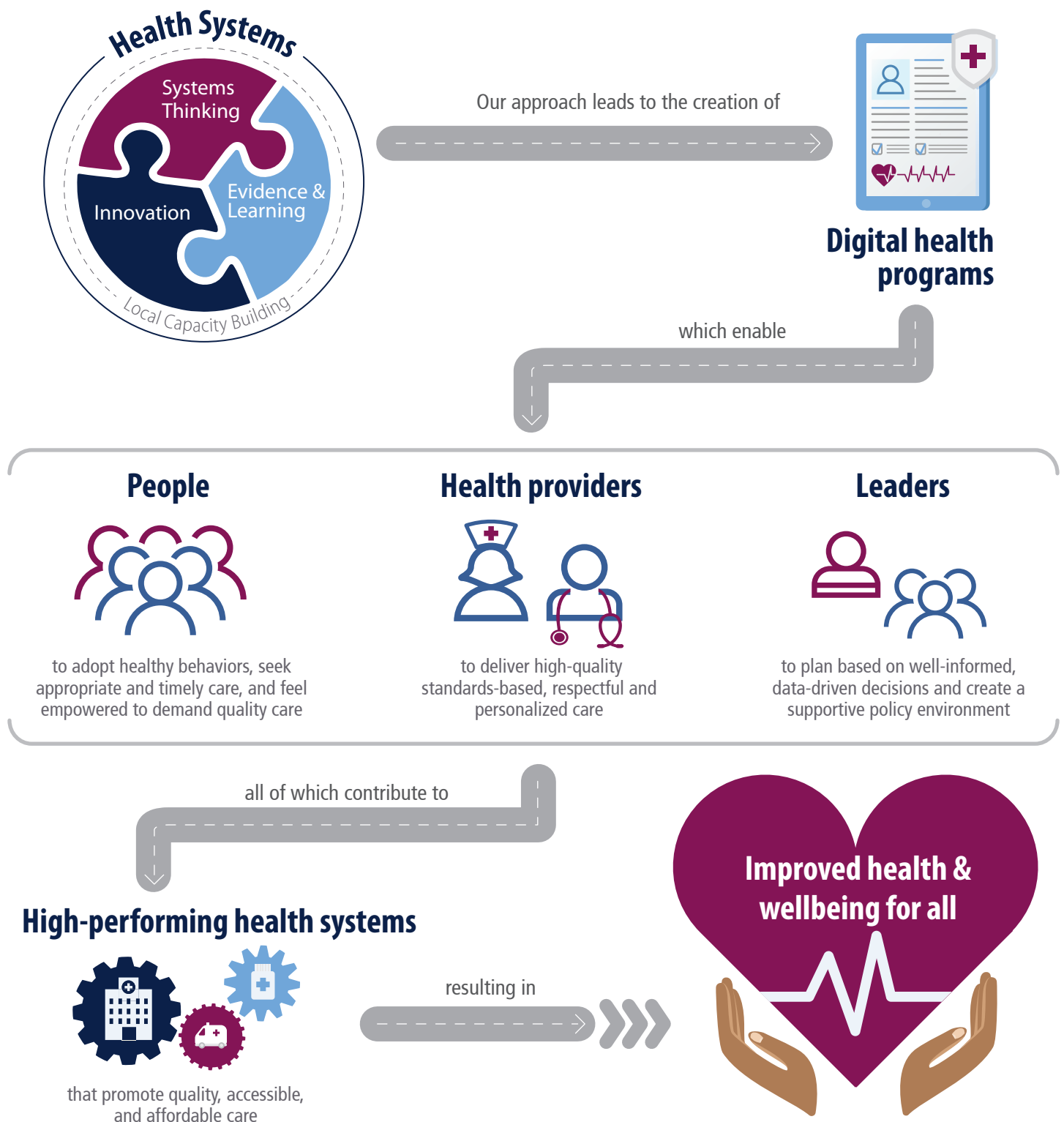
Partnership model
Digital health is a cross-cutting field which requires expertise from multiple sectors—health, IT, financing, regulation, analytics and beyond. No one can do it alone. We work in partnership with local and global experts across sectors towards the vision of better healthcare for all.

Years of experience
D-tree, founded in 2004, was an early pioneer in the field of digital health and knows what works—and what doesn't. Our approach combines this pioneering spirit of digital health innovation with pragmatic, grounded experience to help digital health programs succeed.

THEORY OF CHANGE

Our theory of change illustrates the path by which our digital health programs influence interactions and relationships between people, healthcare providers and health system managers at multiple levels of the system, all of whom are inter-connected and dependent on each other to create long-term social change. This is based on years of experience working at the forefront of global digital health with systems strengthening at the core of our approach.

Health Systems

Systems Thinking

Innovation

Evidence & Learning

Local Capacity Building

Our approach leads to the creation of

Digital health programs

which enable

People

to adopt healthy behaviors, seek appropriate and timely care, and feel empowered to demand quality care

Health providers

to deliver high-quality standards-based, respectful and personalized care

Leaders

to plan based on well-informed, data-driven decisions and create a supportive policy environment

all of which contribute to

High-performing health systems

that promote quality, accessible, and affordable care

resulting in

Improved health & wellbeing for all

# EXAMPLES OF D-TREE'S HEALTH SYSTEMS INNOVATIONS

Emergency transport

Working with partners, we have developed an innovative emergency transport system to ensure no women or children die due to lack of transportation during a life-threatening emergency. The system builds upon existing ambulance networks and individuals with cars in the community. Dispatchers, accessible through a toll-free number, triage calls through a mobile app to determine emergency severity and referral locations, organize transport, pay drivers automatically using mobile money and follow up with referrals to obtain outcome data.


Photo credit: Simprints

Artificial intelligence and biometrics

Within the Afya-Tek program in Tanzania, D-tree is working with a consortium of partners to examine the feasibility of artificial intelligence to improve clinical decision-making and exploring how these tools could complement more traditional decision-support tools to improve health. We also integrated biometrics into the digital system to uniquely identify clients, facilitating a continuum of care as people move among multiple providers—from community health workers to private sector drug dispensers to primary health facilities—within the health system.
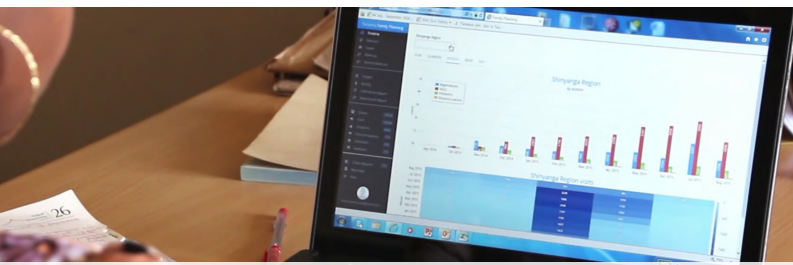
Big data and machine learning

Through our Safer Deliveries program in Zanzibar, we are leveraging big data and using machine learning to develop algorithms to predict risk of adverse health outcomes when a client is registered into the program. When identified, community health workers can provide more targeted and frequent support to identify and address health behaviors or refer clients to appropriate care early on. This enables the health system to achieve more precise, cost-effective and equitable health service delivery.
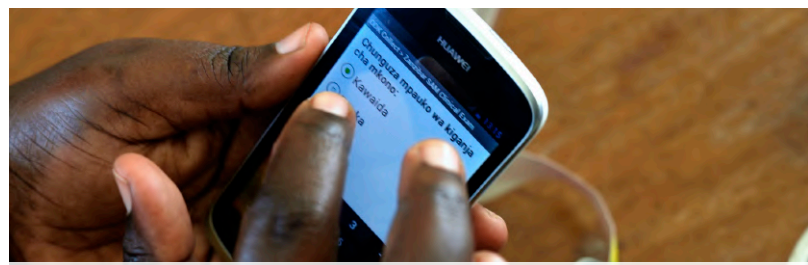
Near field communication

Along the Thailand-Myanmar border, migrant workers move frequently depending on economic opportunity. This population is burdened with high rates of tuberculosis, requiring 6 months of treatment. Frequent movement leads to high rates of treatment failure. D-tree is working with Alight to introduce near field communication (NFC) tokens to migrant workers, enabling a 'portable' electronic medical record, which is carried by the patient and scanned by a health worker using a mobile app to provide continuity of care across locations, resulting in improved treatment adherence.

D-TREE ACCOMPLISHMENTS

D-tree's programs have demonstrated improvements in multiple levels of the health system, all leading to improved health and wellbeing. The key metrics we look at are people, providers and national-level change:

Helped people	Supported providers	Effected national change

27% REDUCTION IN MATERNAL MORTALITY
through a comprehensive digital emergency transport system[8]

5-FOLD INCREASE
in clients registered in community health programs compared to programs without D-tree's digital system [9]

REDUCED UNWARRANTED PAYMENTS
for antenatal care from 37% to 1% using real-time data for government-level decision making

50% INCREASE
in facility birth rates[10]

15-FOLD INCREASE
in timely follow-up visits by health workers[9]

Zanzibar Community Health Strategy now includes
DIGITAL TECHNOLOGY IN THE NATIONAL HEALTH SYSTEM

4-FOLD INCREASE
in postpartum follow-ups[10]

HEALTH PROVIDERS FEEL MORE CONFIDENT, COMPETENT AND MOTIVATED
when using D-tree's digital health tools[13]

Key contributor to the Malawi Ministry of Health to design a
GOVERNMENT-OWNED AND LED NATIONAL DIGITAL COMMUNITY HEALTH SYSTEM

3-FOLD INCREASE
in referral completion rates compared to non-digital community health programs[12]

43% IMPROVEMENT IN DIAGNOSTIC ACCURACY
due to digital decision support systems in Malawi[11]

ZANZIBAR'S SAFER DELIVERIES PROGRAM EXPANDED
and became the basis for the country's national community health volunteer program

D-TREE'S FIVE-YEAR GOALS

10 MILLION.

That's the number of people whose health and wellbeing will be improved following D-tree's five-year plan. We will deepen our digital health systems strengthening efforts in existing areas and apply established successes and lessons learned to expand our model and improve lives through digital solutions in new geographies. Our strategic priorities, which will help us reach these goals, are outlined below.

Strategic Priority 1

Maximize the potential of digital technology to strengthen the Zanzibar health system

With continued leadership from the Government of Zanzibar, all of Zanzibar's 1.5 million people will have access to high-quality community health services. By further expanding digital technology to other areas of the health system, which are consistent with government priorities, we will improve the quality of care and further build capacity of the government to manage these systems. This will serve as a model for other countries.

Strategic Priority 2

Replicate our approach in new geographies and health areas

We will replicate our model of engagement from Zanzibar in Tanzania and Malawi where we also have country offices, and expand to two new countries. We will support a total of five governments to develop and implement effective digital health systems reaching between 1–3 million people in each location, improving the lives of at least 10 million people in five years.

Strategic Priority 3

Identify and test transformative innovations

New innovations have the potential to positively disrupt and improve health service delivery, but must be considered within the local context and be introduced responsibly. Building on our strong track record of introducing innovations into health systems, we will continue to identify new, promising innovations, testing and adapting them to the places where we work so that people have increased access to high-quality care.

Strategic Priority 4

Serve as a key contributor to the global digital health agenda and evidence base

Generation of evidence and dissemination of learning is key to supporting the expansion of effective models for digital health globally. By expanding our focus in this area, we will continue to use our programs to inform and shape global policy dialogue around digital health.

Cross-Cutting Strategic Priority

Build, strengthen and support local capacity

Maximize the potential of digital technology to strengthen the Zanzibar health system

Why is this important?

Through a deep-rooted, long-standing relationship in Zanzibar, the national government has adopted a digitally enabled community health system, developed with D-tree, as the primary means to deliver integrated maternal, newborn and child healthcare and early childhood development services throughout communities. This system has been formalized and integrated into Zanzibar's national Community Health Strategy. As the government's partner in this effort, D-tree has a unique opportunity to expand digital health programs to new areas within this health system.

Maximizing the potential of digital technology to strengthen Zanzibar's health system will position Zanzibar as a model for other countries to integrate digital technology effectively into their national health systems.

How will we accomplish this?

1A. Apply our model to strengthen other areas of Zanzibar's health system

- Support the Zanzibar government to integrate **new content into the community health program** based on government priorities (such as family planning, non-communicable diseases, adolescent health and mental health)

- Apply digital health and emerging technology to **additional areas of the health system** in collaboration with the government and partners (such as primary healthcare and private sector drug dispensers, strengthening the continuum of care between community and health facility, integration of point-of-care diagnostics within digital tools for frontline health workers, and strengthening supportive supervision and quality of care)

1B. Continue to develop the Government of Zanzibar's digital health leadership and capabilities

- Transition full **leadership of Zanzibar's community health program to the government**, with D-tree as a technical advisor

- Support the Government of Zanzibar to **develop a national digital health strategy** to guide planning, coordination and financing for all digital health initiatives

- Work hand in hand with government employees, investing in their skill sets, as much or more as we do for our own staff, to **strengthen their ability to manage digital health systems**

Replicate our approach in new geographies and health areas

Why is this important?

Digital health is recognized as an important component of health systems strengthening in low- and middle-income countries, attracting growing interest from the global health community as it seeks to deploy digital technology to have positive, long-term impact. D-tree with its systems-building approach is poised to replicate the successful model built in Zanzibar to help other governments and partners navigate the digital health landscape with the goal of creating government-led programs that expand and exist well beyond the pilot phase.

How will we accomplish this?

2A. Expand our focus from smaller projects to encompassing programs, applying our approach holistically and maximizing our impact

- **Formalize our engagements in mainland Tanzania and Malawi** with longer-term programs, collaborating with governments and like-minded partners

- Work closely with governments to **define strategic priorities** that leverage the success of our approach

- Cultivate relationships with **multiple aligned funders** who are interested in long-term engagements that can lead to fully integrated, digitally-enabled health systems

2B. Expand to new geographies by establishing a long-term presence

- Establish a **Global Programs team** to standardize D-tree's approach in new geographies based on our learning and best practices from working across projects and settings

- Select **two new countries** based on potential for long-term engagement and impact

- Mobilize resources to **open offices, hire staff and initiate programs** in these new geographies

2C. Strengthen D-tree's internal systems and operations to support expanded geographic reach

- Expand D-tree's **Operations team and systems** (including Finance, Administration and Compliance) to continue high-quality management of resources as we scale

- Create a lean **People Operations team** to strengthen our ability to recruit, develop and retain top talent by focusing on improved employee onboarding, talent management and retention, leadership development, employee experience and culture, and internal communications

- Grow our **Partnerships and Fundraising team** to cultivate new partnerships and funders and to diversify and sustain resources

Strategic Priority

3

Identify and test transformative innovations

Why is this important?

New advances in and applications of technology are accelerating at an exponential rate. The potential for emerging technology, such as artificial intelligence, new diagnostic devices and telemedicine, to improve access and personalization of healthcare is significant. Innovations also have potential to bridge gaps within health systems, enabling high-quality service delivery to be shifted to those with little training and improving efficiency within health systems. With such a wealth of new and often competing opportunities, we recognize the need to support the introduction of appropriate innovations that have real potential to improve health systems in the long term, while understanding risks. We will continue to identify promising innovations, testing and adapting them to the places we work. We are also committed to analyzing opportunities and threats more broadly, helping partners to strengthen their offerings and responsibly integrate relevant innovations into broader digital health systems.

How will we accomplish this?

3A. Identify promising innovations to disrupt healthcare based on recognized needs

- Expand our current capability to build a **global, multidisciplinary Innovations team** consisting of local and international staff to stay at the forefront of technological innovations

- Develop **strategic partnerships** with innovators who are developing new products and using emerging technology that could be tested and applied within our programs

3B. Test and learn from innovations

- Work with our partners to **evaluate new technologies and approaches**, and feed learnings back to our other programs and the broader ecosystem

- **Apply technological and programmatic innovations** broadly across countries and programs to test their potential, replicability and scalability

- Share successes and failures widely to support improvements from innovators and to **generate new learning** and evidence from these innovations

Serve as a key contributor to the global digital health agenda and evidence base

Why is this important?

The World Health Organization's digital health guidelines illustrate the lack of rigorous evidence around digital health implemented in real-world programs. We recognize the need to couple digital health implementation with rigorous learning and evaluation to contribute to evidence within countries and globally. With experience in both on-the-ground implementation and global thought leadership, we are well positioned to add to the global evidence base and dialogue. We will continue to generate and disseminate learning across the geographies in which we work and among broader global conversations in order to help advocate for how governments, donors and health system actors can effectively use digital health to achieve health system gains.

How will we accomplish this?

4A. Systematically learn from our programs

- Expand the capacity of our team and government partners to **monitor and measure the impact of all of our work** as it relates to our theory of change

- Conduct **implementation research** (qualitative and quantitative) and impact evaluations of our programs to generate evidence

- Establish **long-term partnerships** with leading research, learning and evaluation organizations to technically advise us and expand our capacity to maximize learning in all of our work

- Support the **capacity building** of partners and local stakeholders to use data for effective decision-making

4B. Disseminate our learnings to advance the field of global digital health

- Increase the power and reach of **global goods software platforms** for health systems by taking an active role in software developer communities, by contributing content, documentation, best practices and case studies

- **Publish peer-reviewed manuscripts** to add to the global evidence base for digital health

- Engage in **international working groups** and global dialogue to influence policy decisions around digital health

- Organize **dissemination events** in the countries in which we work and at relevant global events

Build, strengthen and support local capacity

Digital health programs with potential for long-term impact depend on strong local capacity: a health workforce that is motivated and has capacity and ability to use and learn new technology; leaders empowered to make informed and effective decisions and develop strategies to integrate technology into their health systems; local software developers and IT professionals to create digital systems and integrate new solutions; and local innovators with the creativity to solve problems in their own communities. Cutting across each of our strategic priorities is our commitment to improve and build on existing local capacity in all that we do.

How will we accomplish this?

• Engage with local experts within our country programs and partner with local technology and health organizations to learn from them and transfer knowledge from global best practices to support development of technical and administrative capacity

• Work closely with governments and health system actors and support skills development at all levels of the health system required to manage and sustain digital health programs

EMPOWERING CITIZENS TO DEMAND ACCOUNTABLE CARE

In D-tree's community health programs, we have introduced citizen reporting to empower clients to give feedback on the quality of services they receive at health facilities. Community health worker apps trigger this survey when a client has been to a health facility. The client can give feedback about waiting time, payments for services, types of services received and respectful care. This data is immediately available to district health teams that can review the quality of care across the district and at individual health facilities.

In 2017, district health managers in one district in Zanzibar used the dashboard from the digital health program to identify that 37% of women were paying for antenatal services, even though they are supposed to be free of charge. This can be a significant barrier to accessing services. Through mentorship from the D-tree team, the district health team developed an action plan to investigate why health facilities were charging fees for these services. Quantifiable, accurate data from the program allowed the district health team to approach health facilities with facts rather than only anecdotal evidence. They learned that facilities were chronically out of stock for reagents for tests performed at antenatal visits, and therefore needed to charge clients for services so they could procure these reagents from local pharmacies. With this information in hand, the district health team met with the District Commissioner and presented the data and findings. They were able to get a commitment to increase the district health budget to cover the cost of these reagents. Prior to the digital program, district managers knew women were paying for health services but could not back this up with data and were therefore never able to advocate for increased funding.

Due to this action by the district health team, payments for antenatal care dropped immediately from 37% to 1% and have been sustained to date.

This is an example of how D-tree's digital systems—when coupled with engagement with stakeholders at all levels of the health system—can give clients a voice in demanding quality care and can empower governments to use data to make informed decisions, leading to positive change.

JOIN US as we change the lives of 10 MILLION PEOPLE

The field of digital health is at an inflection point. Digital technology can—and must—become an essential part of health systems in order to accelerate progress towards achieving universal health coverage.

D-tree is at the forefront of establishing positive health system change through digital technology. Our work in Zanzibar proves that digital health systems—when developed together with governments and local stakeholders with a long-term commitment to capacity building—can reshape healthcare delivery and become embedded within broader health systems. These systems empower people, health providers and leaders to receive high-quality, accessible care, resulting in improved health and wellbeing.

The depth and breadth of D-tree's experience uniquely positions us as an organization that can support health system transformation through digital technology around the world. D-tree is leading by example and bringing together technology partners, governments and health system actors to achieve systems change and institutionalize digital initiatives at scale.

We invite you to join us as we realize our vision of improving health and wellbeing for all!

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